

481

The Indian Veterinary

Journal

1953 - November

VOL - 30, NO - 3



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THE
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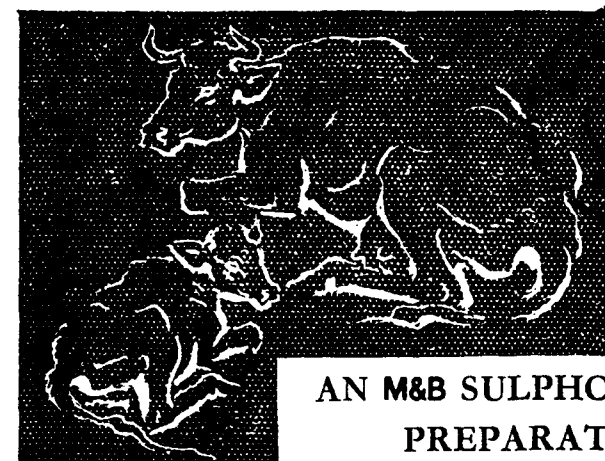
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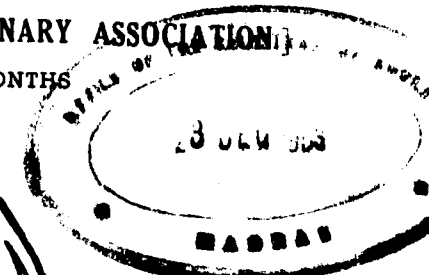
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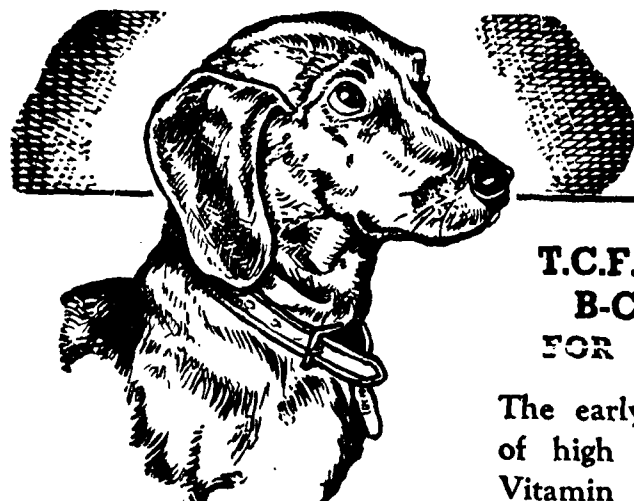


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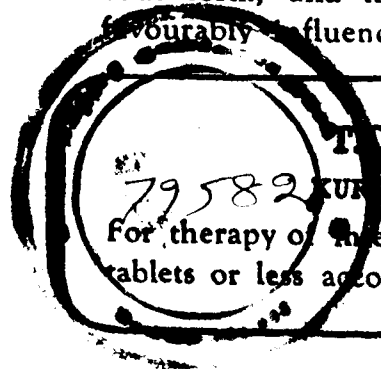
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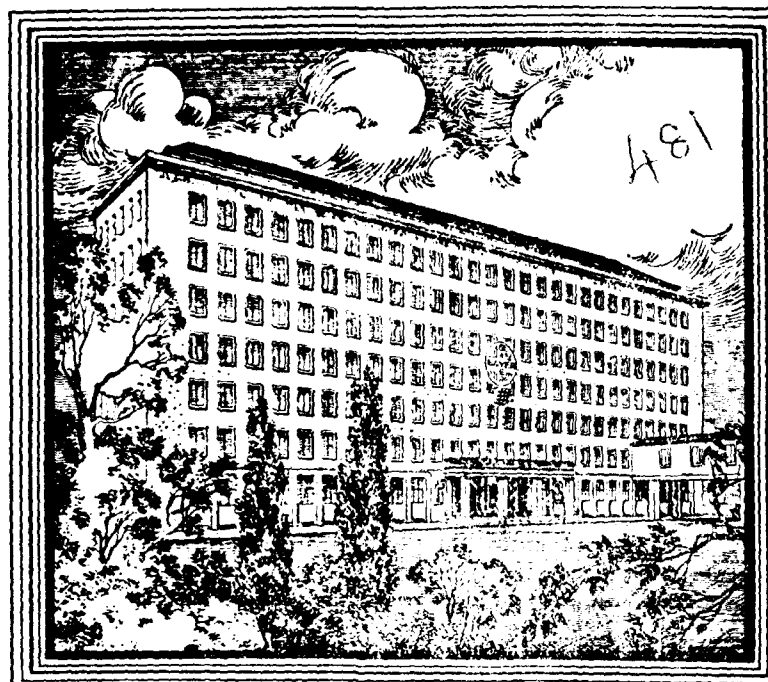
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Vol. XXX

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General Articles

CHRONIC BOVINE HAEMATURIA†

By

S. DATTA, D.Sc., M.R.C.V.S., D.T.V.M., F.R.S.E., F.N.S.,

Director,

Indian Veterinary Research Institute, Mukteswar.

VI. Haematuria Transmission Experiments

(i) Position in literature.

In summarising the work of previous investigators in this connection, it may be said that negative results have been the rule and cases where successful transmissions were claimed are very few indeed. Many workers have made these attempts at transmission. In these tests a variety of suspicious materials including diseased tissues, urine, blood, samples of water and vegetation have been employed. Besides some commercial acids have also been tested. The routes of administration have been varied but positive results have not been forthcoming.

In the British Isles, Craig and Kehoe (1923 and 1925) carried out a series of experiments with both blood and urine, and they were led to conclude that no microbe or parasite was involved in the causation of the disease. In East Africa, Kearney (1918) inoculated large quantities of blood into healthy animals of different ages and breeds. Samples of haematuria urine were injected into the bladder of a healthy cow. Scrapings from the bladder growth collected immediately after death were inoculated into guinea pigs. Negative results were reported in each case, and no incriminating organisms were detected on bacteriological examination of the tissues from diseased subjects. The above instances of experimental tests may be taken as representative of all the work carried out so far.

When Detroye (1891, 1904) claimed the first positive results, Moussu came forward to test out the effects of the culture of the alleged pathogen which the former had supplied to Nocard. Careful scrutiny

† Continued from page 119 of I.V.J. Vol. XXX No. 2, September 1953.

was made, and the tests carried out by Moussu failed to confirm the conclusion of Detroye that the disease was microbic, inoculable and contagious. Further, the criticism was also made that Detroye had not differentiated between haemoglobinuria and haematuria. It is, however, interesting to note that Detroye cultivated his microbe on such liquid media as urine, serum and bouillon, and that the organism, said to be a micrococcus, thus assumed the form of a diplococcus or a streptococcus. Very young cultures of this organism appear to have been used by him in the transmission experiments, presumably in the view that the microbe happened to be a bacterium. Twelve animals were inoculated, subcutaneously and intravenously, and positive results were reported in six of them in between 3-20 days.

In the face of the fact that Detroye's results could not be confirmed, it may not be admitted that he had actually encountered a pathogenic organism. In the instance of bovine haematuria, however, technical reasons exist why a similar divergence in the results of transmission experiments may have been inherent in the problem itself rather than a matter for the absolute discredit of his work. Detroye did not record the detailed and specific characteristics of the micrococcus dealt with, and the mere morphological resemblance to a diplococcus or a streptococcus that he mentions is capable of another interpretation.

A series of transmission experiments, which received an even greater prominence than Detroye's work, was carried out by Hadwen. Like others, he also had first failed to transmit the disease to healthy animals, by cohabitation with the clinical cases, by injecting haematuria urine into the bladder, by giving it by the mouth, and by the injection of the blood and urine under the skin. He employed as many as seventeen animals for the purpose. While examining urine samples from clinical haematuria cases, he encountered crystals of calcium oxalate and presumed that these must have come from oxalic-acid-bearing plants ingested by the animals. Therefore he carried out a second series of experiments (with commercial oxalic acid and calcium oxalate), and claimed to have produced the disease by (i) injection of calcium oxalate crystals in aqueous emulsion into the bladder and (ii) by the oral administration of oxalic acid, in about five months, and two and a half years respectively. Hadwen's oxalic acid theory has two special merits, firstly that it had the possibility by offering an explanation of the connection of the disease with special enzootic areas, and secondly some workers were able to find calcium oxalate crystals in haematuria urine. Hadwen's conclusions were generally accepted and held the ground until comparatively recently. The *Veterinary Bulletin*, a publication of the Imperial Bureau of Animal Health, appeared to give credence to it as late as 1931.

Among the other lines of work, the possibility of plants, endemic to the haematuria areas, producing the disease due to their toxic properties has been subjected to experimental tests by several workers with a negative result in each case. For instance, Cleland (1911) experimented with *Homalanthus populifolius*, *Indigofera australis* and *Goodia lotifolia*, and Hadwen employed in his tests extracts of dicentra, deergrass, alder and bracken.

With a view to explaining the negative results obtained, Hadwen remarks that it is very improbable that one special plant causes the disease because the vegetations in the various countries differ so much, and that a group of plants may thus be responsible rather than one particular species. In Germany the general belief existed for a long time among owners of "red farms" (haematuria) that the disease is somehow transmitted from animal to animal. To test this belief, the other suggested causes and particularly the bacterial theory, Schlegel carried out experiments designed to provide clear results. 80-200 ccs. of blood collected from the jugular vein of clinical cases were administered either whole or defibrinated by one or more routes into healthy animals; haematuria urine, 50-180 cc., being given at the same time, either orally or subcutaneously. These administrations were repeated several times, and the animals were kept under observation (pulse, respiration, temperature and the character of urine) up to eleven weeks. Further some of the animals were drenched with three-quarters litre of urine. Schlegel reports that in these animals no abnormality was noted in life or at autopsy in spite of the large doses being repeated five or more times. Similarly, 65 c.c. of a filtered emulsion of verrucose bladder growths and of kidney from a clinical case was given subcutaneously into a cow, and five weeks afterwards when the experimental animal was sacrificed, no changes were discovered at the seat of the inoculation or elsewhere. In one of the two experimental healthy cows, the calcium content was found to decrease and the phosphoric acid content to increase.

It is a remarkable fact that, in the autopsy of his experimental subjects, "lesions of tuberculosis" are said to have been found in most cases. It is curious that Schlegel should not have offered any explanation for this unusual finding in his animals. It appears more than certain that he relied wholly on the gross characters of the lesions to arrive at that diagnosis, and that the lesions were actually pseudo-tubercles.

In the small animal tests, four white mice, three guinea pigs and rabbits were inoculated with one, two and five c.c. of strongly bloody urine at the root of the tail, but no reaction was noticed in life or on

destruction. From the above experiments and the failure to find any parasites in the post-mortem examination of clinically affected cases, Schlegel concludes that the disease is not transmissible, is not contagious or infectious, and no parasite is involved in the causation. Further to test whether any general poisoning through acids produces haematuria, commercial acids and spring water from notorious localities were tested experimentally. Schlegel administered to healthy cattle increasing doses and varying concentrations of nitric acid (up to 65 c.c. of 0.17 to 0.39 per cent. solutions), silicic acid (solution containing 50 grams of potassium silicate in 0.29 to 1.06 per cent solution). The acids were given in water and over a length of time.

No changes were noticed in these animals. Schlegel, therefore, concludes that these common acids do not cause haematuria in animals, and that the water from enzootic areas do not contain any virus or bacteria capable of transmitting the disease.

In the interesting cattle feeding experiments on the "red water farm" at Milner B.C., twenty cattle were placed on the farm, and grouped according to the feed or water supplied to them, with the object of determining the effect of such on the production of the disease. Nothing of significance occurred for twenty-six months, but later on nine showed symptoms of haematuria. It is to be noted that in eight of the nine clinical cases, the symptoms appeared within a period of from *twenty-eight months* and *forty-one months*, and in the ninth case *forty-eight months* after being placed on the farm. Three of these cattle were slaughtered and apart from typical lesions in the urinary bladder, no other constant pathological condition was noticed. This fact was substantiated by numerous autopsies in the field. Of the remaining cattle which did not exhibit blood, six were slaughtered after being on the farm for thirty-six months.

The bladders of three showed minute *haemorrhagic spots*, suggestive of lesions in the very early stage, and another showed slight but quite definite lesions. The cattle which showed positive or suspicious evidence of disease had all had access to pastures on the affected farm. These pasture fields had a good deal of surface water standing on them at certain periods. Of the nine positive cases, one received hay and grain from non-red water farm, and artesian well water, but was allowed pasture grazing. The other eight received hay from red water farms and grain from non-red water farms; of these again four received artesian well water, and had access to surface water in the pasture fields and to stream water. The evidence gathered from these interesting field experiments indicated that the disease is contracted on the pasture fields on haematuria farms.

In order that more specific data might be secured regarding the environment or of the factors responsible for the disease, certain alterations were made in the grouping of the experimental cattle. Ten more cattle were added to the Milner herd, and two animals were put into each of the five groups, receiving different combinations of feed or water supplied from the red water farm, and feed from non-red water farm, either kept restricted to the stable or allowed on the pasture. All straw for bedding came from non-haematuria farms, but up to the date of reporting no haematuria was seen. Besides, two yearling heifers were kept on a neighbouring farm in a yard which was suspect because of the considerable loss from the disease which had been experienced among the bulls that had been kept there. It was reported that some of these bulls contracted haematuria without ever having been on pasture. The yard had no vegetation on it but as regards the presence of surface water for long periods due to heavy rains it presented conditions closely resembling those of the haematuria pastures. Feed from non-haematuria farms, artesian well water, and surface water from the yard were available to the heifers, but up to the date of report they had not produced any evidence of the disease. In another series of experiments, guinea pigs were fed urine from clinical cases and a pronounced cystitis was thus produced, and these lesions resembled very much those of haematuria. The controls as well presented some lesions. The results could not therefore be interpreted. Further two calves were fed with haematuria urine for about a year and had consumed twenty gallons of urine between them during the period. The experiment was in progress till the time of writing.

It has been noted above that Detroye, Hadwen and Bankier are the only workers who have reported successful transmissions. Of these, Bankier's report appears to be the only one pointing to some clear clues and suggestions. Most of the investigations carried out so far in different countries have been concerned mainly, if not exclusively, with field observations. While these field observations may establish a definite relation of the pasture and forage, etc., it will be realised that the final elucidation must depend upon some positive work with morbid materials from clinical cases.

(ii) Present studies.

Material and Methods.—In planning future experimental transmission work, past experience demands that a greater appreciation of what constitutes a positive result, and what results are to be expected from the methods adopted, and how these methods are to be utilised, to the fullest advantage are points of fundamental importance. No one doubts that under natural conditions the disease develops very slowly, and the latest data regarding early lesions and incubation period produced

in the field observations at Milner B.C. should be kept in view. Past workers have repeatedly made the mistake of expecting rapid results on the preconceived notions of a bacterial infection, and there are reasons to believe that such lesions as were present were summarily ignored during the making of naked-eye search for gross lesions. Every natural disease has its earliest and smallest beginnings, which may or may not be detectable even under the microscope. Besides the features of an artificially produced disease, under exaggerated conditions of experimentation, are not likely to produce the same identical composite picture, as one would find in the tissue representing a mildly progressive disease of long duration. The existence of the pre-clinical stage of the disease has come to be realised only very recently, and the absence of that knowledge could not have been helpful in the interpretation of transmission experiments carried out in the past.

The infective clinical material used in the transmission experiments by other workers include blood from the jugular veins, the whole (haemorrhagic) urine, portions of the bladder growths or emulsions made from it. The materials were administered through all the routes, *viz.* subcutaneously, intravenously, orally and even injected into the bladder of healthy animals. The administrations were given either on a few occasions, or over a length of time. It is remarkable that there happened to be no method by which the amount of the material to be administered, or the frequency of the administration required, could be judged or controlled. Besides what is more important is that the character of the lesions to be expected in any successful transmission under the conditions of experimentation was not realised. Even the necessity of destroying animals for a careful examination of the bladder, rather than be content to pronounce the result only from the character of the urine, was not appreciated.

In some of the earlier transmission experiments, the present writer made similar mistakes, and therefore his results also were not sufficiently controlled to be clear and precise. For instance, experimental animals were not finally disposed of by destruction but were utilised for other work. Sediments of urine were used in the present investigations rather than the whole urine, used by the previous workers, thus obviating the administration of large quantities of unnecessary material and enabling the infective doses to be given in a greater concentration and with a frequency somewhat similar to what would happen naturally in an enzootic area. In short, no method of concentrating the infective material was adopted by the previous workers. Further, in the writer's work, when the inoculum was introduced subcutaneously, the nodular lesions produced were not left to themselves to disappear spontaneously with time, but were either surgically removed and examined culturally

and histologically, or smears were prepared from the inside of the lesions, by aspirating the contents with sterile needles or from the burst lesions. Similarly, urinary sediments from haematuria cases were injected directly into the testicle or liver of rabbits, and the organs were subjected to complete examination by collecting them. While the testicles could be removed without sacrificing the animals, the liver was collected either at death or by destroying the animals. Another method of preparing the inoculum was by collecting the urinary sediments, washing them with changes of sterile normal saline by means of the centrifuge, and incubating the washed sediments in sterile bouillon at 37°C. One of the other earlier mistakes in the present investigation was the exclusive reliance placed on naked-eye examinations, and the failure to take into account such lesions as were present in the bladder of destroyed animals. The writer's experience shows that the microscopic examination of sections is the only correct and dependable diagnostic method, though the changes in the character and appearance of the urine as passed or after settling is a useful adjunct. Moreover it is felt that in order to ascertain if a transmission experiment has succeeded the following important points be remembered :—

- (1) The varying features of the natural disease in the early commencing, and in chronic cases to be kept in view (*cf.* Bankier's findings).
- (2) Naked eye examination of the mucosa and the deeper tissues by sectioning through the bladder wall at several places.
- (3) Direct examination of smears made by impression and scraping.
- (4) Microscopic examination of the urinary sediment.
- (5) Materials for close histological examination should be representative.
- (6) Methods of staining must be appropriate.
- (7) Material for fresh examination should be suitably prepared.
- (8) Culture from the depth of the bladder tissue after superficial treatment with disinfectants.
- (9) Culture from jugular blood or from heart blood.

(a) Small Animals

Among the ordinary laboratory animals, rabbits, guinea pigs and white mice were largely used by the writer. When the suspicion arose that the haematuria parasite might be an entamoeba, it became necessary to employ dogs and cats as experimental animals. A number

of these were used, but they were found to be unsuitable for haematuria investigations. The dogs were given (by the mouth) urinary sediments, and were injected with blood from rabbits succumbing to similar administrations, but they continued to be apparently free from malaise. Besides the oral administration, the cats were given urinary sediments intrarectally, and the majority died after varying periods of up to eight weeks, showing in most cases degrees of localised ulceration in the intestine. A few of the cats however lived for eight or nine months after the initial feeding. Since only negative results were obtained with regard to the suspected entamoebic infection, and due to the difficulty of handling semi-wild cats which only could be made available for these tests, other species of animals were requisitioned for the subsequent experiments.

About this time wild rats became a serious pest in the laboratory area and large numbers were trapped. As these were awaiting disposal, it was thought advisable to carry out some feeding experiments and subcutaneous injections upon them. Circumstances, however, supervened which prevented any further use being made of these extremely economical animals. Firstly the rats began to die in captivity, and secondly, those that survived were found to be already carrying in their system a fungus infection and discharging numbers of Gram-positive large and ovoid yeast-like bodies in their faeces.

When white mice were, however, used the results obtained were striking. For instance, when in some of the earlier experiments a small dose or doses of urinary sediment, after a preliminary preparation or directly, were given into the subcutaneous tissue of white mice, it was observed that the majority of the mice so treated succumbed in about the same period of four to five weeks, revealing some mild but distinct lesions in the kidney or elsewhere. A further observation made in the mice was that when emulsions of infected internal organs were used as infective material, the period of time required to produce fatal results in mice was gradually shortened till the mice began to die in two to nine days. Smears from the heart blood from each of those cases showed very numerous branching, Gram-negative chained organisms. Smears from the liver and other internal organs showed minute budding organisms, some of which were tending to take the Gram stain. Bacteriological cultures were made from the heart blood and the viscera of these mice, but no significant bacteria could be recovered. In order to see if there existed in the internal organs of these rapidly dying mice any lethal factor for bovines, four healthy bulls were either drenched, or inoculated subcutaneously or intravenously, with emulsions of internal organs from these mice. In about a year's time it was thought that the bulls had not 'taken'. Samples of urine from these

bulls were examined by the naked eye and, chemically, for the presence of blood with negative results. Most of these animals were transferred to another experiment, and when they were eventually killed, two of them presented unmistakable signs of bladder disease. Histological sections from one showed lesions similar to some extent to those of the natural disease. Although at the time it was proposed to repeat the experiment with similarly prepared mouse material, more direct results became available, and this idea receded into the background.

Regarding the rabbits used in the early experiments, it may be said that they were given urinary sediments into the subcutaneous tissue, or into the testicle or the liver. Injections into the liver produced abscesses in that organ which penetrated through into the diaphragm. The animals died within seven to ten days, and numerous cryptococcal forms of the parasite were detected both in stained sections and smears. The liver tissue was highly degenerated and necrotic with areas of haemorrhage and cellular infiltration in the parasitised parts of the organ. Similar lesions were present in the testicular tissue. It was found that for the morphological study of the developmental stages of the parasite, the testicular lesions were more suitable than the liver or the subcutis. Pure cultures of the *Aspergillus* were recovered from the suppurating nodules in the testicle and the skin. In sections chlamydospores and sprouting conidia were detected. In the subcutaneous nodules, large numbers of unchanged conidia and other capsulated forms were present. The great majority were intracellular. Others were lying free. There were young and rapidly multiplying forms, empty capsules, budded organisms and others in the process of degeneration. The thickness of the capsule varied in individuals, presumably representing different developmental stages. Some spores were inclined to be more stainable than others. One of the earliest rabbits used in these tests, it may be noted, died after ten days of receiving urinary sediment subcutaneously, and was found histologically to have died of a mycotic pneumonia. In several rabbits the blood vessels of the bladder were markedly dilated, while in two or three animals a tendency to papillomatous growth was evident. In guinea pigs, greyish areas in the kidney and cystitis were produced.

(b) Large animals

Before employing healthy bulls and calves in transmission experiments, these were first kept under observation for varying periods, usually for a fortnight or a week. To start with, the body weights were recorded. A temperature chart was maintained for each animal, showing the temperature of each morning and evening. This temperature recording was continued till the animals were finally disposed of at the conclusion of the observations. Faecal smears were

examined for helminths, their ova, or for coccidial oocysts, and blood smears for protozoa. Sample of urine were examined for cellular content, presence of blood cells, and for fungal mycelia and spores. As complete an information as possible of each animal to be used, was thus secured before the formal commencement of the transmission experiments. These elaborate precautions were observed till one could be sure of the suitability of the individual subjects for the work in view.

Following the work of the previous investigators, amounts of jugular blood from clinical cases administered by various routes to healthy animals. Portions of bladder growths, collected fresh and aseptically, were introduced surgically into subcutaneous pockets in a number of cattle. Again these growths were minced and emulsified, and introduced repeatedly into the urinary bladder of female calves with the help of a catheter. Similar emulsions were injected into the vulval lip, or into the rectal submucosa. However, in none of these animals did any marked and noteworthy results appear.

Urinary sediments do not appear to have ever been used by any previous worker, according to the recorded information. In the present studies urinary sediments from the active stage of haematuria were used. When these were inoculated subcutaneously, nodular abscesses were formed. In the majority of cases no obvious pus formation took place. The injections were given at various intervals, once or twice a week, every alternate day, or once every fortnight. It was found that considerable variations took place depending upon the frequency of the administrations, and that the abscesses were cold and not markedly painful. It was only in rare instances that the abscesses burst spontaneously, and this appeared to be due to either a too frequent or a too massive dosage. The external manifestations of the inoculation consisted of a nodular elevation or patchy thickening, but no disturbance in the body temperature or in any other normal functions was exhibited. On excising these cutaneous nodules sections were prepared and examined when considerable histological reactions were seen. It was found that in areas a considerable number of fungal spores or conidia were phagocytosed by the body tissue cells, that a very active fray between the host and the parasite, represented by degrees of haemorrhage, degeneration, cellular reaction particularly of polymorphonuclear leucocytes, was in operation. In cases where the injections were recent or repeated, the lesions were found to have extended to considerable depths. The degree of haemorrhage in the tissue was found to be comparatively severe, and greater in degree than originally anticipated from the previous experiences of nodules set up with suspicious materials from other diseases. Regarding the

parasites, occasional hyphal tubes or even shreds of mycelia apparently in the process of disintegration were observed. The fungal spores were most numerous, and appears to be possessed of only very restricted powers of budding, since the germ tubes produced by them were in most cases highly abbreviated. The tissue elements appeared to be capable of disposing of the fungal spores, presumably only as long as the dose or numbers of the parasite were not concentrated beyond a certain limit. Stages of degeneration of the spores were also seen. About twelve animals in all were subjected to these subcutaneous injections from time to time. Cultural examination of the material, aspirated out from the centre of the subcutaneous nodules (with the help of sterile needles), and of the excised subcutaneous tissue was made, and the *Aspergillus* sp. recovered. In smears made from the abscesses, intact or bursting spontaneously or from those which were surgically incised, the characteristic fungal elements were invariably found. No actual haematuria was however produced in the majority of the animals so treated, barring the exceptions mentioned below. The information regarding the appearance and behaviour of the parasite in histological lesions which resulted from these experimental studies were of considerable value in interpreting the findings in natural lesions.

Of the animals of this lot, five revealed degrees of bladder disease recognisable by the naked eye. Hill Bull No. 1061 showed patches of chronic congestion and old haemorrhage in the bladder wall. Hill Bull No. 924 presented a few rounded nodular growths on the mucous membrane. Hill Bull No. 143 showed signs of haematuria in life a few days before destruction. Extensive oedema of the bladder wall, rounded nodular growths and a few solidified calculi-like deposits were found at autopsy. Hill Bull No. 193 showed distinct chronic congestion of the bladder, but it appeared to be more superficial than in the other animals. Hill Bull No. 357 passed blood in the urine for some days in life. It is to be noted that only two hill bulls (Nos. 143 and 357) actually exhibited haematuria. The definite lesions in the bladder in different stages of formation found in the other cases suggested that, if the animals were allowed to live longer, outward signs of the disease might have been manifested in due course in them as well. This view appears to be reasonable in view of the known facts regarding the early stages of the natural disease.

The necessity of a complete histological examination of the urinary bladder from these cases was not realised at the time and therefore not made. Regarding the control animals, urinary deposits from healthy cattle, where such were available were collected and pooled together from several animals, washed and then employed in the same manner as in the above mentioned cases.

Among the other bulls used in transmission experiments, two animals were given a single administration intravenously of 20 c.c. of a saline emulsion of bladder growths. Both the animals were kept under observation for about nine months till finally they were destroyed. In the meantime their body weights, temperature, results of blood and urine examination were recorded. Each of them gained in weight but did not reveal any marked changes in the urine. The bladders were examined with the naked eye, and in the absence of any gross warty or nodular growths they were passed as "apparently normal". Two animals which received urinary sediments into the rectal submucosa passed soft faeces for a few days after the injection. They also gained in weight and when finally destroyed did not show any gross lesions of the urinary organs.

Experiments in young calves.—Four calves between the ages of 5 to 8 months, were taken, and their urine examined culturally and microscopically for about a week to 10 days. Two were inoculated subcutaneously with urinary sediments in normal saline from haematuria cases. In one the injections were given once in every five days, and the other received injections every eighth day. The third animal was drenched with urinary sediments every third day, and the last animal received weekly injections into the vaginal submucosa. An increase in the cellular contents of the urine was often exhibited lasting for 4 or 5 days till it gradually fell down to normal. The urine of the animals was examined periodically. It was only in one calf (No. 30) which received the infective material through the mouth that actual haematuria was exhibited after about 3 months of the commencement of drenching. The bleeding was not continuous but recurred at intervals for about four months of observation. One of these calves is discussed below.

(c) Experimental Lesions

Among the large and small animals subjected to administrations of infective materials from haematuria cases, lesions were detected in a number of animals of various species. Urinary sediments appeared to be more infective and suited for transmission work than even portions of bladder growths or kidney lesions. The transplantation of the growths or lesions into subcutaneous pockets or into the submucosa of the rectum and vagina has not succeeded. Emulsions of the lesions were administered only occasionally in each animal and did not set up any marked results. The presence of the infective agent, the fungal parasite, was demonstrated constantly under microscopic examination; and, in the artificially produced subcutaneous nodules, the close association of fungal structures with those lesions characterised by some of the features of haematuria was invariable. It is remarkable that irrespective

of the tissue into which the sediments were inoculated, the character of haemorrhage, degeneration and cellular reaction of the host, and the features of the parasites were the same, and compared very favourably with those of the natural disease. In the cats succumbing to intra-rectal administrations, patches of intestinal ulceration formed a common feature, but nodular lesions were also present on the renal surface in some of them. Similarly mild but distinct lesions were present in the kidney and sometimes in the liver of the white mice. Among the rabbits a progressive disease was set up by local inoculations into the liver and the testicle, and while, in the former, fatal results followed, the disease in the latter case was comparatively mild and localised. Subcutaneous injections also caused death of a number of rabbits, and the finding of mycotic pneumonia in one of them was very striking. Of all the species of experimental animals, the most noteworthy results were no doubt produced in the natural subjects of haematuria. Of these, two bulls and a calf actually developed haematuria in life, while degrees of bladder disease readily recognisable by the naked eye were present in three other bulls. That the artificial lesions were more or less identical with those of the natural disease was proved by detailed examination of the lesions in which fungal activity was well represented. Of the other animals in which no clear naked eye lesions were recognised, one could not definitely eliminate minor degrees of infection. Here it must be explained that only small amounts of haematuria urine were collected, and as a number of these experiments were proceeding simultaneously the amount of urinary sediment available for each animal was rather meagre. It is now felt that the doses employed in each case must have been much lower than actually infecting animal naturally. Besides it is certain that the fungal elements as discharged in the urine by an affected subject are insufficiently aerated and consequently contain a far fewer number of spores than those of the infective material responsible for the disease in nature. In surveying the past work, it is felt that if the urinary sediments were kept exposed to the air for at least a week before use, the natural conditions could be more closely approximated and even better results expected than recorded here. The experience gained in these studies, particularly in mice, suggests that a highly active and virulent blood form of the fungus is produced hitherto unrecognised. Finally the case of a calf that developed a highly extensive haemorrhagic inflammation in the subcutaneous tissues, following upon injections given there, and died of a rapid diffusion of the parasite into the general system, must be mentioned. This case will be compared later to another that succumbed in a similar manner after subcutaneous injections of the pure *Aspergillus* culture.

(To be continued)

**EVALUATION OF SIRE INDEX AND PROGENY TESTING
AT THE LIVESTOCK RESEARCH STATION, HOSUR, MADRAS**

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The first step that an animal breeder, when he plans his breeding programme, has to decide is the ideal type that he is thinking of and then find out the genes that go to make up his ideal. As far as the genes are concerned the breeder can never see the genes, but he can judge the presence of the genes which the ideal type can produce by close observation of the near relatives from time to time. The breeder of pure breeds then stays with the best individuals and then keeps up the breeding. This may be useful in utilising the laws of Mendelian inheritance to keep it at a nearly constant level so that the future animals may be allowed to the proved sires and dams of the past. This requires careful planning to be continued for generations to maintain the ideal type as economically as possible.

Selection of animals in a herd for breeding cannot create any new genes. By careful selection a combination of genes to have more off-spring than those which lack those genes takes place, as much it is creative in such a way that *new types* can be produced to move the average of the population from the original position. If there is proper attention to the relatives of these animals used for breeding, a certain amount of increase in the genetic effect will take place to improve the accuracy of the selection. With respect to the genetic principles involved, pedigree estimates are those directly connected with the parents, while progeny testing is of its descendents. In the absence of any other information about the production records of the animals, pedigree selection can make selection more effective than the individual merit of the animal, which may be complicated by environment, dominance and interactions of the genes.

Progeny testing estimates the individual's heredity by studying its off-spring. It aims at the principles of inheritance that each off-spring gets from the parent sample half of the inheritance. This sample half of inheritance will be different for each off-spring, though the source of the parent is the same. If we can estimate in all these samples of the off-spring we can have some idea of the parent. With

this object in view, the progeny testing is able to estimate the value of the individual.

In progeny testing, since we do not know the genes present in the off-spring, while estimating the parent's genes, there is a possibility of the other factors such as dominance, environment and interaction of the genes deceiving the real estimation of the parent. Again the off-spring also gets half of its inheritance from the other parent, and we may not be in a position to assess the value due to a certain good quality which has come either from the sire or dam. This can be solved by breeding an animal to a large number of mates, so as to equalise the merits and defects. The practical difficulty which cannot be avoided in progeny testing is due to the environmental condition where the off-spring and the parent individual are born in different times and different conditions.

One of the important facts to be borne in mind in progeny testing, is that the off-spring be an unselected sample and, in case a selection is made in marking the progenies to be tested, a bias is created which will be unfair to evaluate the result of the parent individual. Equal chances must be given for the dams to form a random sample in a particular breed so that the average of the dams can be taken as the breed average and as such the random errors can be avoided. Again, if the number of progenies is increased, the errors of Mendelian sampling are reduced. Usually for slightly less hereditary characters between the off-spring and the parent, five dam-daughter comparisons are fixed as the minimum. Care is also taken that there is not much of correlation between the off-spring and the parent. The genetic make-up of the progeny tests indicate that the results are very accurate and gives wider scope for the selection of animals without altering the genetic characters. If the progeny testing is not applied, for selection, some which would have proven to be of good characters, might have been lost by mere pedigree or individual selection. The limitation on this progeny testing is that the information about the parent individual comes so late in that particular animal's life that some of the off-spring are worth using for breeding.

The sire index gives an estimate of the breeding value of the sire from an indication given by the progenies of the sire about the heredity. Usually for all practical purposes, the sire index must include a complete information about the sires' own characters, and about the ancestors as well as the progenies born to the sire, but the current ideas deal only with the information about the progenies with their parents, and the other information about the ancestors is only secondary.

The assumption made use of in estimating the sire index is that the off-spring averages midway between the two parents (i.e. $\frac{S+M}{2} = D$ where S—indicates sire, M dam and D daughter). The estimation of the sire index mainly depends upon the assumption made above. The reasons for doubling the index arises completely from "Mendelian errors" and "errors of appraisal". The variations due to Mendelian errors are truly random, if the off-spring are from an unselected sample and thus the random errors cancel each other as the number in the sample increases. The errors that arise due to environment and other conditions of differences between the Dam and Daughter, are systematic and the average environmental error does not tend to Zero and is doubled in getting the estimate of the sire. Thus the effects of environment on the dams fail to be random and becomes the major source of error in calculating the Sire Index and Progeny Testing. As far as these systematic errors are concerned, there is little than we can do except to make a close study of the environmental conditions and give some special allowance in the estimation of Sire Index from the life time records of the Dams. Mention may be made that if the Dams are selected for breeding though the off-spring are from an unselected sample, considerable regression towards the average of the breed should be allowed while estimating the real breeding value.

Progeny Test reveals by the test of significance whether the sire can produce daughters whose average milk yield is better than their dams, but the sire index gives an estimation of the breeding value of the sire with respect to the progenies born to the sire. Though there are so many indices used to estimate the value of the sire, the one, which is commonly used, is the "Commercial Mount Hope Index," otherwise known as "Intermediate Index." This goes by the formula $\frac{S+M}{2} = D$ i.e. $S = 2D - M$ where D and M are the average milk yields of daughters of the sire and his mates.

While computing the value of sire index and progeny testing, the following are the major factors which affect the milk yield and they have to be standardized.

- (1) The number of the lactation.
- (2) The length of the lactation.
- (3) The number of times the animal is milked in a day.

The number or order of the lactation is usually the first lactation of milk yield for estimating the index, so that this estimation can be useful for other lactations, but for real estimation of further lactations, it is advisable to recalculate the index further. In foreign

countries, conversion factors are used for recalculation, but for Indian cattle, no such factors have been worked out.

The length of lactation is very important for adjustment. The standard number of days for the length of lactation is fixed, as the first 300 days of the milk yield, but in India usually it has not been recorded in the past, though it is now being recorded in the Dairy Farms. In the absence of this data the lactation yields are adjusted to the standard length of 300 days by the use of regression method. Advantage is gained by this method, in reducing the sampling error of the Sire Index.

The number of milkings in a day is usually two in India; as such the calculation is based on twice-a-day milking conditions and, in case the number is more, records are usually corrected to twice-a-day by conversion factors.

While calculating the Sire Index, it is important to estimate the sampling error of this index. The sampling error will show the magnitude and the extent to which the index is likely to vary from chance causes. In statistics, the sampling error is known as standard error and it is common to add or subtract the standard error to the calculated index. For calculating the standard error, the multiple is given by "Student's t" corresponding to the number of comparison of Dams and Daughter. The level of probability calculated in the test of significance is always 5 per cent, but, since it is difficult to detect the genetic ability due to continuous selection, 10 per cent level is taken so as not to over or under estimate the breeding value of the sire.

The Livestock Research Station at Hosur maintains a good number of pure-bred Sindhi animals. Records of milk yield and other pedigree particulars are maintained at this farm for over 25 years. As it is the desire to fix the characters and to plan the breeding programme, the records are analysed with the recent statistical techniques to estimate the breeding value of the sires and of progeny testing. By paying good attention to ancestral study, it is possible to develop the accuracy of the selection. As the selection proceeds by pedigree or individual merit, a stage may be reached to exhaust all that are practically possible and progeny testing now gives entirely a new opportunity to breed more useful animals and also to assess the worth of the selection previously done. The Sindhi animals, which are used for breeding at the Livestock Research Station, trace their origin to the individual merit and pedigree estimates of the collateral relatives. Now the "Intermediate Index" with the standard error is calculated for all the available Sindhi bulls at the farm. The Regression co-efficient is also computed from the milk yield records for the respective dams and daughters to standardize the length of the lactation period to 300 days. The detailed procedure in computation is given below:—

Sindhi Bull No. 124

Serial Number.	Unadjusted milk yield of dam.		Unadjusted milk yield of Daughter.		Adjusted milk yield in the first lactation for 300 days.	
	Milk yield in lbs. of first lactation.	Number of days in milking.	Milk yield in first lactation in lbs.	Number of days in milking.	Dam. M	Daughter. M
1.	1075	136	3212	338	3153	2807
2.	3042	279	5630	346	3308	5139
3.	918	131	2004	291	3059	2100
4.	1075	136	2852	314	3153	2703
5.	2758	293	2828	294	2847	2892
6.	2584	235	2317	349	3408	1794
7.	4367	361	2292	310	3594	2185
8.	3311	269	2789	321	3704	2565
9.	2432	320	2363	315	2179	2203
10.	123	34	2939	309	3746	2943
11.	4115	349	3874	315	3494	3714
12.	3848	326	5721	589	3319	2647
13.	5103	331	3210	311	4710	3094
14.	3052	382	3439	334	2026	3076
15.	4663	370	2825	344	3776	2456

X — Milk yield unadjusted in the first lactation.

Y — Number of days in milking.

ΣX — Total milk yield in the first lactation.

Σ — Total number of days in milking.

$$b = \frac{\Sigma (X - \bar{X}) (Y - \bar{Y})}{\Sigma (Y - \bar{Y})^2}$$

 $\bar{X}$ — Average milk yield in first lactation. $\bar{Y}$ — Average number of days in milking.

b — Regression coefficient of milk yield days.

n — Total number of animals compared.

EVALUATION OF SIRE INDEX AND PROGENY TESTING

Dam

$$\Sigma X = 42466$$

$$\Sigma Y = 3952$$

$$\Sigma (X - \bar{X}) (Y - \bar{Y}) = 2008752.54$$

$$\Sigma (Y - \bar{Y})^2 = 158547.74$$

$$b = \frac{2008752.54}{158547.74} = 12.6697.$$

Daughter

$$\Sigma X = 48295$$

$$\Sigma Y = 5080$$

$$\Sigma (X - \bar{X}) (Y - \bar{Y}) = 763486.34$$

$$\Sigma (Y - \bar{Y})^2 = 71553.34$$

$$b = \frac{763486.34}{71553.34} = 10.67$$

The adjusted milk yield for 300 days is based on the Regression coefficients calculated for Dams and Daughters.

$$\text{Sire Index} = I = 2\bar{D} - \bar{M}$$

$$\text{Let the sire Index} = X$$

$$\text{Variance} = \frac{\Sigma X^2 - (\Sigma X)^2}{n}$$

$$\text{Standard error of the mean} = \sqrt{\frac{\frac{\Sigma X^2 - (\Sigma X)^2}{n}}{n(n-1)}}$$

$$\Sigma X = 34960$$

$$\Sigma X^2 = 129074298$$

$$\frac{(\Sigma X)^2}{n} = 81480106.6$$

$$\text{Standard error of the mean} = \sqrt{\frac{39494191.4}{15 \times 14}} = 433.66$$

Standard error $\times t$ at 14 degrees of freedom at 10% level of probability = $433.66 \times 1.761 = 753.67526$

$$\text{Intermediate Index} = 2331$$

$$\text{Examination Estimation of Sire Index} = 2331 \pm 763.675$$

$$= 1567 \text{ to } 3094 \text{ lbs.}$$

Thus the estimation of this Sire with the above assumptions made we can except the progenies born to the bull to give milk yield ranging between 1567 lbs. to 3094 lbs.

This bull may not suit the requirements since there is a possibility of throwing out calves which can produce very low yield.

Sindhi Bull No. 139

Serial Number.	Unadjusted milk yield in first lactation.		Unadjusted milk yield in first lactation.		Adjusted yield in first lactation for 300 days.	
	Dam.		Daughter		Dam Daughter	
	Milk yield in first lactation.	Number of days in milking.	Milk yield in first lactation.	Number of days in milking.	M	2D-M
1.	4754	383	4398	419	2160	3586
2.	4204	345	4117	370	2798	3640
3.	5343	382	4020	385	2781	3440
4.	5764	333	4156	383	4733	3590
5.	3538	321	3141	2872	4027	2882
6.	6152	368	3474	335	3663	3235
7.	3913	308	4294	338	3796	3929
8.	4272	340	4499	366	3022	4049
9.	7824	414	7408	371	3012	6924
10.	4204	345	4632	326	2798	4455

The Regression coefficient of milk yield on days for Dams = 31.25. The regression coefficient of milk yield on days for Daughters = 6.82. The adjustments in milk yield to standardise the length of lactation for 300 days were based on these regression coefficient for each day.

Sire Index $I = 2\bar{D} - \bar{M} = 4722.8$ lbs.

Standard error of the mean = 774.93.

"t" at 10% probability level for 9 degrees of freedom = 1.833.

Standard error $X 1.833 = 1420.44669$.

Level of production = 4722.8 ± 1420.44669 .

Estimation of the Sire Index = 3302 to 6143 lbs.

This bull can be taken to be good, since the lower level is more than the average and we can expect the progenies born to this bull to be of better type for milk production, but since the variation is much, there may not be much of homogeneity among the progenies. However this variation will be useful for further selection.

Sindhi Bull No. 144

Serial Number	Unadjusted milk yield in first lactation Dam.		Unadjusted milk yield in first lactation Daughter.		Adjusted yield in first lactation to 300 days.	
	Dam		Daughter		Dam Daughter	
	Milk yield in first lactation	Number of days in milking.	Milk yield in first lactation.	Number of days in milking.	M	2 D-M
1.	4972	341	2866	320	4152	1106
2.	4474	361	3710	326	3254	3401
3.	2852	313	4051	338	2592	3363
4.	2941	280	426	129	3341	4134
5.	7223	457	3207	279	4083	1571
6.	2852	313	2360	354	2592	2456
7.	4531	360	3450	330	3331	3456
8.	3744	307	3096	405	3604	1719
9.	4204	345	2109	277	3304	2857
10.	5241	385	4390	321	3541	96
11.	2847	331	4850	437	2227	1460
12.	3583	263	2979	310	4321	4741
13.	4158	317	2559	281	3818	4221
14.	5139	383	3044	327	3479	1397
15.	3889	335	2950	271	3189	1752
16.	4088	375	3765	318	3294	1969
17.	2731	314	7053	324	2588	3399
18.	3511	290	3218	265	3551	4514
19.	3838	293	3830	333	2451	6768
20.	4176	350	4252	277	3711	3633
21.	3765	318	4654	363	3978	3023
					3176	4525
					3405	5874
						4289

The regression coefficients of milk yield on days of Dam and daughters are 20.03 and 11.87 respectively.

The Sire Index = 3705 lbs.

Standard error of the mean = 512.82.

t at 10% level for 20 degrees of freedom = 1.725.

Level of production = 3705 ± 884.6445 .

Estimation of the sire = 2321 to 4090 lbs.

From the conclusions drawn, this bull may not be preferred over other bulls.

Sindhi bull No. 255

Serial Number.	Unadjusted milk yield in first lactation.			Unadjusted milk yield in first lactation.			Adjusted milk yield in the first lactation for 300 days.		
	Milk yield in first lactation.	Dam.	Number of days in milking.	Milk yield in first lactation.	Daughter.	Number of days in milking.	Dam M	Daughter D	2 D-M
1.	4169		290	3960		276	4285	4219	4153
2.	1888		167	4181		336	3425	3792	4159
3.	3913		311	3182		335	3786	2804	1822
4.	4272		310	1046		87	4156	3346	2536
5.	2272		325	3549		295	1983	3594	5205
6.	3455		342	789		125	2969	2679	2389
7.	3096		405	2055		195	1882	3189	4496
8.	3450		330	2452		233	3103	3176	3249
9.	1256		217	4909		295	2215	4963	7711
10.	3879		377	2424		260	2979	2856	2733
11.	4272		310	837		101	4156	2986	1816
12.	2272		325	2417		206	1983	3432	4881
13.	4436		334	3356		332	4043	3010	1977
14.	5139		383	2566		296	4180	2609	1038
15.	3830		333	4628		365	3449	3926	4403
16.	4850		437	3857		371	3267	3190	3113
17.	3583		263	2679		295	4011	2733	1455
18.	6152		366	3728		357	3390	3112	834
19.	4754		386	2994		358	3760	2368	976
20.	4439		338	2754		377	4000	1922	-156
21.	4992		326	4605		360	4691	3957	3223
22.	4752		319	2924		317	4532	2740	948
23.	5813		339	3085		311	5362	2966	570
24.	3583		263	2492		249	4011	3043	2075
25.	3838		293	3452		299	3919	3463	3007

In the case of this bull, there are 25 comparisons made, as such the sample number is very high. As the size of the sample increases, the accuracy of the results can be reliable.

The milk data is adjusted in this bull to the usual regression coefficients for Dam and daughter with 11.56 and 10.7891 respectively.

Sire Index = 2745 lbs.

Standard error of the mean = 356.87.

t at 10% level for 24 degrees of freedom = 1.711.

Critical difference = $1.711 \times 356.87 = 610.6$.

Level of production = 2744.52 ± 610.6 .

Estimated value of the bull = 2134 to 3355 lbs.

It is observed that the variation among the progenies born to this bull is much less and now we can say that this bull can produce calves of almost fixed uniformity, whose production level ranges from 2134 to 3355 lbs.

This bull can be used for breeding for fixing the characters, but unfortunately the production level is not encouraging.

Sindhi Bull No. 282

Serial Number	Unadjusted milk in first lactation.			Unadjusted milk yield in first lactation.			Adjusted milk yield in the first lactation for 300 days.		
	Milk yield in first lactation.	Dam	Number of days in lactation.	Milk yield in first lactation.	Daughter	Number of days in milking.	Dam M	Daughter D	2 D-M
1.	4630		373	3120		290	2911	3130	3349
2.	7223		457	2004		191	3027	3097	2667
3.	4200		344	4323		267	3164	4752	6340
4.	4086		375	4370		339	2323	3981	5639
5.	3882		359	3326		337	2493	2957	3421
6.	4391		321	2438		301	3897	2428	959
7.	3711		325	3091		357	3122	2523	1924
8.	3142		338	6109		286	2247	6249	10251
9.	2317		340	3329		372	1375	2611	3847
10.	3422		343	2920		315	2410	2770	3130
11.	4919		406	1380		225	2423	2128	1833
12.	3629		342	3826		379	2641	3537	4433
13.	4632		326	4142		345	4020	3693	3366
14.	4837		364	4315		334	3330	3976	4622

The Regression coefficient of dams and daughters are 23.544 and 9.971 respectively.

Sire Index = $2\bar{D} - \bar{M} = 3984.35$ lbs.

Standard error of the mean = 619.19.

t at 10% level of probability for 13 degrees of freedom = 1.771.

Critical difference = $619.19 \times 1.771 = 1096.58549$.

Level of production = 3984.35 ± 1096.58549 .

Estimated value of the bull = 2888 to 5081.

This bull can produce calves to an average which can be estimated to possess the desired characters in the milk yield and gives much scope for selection.

Statement showing the comparative estimations of the Sindhi bulls.

S. No.	Name of item.	Sire No. 124	Sire No. 139	Sire No. 144	Sire No. 255	Sire No. 282
1.	Number of pairs compared	15	10	21	25	14
2.	Average total milk yield of mothers in lbs.	2832	4997	4036	3934	4216
3.	Average total milk yield of daughters in lbs.	3220	4414	3467	2996	3478
4.	Average difference in total milk yield (Daughter-Mother)	388	-583	-569	-938	-738
5.	Average length of lactation of mother (days)	263	354	335	323	358
6.	Average length of lactation of daughters (days)	339	363	315	281	307
7.	Average total milk yield of mothers adjusted to 300 days	3312	3187	3340	3661	2848
8.	Average total milk yield of daughters adjusted to 300 days	2821	3960	3273	3203	3417
9.	Adjusted Intermediate Index	2331	4723	3205	2745	3984
10.	Standard error of Intermediate Index	434	775	513	357	619
11.	Production level	1567 to 3094	3302 to 6143	2321 to 4090	2134 to 3355	2888 to 5081

This table brings out clearly the importance of calculating the standard error of the Intermediate Index, which gives us the degree of reliance that can be placed on each of these breeding bulls.

Sufficient data for progeny testing, in all the Sindhi bulls that are evaluated for Sire Index, is also available at the Livestock Research Station, Hosur. A beginning is made to analyse the records for progeny testing also. It is observed after statistical analysis Sindhi bull No. 38 showed highly significant results and Sindhi bull No. 139 was just significant at 10% probability level. As stated before, if we want not to over or under estimate the value of the sire, this level of 10% probability can also be considered in the case of Sindhi bull No. 139. Mention may be made here that this bull is the progeny of Sindhi bull No. 38.

Progeny Testing on Sindhi Bull No. 38.

Serial Number.	Daughters.	Dams.	Difference between Daughters — Dams.
1.	3711	1872	1839
2.	2720	2646	74
3.	3268	2512	766
4.	2468	2506	-38
5.	3774	3141	633
6.	3851	3408	443
7.	3477	3307	170
8.	4008	2796	1242
9.	4103	3122	981
10.	3880	4312	-432
11.	3625	2441	1184
12.	3952	2563	1389

X = the difference between daughter and dam milk yield.

ΣX = Total difference.

$\bar{X}$ = Mean of the difference.

$\sqrt{\frac{\Sigma (X - \bar{X})^2}{n(n-1)}}$ = Standard error of the mean.

$t = \frac{\bar{X}}{\text{Standard error of the mean}}$ n = the number of individual comparisons.

$\frac{\Sigma (X - \bar{X})^2}{n(n-1)}$

$\Sigma (X - \bar{X})^2 = \Sigma X^2 - \frac{(\Sigma X)^2}{n}$

$\Sigma X = 8241$

$\bar{X} = \frac{8241}{12} = 686.75$

$\Sigma X^2 = 10608941$

$\frac{(\Sigma X)^2}{n} = 5659506.75$

Standard error of the mean = $\sqrt{\frac{4949434.25}{132}} = 193.63$

$t = \frac{\text{Mean}}{\text{Standard error of the mean}} = \frac{686.75}{193.63} = 3.5467$

t for 11 degrees of freedom at 99% probability level = 3.106.

The result is highly significant showing that with 99% confidence we can take the value as valid.

With these observations in view, the breeding programme of the Sindhi herd at the Livestock Research Station, Hosur is planned for the year.

Acknowledgment

The authors are grateful to the Superintendent and Staff of the Livestock Research Station, Hosur for furnishing the data.

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STUDIES ON BOVINE ENDOMETRITIS*

Hydrogen ion concentration of uterine fluids of the cow

By

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Introduction:—During the course of an extensive study of the bacterial flora of normal pregnant and non-pregnant genital tracts and the bacteriology and pathology of endometritis in cows, opportunity was taken to estimate the pH of the uterine and amniotic fluids in a number of cases with a view to correlate the pH of the fluids with the nature of endometritis.

Materials:—This study was made on Ayrshire cows in Scotland whose breeding history had been collected from their owners. The genital tracts were removed aseptically from the cows immediately after slaughter.

Methods:—In a series of normal and abnormal genital tracts the pH of the uterine discharges and amniotic fluid was determined with a Cambridge potentiometer, using the quinhydrone half-cell and saturated calomel half-cell. About two cubic centimeters of discharge were collected in a glass tube measuring 4" x 1.5". To the discharge was added an equal quantity of glass distilled water and a pinch of quinhydrone and the whole mixed with a glass rod. Immediately on solution the electrodes were immersed in the fluid and the potentiometer readings taken. The pH was read from the table in the Handbook of Chemistry and Physics (Hodgman, 1939). It was often not possible to collect sufficient fluid from normal uteri. In such cases 4 c.c. of glass distilled water was washed through the uterus and collected. The electrodes and the potentiometer were standardised against standard buffer solutions each day before use.

Results:—The results of estimation of the pH of the normal and abnormal uterine fluids and amniotic fluids are set out in Table I. An analysis of these results (Table II) shows that the normal uterine fluids have an average pH of 7.08 with a range of 6.86 to 7.28. The amniotic fluid averaged a pH of 7.22 with a range of 7.00 to 7.54. The average pH of the uterine exudate in catarrhal, suppurative, hyperplastic and atrophic endometritis was 7.50, 7.61, 7.01 and 7.48 respectively.

*Paper presented to the Section of Medical and Veterinary Sciences, 39th Session, Indian Science Congress, Calcutta 1952.

TABLE I.

Results of pH of uterine fluids.

NORMAL.				ENDOMETRITIS.									
Uterine fluid.				Amniotic fluid.		Catarrhal.		Suppurative.		Atrophic.		Hyperplastic.	
Case No.	pH.	Case No.	pH.	Case No.	pH.	Case No.	pH.	Case No.	pH.	Case No.	pH.	Case No.	pH.
130	7.09	182	7.00	170	7.35	154	8.18	153	7.65	162	7.34	136	6.98
132	7.11	187	7.14	177	7.27	171	7.13	159	7.76	179	7.67	167	7.24
139	7.09	189	7.00	184	7.09	178	7.78	166	7.84	185	7.56	188	6.97
142	7.00	191	7.25	186	7.54	192	7.47	172	7.65	202	7.38	190	6.89
156	7.18	193	7.12	204	7.00	195	7.49	174	7.65			206	7.00
158	6.86	194	7.28	227	7.20	197	7.56	205	7.56				
163	7.01	196	7.00	238	7.12	200	7.34	207	7.48				
165	6.91	198	6.96			211	7.38	210	7.56				
169	7.08	203	7.17			224	7.18	214	7.86				
175	7.05	208	7.10			236	7.43	223	7.45				
176	6.95	215	7.03					231	7.38				
129	7.17	146	7.08					232	7.86				
180	7.20	157	7.09					239	7.28				
181	7.25	164	7.18										

TABLE II

Nature of fluid.	Number of Cases.	pH	
		Range	Average
Normal uterus ...	28	6.86-7.28	7.08
Amniotic ...	7	7.00-7.54	7.22
Catarrhal endometritis ...	10	7.13-8.18	7.50
Suppurative endometritis ...	13	7.28-7.86	7.61
Hyperplastic endometritis ...	5	6.89-7.24	7.01
Atrophic endometritis ...	4	7.34-7.67	7.48

Discussion :—The results for the normal uterine fluid and normal amniotic fluid are in general agreement with those of Lardy, Pounden and Phillips (1940) who recorded an average pH of 6.0 with a range of 6.6 to 7.15 for the uterine fluids and 7.12 and 7.0 to 7.4 respectively for the amniotic fluid. Conklin, McCarthy, Thompson and Pugsley (1931) examined 70 samples of amniotic fluid and reported an average pH of 6.85 for amniotic fluid from clinically normal cases and 5.46 to 7.20 for fluid from clinically diseased specimens.

The results further show that 20 out of 28 normal uterine fluids (71.4%) had a slightly alkaline reaction, 4 were slightly acid and 4 neutral while the pathological exudates in endometritis of bacterial origin, viz. catarrhal, suppurative and atrophic were all markedly alkaline being near the optimum for bacterial growth. It is noteworthy that though the average pH of the jelly like glairy discharge in hyperplastic endometritis was just alkaline or neutral, the individual figures (6.89; 6.98; 6.97; 7.00; 7.24) show that three were slightly acidic, one neutral and one alkaline. The one having an alkaline reaction was a case of hydrometra in which the mucus had become liquefied. This relationship between the consistency of the mucus and its pH seems to support Hammond's (1927) observation about cervical mucus that, "mucus in a slightly acid medium becomes tough and stringy while in a slightly alkaline one it becomes fluid".

Summary

1. In a series of normal and abnormal genital tracts of cows the pH of the uterine discharges and amniotic fluid was determined.
2. The results of estimation of the pH of the uterine fluids show that the normal uterine fluids have an average pH of 7.08 with a range of 6.86 to 7.28. The amniotic fluid averaged a pH of 7.22 with a range of 7.00 to 7.54. The average pH of the uterine exudate in endometritis

of bacterial origin, viz. catarrhal, suppurative and atrophic endometritis was 7.50, 7.61 and 7.48 respectively being near the optimum for bacterial growth.

3. The pH of uterine fluids of majority of the genital tracts with non-bacterial hyperplastic endometritis was acidic.

Acknowledgment

The author gratefully acknowledges his debt of gratitude to the Director and Dr. P.S. Watts, B.Sc., F.R.C.V.S., D.Bact., Ph.D., Pathologist, Hannah Dairy Research Institute, Ayr, for the facilities provided.

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INCIDENCE OF HORN CANCER IN MEERUT CIRCLE, UTTAR PRADESH

By

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This condition has been investigated and recorded from time to time by various Veterinary Investigation Officers and others in different parts of the country. This is described as occurring mostly in the bullocks of large horned breeds. The main symptoms in the early stages are the loosening of the horn, with pain at the base of the horn, eventually leading to dropping of the horn. When the horn is removed, cauliflower-like growth is observed in the core of the horn. The malignant nature of this growth is proved by the fact that it has tendency to grow on removal. The affected tissue on histopathological examination represents a typical squamous cell carcinoma. No detailed post mortem of any clinical case has been described, and occurrence of metastasis in any other part of the body has not been recorded so far.

Various etiological factors have been mentioned, the main amongst them being parasitic infection and trauma as a result of chronic irritation by ropes etc. At the last Disease Investigation Officers' Conference held at Poona in 1953 also, the importance of irritation and injury of one form or another to the horn or its base is stressed as a possible predisposing cause. It is stated that such practices as paring the horns for beautifying them and dehorning in early calfhood may lead to this condition. The Conference considered it disappointing that the real etiological agent still remains obscure. Its incidence has therefore been studied in Meerut Circle and the data is put forth to bring certain conclusions which may possibly give lead for further work on this problem.

Incidence:—During the years 1947 to 1952, 6286 cases of horn cancer have been recorded in Meerut Circle where the predominant breed of cattle is Haryana and buffaloes Murrah. Out of this, 93% of the animals affected were in bullocks and the rest cows, male and female buffaloes. There is not one case recorded in a bull. The disease has, therefore, obviously a sex incidence i.e. it occurs predominantly in bullocks. It is also possible that the number of cases recorded in cows and female buffaloes were perhaps not cases of genuine horn cancer but were put down as such due to the difficulty of exact diagnosis in the field, where in a number of cases, it is confused with caries horn or complicated wounds of broken horn. The disease has also a geographical incidence which is maximum in the districts of Muzaffarnagar and Meerut where the Haryana breed is found in a greater degree of purity than for instance in a district like Dehradun, Farrukhabad or Mainpuri where hill cattle or *desi* cattle are found predominantly. This confirms the existing observation, that the disease is common in large horned breeds. It has also an age incidence. Out of the 6181 cases in which the ages have been recorded, 82% of the cases are in the age group of 5 to 10 years; about 18% over 10 years and less than .05% in animals below 5 years. The incidence in the lower age group seems to be insignificant. Information was also collected as to whether the incidence was more in the right horn or the left horn and whether there were any cases in which both the horns were affected. Information was available for 2009 cases; the incidence in the right and left horn is about the same. There is no record of a case in which both the horns were affected. The work for which these bullocks were employed was noted but no association could be found from the meagre information available whether the use of the bullocks for ploughing, draught or in carts had any effect on the incidence of the disease. The table below gives the details of the incidence in various districts.

Incidence of Horn Cancer brought to the hospitals in Meerut Circle from 1947-52.

Distt.	Species.				Age.			Whether right or left horn affected.	
	Bullocks.	Cows.	Buff. male	Buff. female	Below 5 yrs.	Between 5-10 yrs.	Above 10 yrs.	Right.	Left.
1. Dehradun	9	—	—	—	—	3	6	3	1
2. S' Pur	455	18	—	7	—	436	41	70	74
3. M. Nagar	2406	71	—	22	18	2281	201	77	60
4. Bijnor	403	4	—	—	5	321	74	132	207
5. Meerut	639	1	—	—	5	387	238	25	18
6. B'Shahr	432	30	36	25	—	381	141	24	18
7. Aligarh	501	13	3	6	1	496	26	40	59
8. Mathura	503	4	11	1	—	374	145	255	264
9. Agra	186	5	2	1	—	156	38	95	91
10. Etah	84	5	—	—	—	58	31	61	30
11. Mainpuri	49	2	—	—	—	31	20	44	9
12. Etawah	143	20	51	24	8	117	114	110	118
13. Farrukhabad	95	8	6	6	—	15	13	71	54
Total	5905	181	108	92	37	5056	1088	1007	1003

Discussion:—From the analysis of this data, it is obvious that the disease mostly occurs in bullocks and that there are no recorded cases of the disease in bulls, and also that there are no cases where both the right and left horns are affected. This leads to the conclusion that trauma plays very little part as a pre-disposing cause in this disease. Both the right and left horns normally are under equal strain and stress, when the bullock is being used for plough or draught. If trauma was a predisposing cause, surely there must be some cases where both the horns would be affected. Again the bulls, which are known to have more fights and thereby injure each other more than the bullocks, do not suffer from this malady. Out of a large number of cases of furious bulls which have come to my notice, not one case of horn cancer has been observed, though, in a number of cases, broken horns have been noticed. This, therefore, indicates the possibility that one of the predisposing causes of the cancer may be some hormonal

disturbance in the bullocks as a result of castration. The testicular hormones are known to produce cancer in rats when injected in heavy doses, while it is the opposite case in prostatic cancer in human beings where the administration of stilboestrol to men inhibits the formation of testicular hormone and causes subsidence of cancer. It is likely that the presence of the testicular hormones in the body keeps producing anti-cancerous substances which are eliminated after castration, thus rendering the animal more susceptible to cancer. As a result of castration, the absence of the testicular hormones in the bullocks is also noticed to affect their colour. This is known from the fact that the Haryana bulls, when castrated, lose their grey or dark colour and become white and even the animals which are slightly dark coloured at the time of castration become white and whiter with age. It may also be mentioned here that the incidence in the coloured breeds in this province is much less. It is difficult to say exactly why the larger breeds are more susceptible; it may be because of the greater requirements of hormones for maintaining the hormonal balance in a larger body than in a smaller one. Similar observation has been made by Cotchin (1953) that large dogs are more prone to bone sarcomas than small ones. He further states that the reasons for this incidence in larger dogs are not known. Hereditary factors may be involved but no information on this point was available. On the other hand it has been suggested by Willis (1948, quoted by Cotchin, *ibid*) that the cause for bone sarcomas is to be looked for chiefly in disturbance of bone growth and malnutrition, and it might be significant that the large breeds of dogs seem more often to develop rickets and osteoporosis than do the small dogs.

Treatment:—Treatment mostly consists of amputation of the horn, removal of cancerous tissue, firing and dressing the wound with strong antiseptic agents. There is a long list of antiseptic agents tried by the various veterinarians such as copper sulphate, formaline, liq. arsencalis, carbolic acid, boracic acid, phenyl, etc. and different degrees of success are claimed for different types of treatment by various individuals. How far permanent cure is effected is not known because in a number of cases prolonged treatment is required which the villager cannot undertake and he fails to bring back the animal to the hospital. It is, however, alleged by quite a few that in early cases where the cancerous tissue can be removed as a whole, the chances of success are bright. It is also to be kept in mind that the number of cases which are cured may be cases of caries horn or complicated cases of broken horn which are confused with horn cancer cases in the field as mentioned above. The dressing consisting of white arsenic, yellow arsenic, copper sulphate, formaline, *haldi* (*Curcuma longa*), *neem* bark powder, *madar* (*Calotropis* species) leaves

mixed in mustard oil and heated in an iron pan, has been reported by one veterinarian to have given a fair degree of success. One has reported 50% success with application of propamide jelly locally and injection of anthiomaline. The efficiency of all these treatments, however, cannot be properly determined as already stated because of the difficulty of maintaining proper records in the hospitals and the difficulty of the villager in bringing the animal to the hospital for treatment over long periods.

Economics:—From the large number of cases received in the hospitals, it is obvious that this disease is of great importance and the loss caused to the Indian villager from this disease, when translated in terms of the whole country, is tremendous. This disease has not received the same attention which it deserves. In fact nothing more than merely recording the disease has been done so far. The above analysis of the data leads atleast to one conclusion that hormonal treatment under controlled conditions would be worthwhile trying for sake of treatment as well as to investigate the etiology of this malady and quite possibly of other types of cancers as well.

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NORMAL MORNING TEMPERATURE OF GOATS IN INDIA

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 Govt. Livestock Farm, Hissar.*

Sadiq (1943), after observing 1174 morning temperatures of 366 goats in Lahore, reported that the mean temperature of this species of animals ranged between 99.87°F to 101.6°F, the lower temperatures occurring during the cooler parts of the year and the higher in hotter parts. Minnett and Sen (1945) observed temperatures of goats in the

months of February and June at Izatnagar (Barielly, U.P.) and fixed their mean morning temperature at 101.83°F and 104.15°F for the months of February and June respectively. This was much higher than the observations of Sadiq. Moreover, the normal temperature of goats recorded by foreign workers in various text books is also much higher than the findings published by Sadiq. According to Damant (1947) the temperature of goats ranges from 101.7°F to 105.3°F , the mean being 103.8°F . Malkmus (1949) mentions the range varying from 102.2°F to 104.9°F and Wooldridge (1934) between 101.0°F and 104.0°F .

In view of the above diversity of opinions, and our own experience of over 3000 goats, we were prompted to analyse the data available with us to find out the exact position.

Methods and materials:—Morning rectal temperature of goats was recorded at 4 stations in Punjab (India) from 1947 to 1951, the stations being Ambala, Ferozepur, Dagshai (Simla Hills) and Hissar. The goats used were healthy, age 1 to $1\frac{1}{2}$ years, weighing between 22 to 45 lbs. On an average three days' morning temperature was recorded for each goat. The temperature was taken between 7 and 8 A.M. in summer and from 9 to 10 A.M. in winter and were recorded in Fahrenheit. The goats were not exposed to the sun and were kept in open shade for at least 10 minutes before the operation. They were not frightened or disturbed during this time but were kept perfectly calm and at rest. Water was withheld until the temperature was recorded. The thermometers used were "Zeal" $\frac{1}{4}$ min. and were kept inside the rectum for a period of one minute for recording the temperature.

The mean atmospheric temperatures were available only for Ambala and Hissar and were obtained through the courtesy of the Deputy Director of Observatories (Climatology & Geophysics), Poona.

Observations:—In all, the temperatures of 2121 goats were recorded and 5594 readings taken.

At Ambala, 190 goats were observed and 563 readings taken from November, 1947 to August, 1948. The minimum temperature shown was 98.0°F and maximum 102.4°F . The temperature of the majority of the animals ranged from 99.00 to 101.8°F (Histogram No. 1). The mean temperature varied from month to month between 98.92°F in January and 101.0°F during June and July (Table I).

TABLE I
Showing the temperature of goats at Ambala city.

Months	Readings taken	Temperature		Mean Temp.	Standard deviation
		Min.	Max.		
October 47	40	99.4	101.6	100.27	0.549
November	94	98.8	101.2	99.66	0.696
December	70	99.6	102.0	99.71	0.772
January 48	74	98.0	100.4	98.92	0.507
February	82	92.2	100.4	99.31	0.465
March	16	98.8	101.4	100.08	0.664
April	19	98.8	101.4	100.08	0.794
May	31	100.4	101.4	101.04	0.471
June	34	99.2	102.2	101.1	0.772
July	52	100.6	102.4	101.1	0.434
August	33	100.0	102.2	100.9	0.448

Similarly 2027 readings on 488 goats were recorded at Ferozepur during the same period. The minimum temperature was 99.0°F and the maximum 102.8°F (Histogram No. 2). The temperature of the majority of the goats varied between 99.4°F to 101.8°F . The mean temperature ranged between 100.16°F to 101.17°F (Table II).

TABLE II
Showing the temperature of goats at Ferozepur.

Months	Readings taken	Minimum Temp.	Maximum Temp.	Mean Temp.	Standard deviation
November 47	456	99.2	102.6	100.2	0.758
December	511	99.0	102.8	100.38	0.812
January 48	388	99.0	102.6	100.40	0.836
February	159	99.0	102.4	100.16	0.792
March	131	99.0	102.4	100.26	0.844
April	128	99.0	102.6	100.62	0.892
May	83	99.2	102.6	100.65	0.831
June	57	99.4	102.6	101.01	0.844
July	52	99.8	102.6	101.17	0.574
August	63	99.4	102.4	101.14	0.650

The temperatures recorded at Dagshai were a little higher. The range of variation was from 99.0°F to 103.0°F (Histogram No. 3). The majority had a temperature between 99.6°F to 102.4°F , the mean being 100.6°F in November and 102.02 in June (Table III). Here temperatures of 847 goats were recorded and 1460 readings taken from September, 1948 to February, 1950.

TABLE III

Showing temperature of goats at Dagshai.

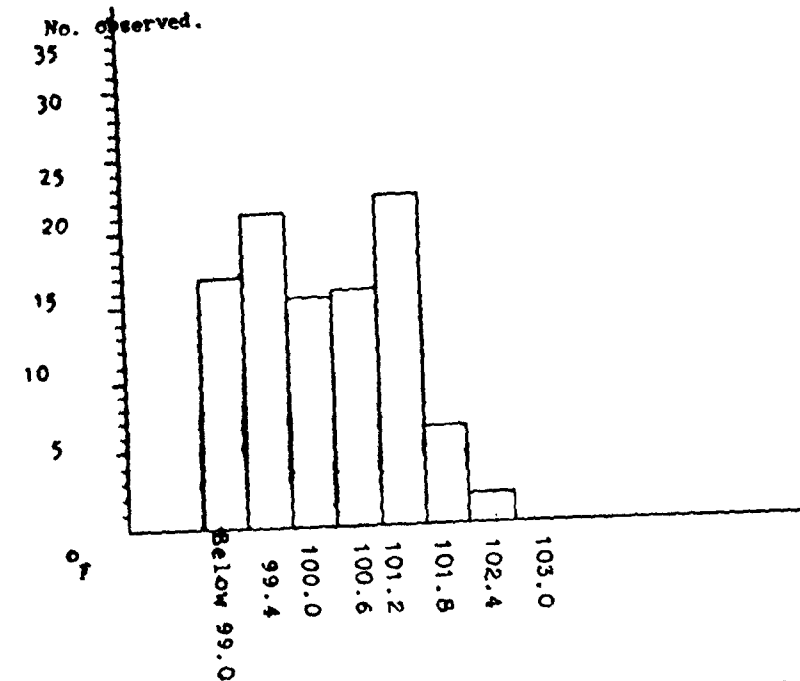
Months	No. of readings taken	Min. Temp.	Max. Temp.	Mean Temp.	Standard deviation
April	96	100.2	102.6	101.5	0.618
May	70	99.6	102.8	101.21	0.849
June	45	100.6	103.0	102.02	0.586
July	46	100.0	103.0	101.70	0.606
August	57	99.6	103.0	101.51	0.766
September	171	99.0	103.0	100.8	0.72
October	233	99.4	103.0	101.15	0.638
November	143	99.0	102.8	100.6	0.635
December	201	99.6	102.4	100.75	0.571
January	164	99.0	102.4	100.59	0.608
February	166	99.4	103.0	100.70	0.677
March	78	100.0	102.4	101.2	0.671

From March, 1950 to March, 1951, temperatures were observed at Hissar on 596 goats and 1544 readings were recorded. The minimum temperature was 99.0°F and maximum 103.2°F. The temperature of the majority of animals ranged between 99.4°F to 102.4°F (Histogram No. 4), the minimum mean being 100.02°F in January and maximum mean 102.06 in June (Table IV).

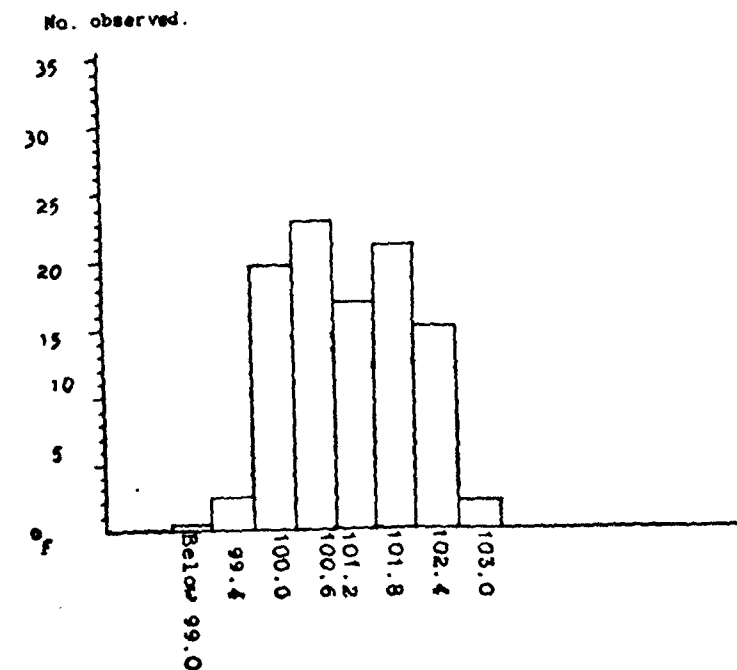
TABLE IV

Showing the temperature of goats at Hissar.

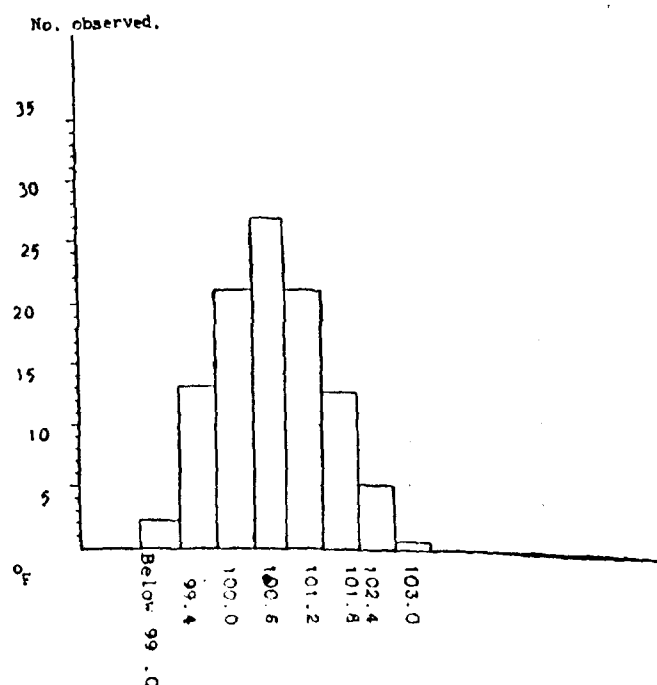
Months	No. of readings taken	Min. Temp.	Max. Temp.	Mean temp.	Standard deviation
April	106	99.4	100.2	100.59	0.598
May	54	100.2	102.8	101.4	0.65
June	112	100.6	103.0	102.06	0.502
July	100	99.0	103.0	101.08	0.842
August	92	99.0	102.2	100.87	0.648
September	87	99.0	102.4	101.01	0.745
October	193	99.0	102.2	100.47	0.94
November	163	99.0	102.2	100.03	0.827
December	188	99.0	101.6	100.58	0.747
January	156	99.0	102.0	100.02	0.880
February	68	99.0	101.4	99.86	0.696
March	225	99.0	102.4	100.87	0.766



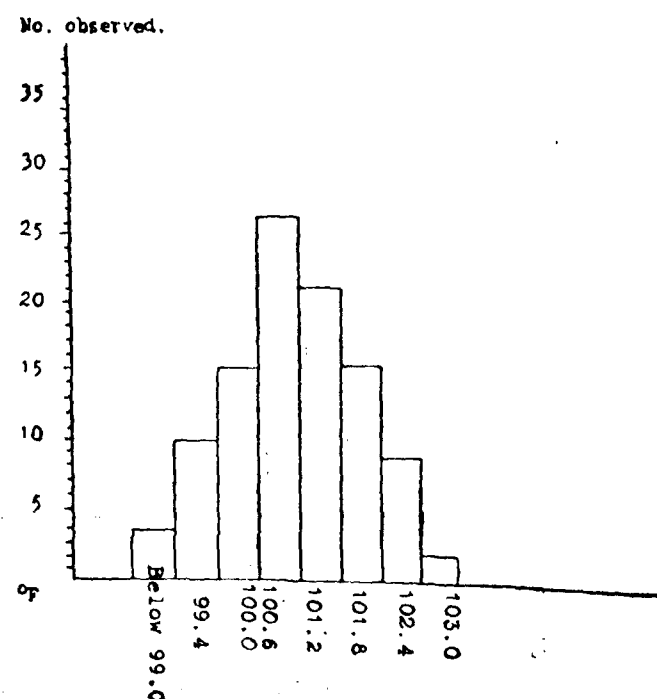
HISTOGRAM No. 1:—Showing the variation in body temperature of goats at Ambala City.



HISTOGRAM No. 2:—Showing variation in body temperature of goats at Ferozepur.



HISTOGRAM No. 3:—Showing the variation in body temperature of goats at Dagsbai.



HISTOGRAM No. 4:—Showing the variation in body temperature of goats at Hissar.

From the above figures and tables Nos. I to IV, it may be noted that the temperature of goats was lowest during the cold months and highest during the hot months. This was correlated with atmospheric temperature at Ambala and Hissar. Graphs I and II clearly indicate that with a rise or fall in atmospheric temperature there is a significant increase or decrease in the body temperature of goats.

Conclusions and discussion:—Taking the observations relating to all the 4 places as a whole, the minimum temperature recorded was 98.0°F and the maximum 103.2°F but the temperature of the majority of animals ranged between 99.4°F to 102.4°F. The mean minimum was 98.92°F and mean maximum 102.02°F. These findings are in conformity with the findings reported by Sadiq (*Ibid*). The mean readings worked out by him also fall within the above range. At Dagsbai, however, these were slightly higher. This may be attributed to two factors; firstly, Dagsbai is about 6000 feet above sea level and secondly it is much cooler than the other three places. This hypothesis may also explain why English authors have recorded a higher temperature for goats. Their countries are much cooler and hilly as compared to the plains of India.

From the above it may be concluded that the morning temperature of goats in India varies between 99.4°F and 101.8°F. It may be slightly higher at hill stations.

Summary

- (1) 5594 morning temperature readings on 2121 goats were recorded at 4 different places of Punjab (India).
- (2) The minimum temperature recorded was 98.0 F and maximum 103.2°F.
- (3) The mean minimum temperature was 98.92 F and mean maximum was 102.2F.
- (4) Body temperature of goats shows significant increase or decrease with a rise or fall in the atmospheric temperature.

Acknowledgment

The authors are indebted to Major A. C. Aggarwala, B.Sc. (Hons), M.R.C.V.S., A.I.R.O., Principal, Punjab Veterinary College, Hissar for valuable suggestions and to Shri M. L. Mehta, L.V.P., B.V.Sc., Asstt. Professor of Medicine, Madhya Pradesh College of Veterinary Science and Animal Husbandry, Jabbalpore (formerly at Punjab Veterinary College, Hissar) for help in the analysis of the data.

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STUDIES ON PASTEURELLOSIS

1. RABBIT SEPTICAEMIA DUE TO PASTEURELLA-LIKE ORGANISMS

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A comprehensive study of the problem of pasteurellosis as related to rabbit septicaemia was considered necessary owing to a huge loss caused by a trickle of deaths among the rabbits kept for breeding or experimental purposes at this Institute. Further, the great demand for rabbits in India and the anticipated programme of immunisation against rinderpest with lapinised virus put this study among the priorities.

Rabbit septicaemia, or "snuffles", or, more precisely, haemorrhagic septicaemia of rabbits may be responsible for a heavy loss in a rabbitry and may jeopardise many important enterprises as evidenced by the loss of the lapinised virus evolved at Mukteswar (Edwards 1949).

The present study was undertaken with a view to scan pasteurellosis on a broader perspective as related to pasteurellosis of various animals and its epidemiological aspect.

Attempts have been made to formulate means for the classification of pasteurella in the past by immunological (Roberts 1947; Jones 1921; Lal 1927; Youef 1935; Cornelius 1929), biochemical (Cornelius 1929; Tanaka 1926; Magnusson 1914; Besemer 1917) and biological tests (Iyer 1944; Yersin, Calmetts, and Borrel 1895; MC Coy 1911; Rowland 1946; Ebersson 1927). Certain variations with regard to the biochemical characters are amongst the disadvantages and it would also seem that classification of pasteurella type of organisms with regard to

the species from which a particular type is isolated is not beyond criticisms (Topely and Wilson 1936). Variants may arise which may fail to kill subsequently the species of animals from which it was originally isolated (Sankaranarain and Banerji (1949). From a reading of the literature one could not escape the impression that gram-negative bacteria which fail to conform to the type description of other known genera but which have some affinity to pasteurella are generally classified under the latter genus. In this article organisms akin to *Pasteurella* have been designated *Pasteurella*-like organisms. It would therefore seem difficult to assess with a definite degree of preciseness whether or not any strain of pasteurella in a particular outbreak among animals is due to a particular classical type or its variant.

It seems possible that bacterial mutants may arise in nature in relation to the availability of a particular species of animals for the propagation of the disease and bio-physical and chemical stimulus afforded by the environment. In this paper organisms akin to *Pasteurella* have been described as *Pasteurella septica* isolated from rabbits.

Materials and Methods:—This observation includes nine hundred and thirty three domestic rabbits which were procured locally from Lucknow and Mukteswar. Observations were carried out for a period of twenty-two months during which the mean incidence of mortality was 63 per cent. Rabbits were kept in proportionate numbers in six mud brick built huts. They were allowed a plentiful supply of greens and grains, water was allowed *ad lib*.

Newly purchased rabbits were kept segregated for about a week. Haemorrhagic Septicaemia serum in doses of 2-5 cc. was given to all and Mecryl was used to keep coccidiosis in check.

Observations:—In November 1948, fifty five rabbits were procured and kept as usual. One rabbit died during this month. In December 1948, 103 rabbits were purchased and with the introduction of the newly purchased stock the mortality rate increased and it was between 24-29 per cent. The purchases were stopped and the mortality rate declined significantly to 2 per cent. From April 1949 to July 1949, 318 rabbits were purchased when the mortality rate increased and showed an upward trend between 11 to 41 per cent. This reached the peak in August when it was 50 per cent. It will be seen from Table I and Fig. I that the maximum over-stocking point was reached in July; consequently the trickle of death continued not only during these months but continued till August 1949. For the time being there was an apprehension of great loss and no new animals were introduced in the stock. Between August to October 1949 a few rabbits were introduced in the stock, and overcrowding was avoided. This resulted in a

TABLE I

Percentage of mortality in rabbits in relation to the size of the stock and number of newly introduced rabbits.

Year	1949												1950									
Month	Nov. 48	Dec. 48	Jan. 49	Feb. 49	March 49	Apr. 49	May 49	June 49	July 49	Aug. 49	Sept. 49	Oct. 49	Nov. 49	Dec. 49	Jan. 50	Feb. 50	March 50	Apr. 50	May 50	June 50	July 50	Aug. 50
Number of rabbits in stock	55	157	85	40	19	61	146	206	239	117	61	39	63	85	128	191	150	141	157	137	53	24
Mortality (%)	2	24	39	12.5	5	2	11	16.5	41	50	16	10	11	8	7	40	33	13	27.5	27	24.5	4
Number of rabbits newly introduced	55	103	—	—	—	36	112	82	88	—	26	5	41	43	73	85	46	72	42	40	53	—

down-ward trend in mortality rate. Overstocking and number of newly purchased stock increased during the winter months of January and February when the rate of mortality increased to about 40 per cent. Mortality rate showed an upward trend during monsoons in 1950 but, from July, rabbits were kept either individually or in pairs in cages which was followed by a significant decline in the number of deaths.

Pathology of the Infection

(a) *Clinical*.—Usually the infection was not accompanied with much malaise before death. Animals, however, were dull and showed fever (106–107° F.). At other times, animals were bright even an hour before death. A few minutes before death, the animal jumped, rolled and after a brief struggle for about fifteen minutes died. Such cases represented peracute course of the disease. In some cases, when Pasteurellosis was complicated with Coccidiosis, animals were in poor condition with diarrhoea and were dull for about two to three days before they died.

(b) *Postmortem lesions and histopathological changes* :—Predominant postmortem lesions were seen in the abdominal and thoracic viscera. There was an appreciable stickiness of the abdominal viscera with considerable amount of fibrin flakes or strands distributed over the stomach and intestines. Other lesions consisted of gastritis enteritis, and even haemorrhage in the intestines. Some pregnant animals showed haemorrhage in the uterus.

Lungs were enlarged and pneumonic in practically all such cases and the histo-pathological examination revealed broncho-pneumonia, peri-bronchitis and pneumonia in all its stages. In some cases there was adhesion between the lung and the pleura and the whole mass appeared cemented in a sticky fibrinous element. There was well-marked fibrinous pleurisy. Heart showed fibrinous pericarditis and vegetative endocarditis. Vegetations were conspicuous and were attached to the valves. In some cases the heart was considerably atrophied due to the pressure in the pericardial sac.

Spleen was enlarged in all these cases.

Innumerable bi-polar organisms indistinguishable from *Pasteurella* were seen in smears from heart blood and spleen.

(c) *Bacteriology of the infection* :—Non-haemolytic, small translucent colonies could be regularly grown on blood agar whenever seeded with blood from such dead rabbits. Details are set out in Table 2.

TABLE II
Table showing the details of biochemical characters, pathogenicity and staining reaction of organisms isolated from rabbits.

Strain Number	Cultural Characters		Haemolysis	Motility	Staining	Growth on Bile Salt Media	Sugars							Other biochemical tests				*Pathogenicity				
	Nutrient Broth	Blood Agar					Dextrose	Lactose	Mannite	Sorbitol	Salicin	Sucrose	Dulcitol	VP	MR	Nitrite	Indole	H ₂ S	Rabbits	Buffaloes	Fowl	
1	Turbid	Small translucent colonies	...	...	Gram Negative	...	+	+	+	...	...	+	...	...	...	...	...	...	...	...	...	...
3	"	"	...	...	"	...	+	...	...	...	...	+	...	...	...	...	...	+	...	...	...	...
4	"	"	...	...	"	...	+	...	+	...	...	+	...	...	...	...	...	+	+	...	...	...
5	"	"	...	...	"	...	+	...	...	...	...	+	...	...	...	...	...	+	...	...	...	...
6	"	"	...	...	"	...	+	...	...	...	...	+	...	...	...	...	...	+	...	...	...	...
7	"	"	...	...	"	...	+	...	...	...	...	+	...	...	...	...	...	+	...	...	...	...
8	"	"	...	...	"	...	+	...	+	...	...	+	...	...	...	...	...	+	...	...	...	...
24	"	"	...	...	"	...	+	...	+	...	...	+	...	...	...	...	...	+	...	...	...	...

* Pathogenicity tests were carried with 2 strains.

This finding was also confirmed by the Officer-in-Charge, Pathology and Bacteriology Section, I.V.R.I. Mukteswar, who described the organism as a *Pasteurella* of low virulence.

The biochemical reactions reveal considerable variation from classical *Pasteurella*. While dextrose and sucrose were uniformly fermented according to type description, fermentation of mannitol and sorbitol was very variable. The organisms varied sharply from true *Pasteurellas* in that all but one strain failed to form indol and the only strain which did form indol also was V.P. positive unlike true *Pasteurellas*. But in this laboratory, we have strains of *Pasteurella* which have become avirulent through long passage in artificial media and which have lost the capacity to produce indol.

Epidemiology :—The epidemiology of this particular infection can be discussed under following heads viz :—

- Number of rabbits in stock at any particular time.
- Climate.
- Number of rabbits freshly introduced.

Though all these factors contributed significantly for the propagation of the infection, yet any one factor individually cannot possibly be given importance over the other. It will be seen from Fig. I, that, whenever there was a chance of overstocking, the disease flared up. This may be due to the greater chances of spread of infection among a larger number of susceptible stock at any particular time and resultant heavy mortality.

The bearing of climate on this disease and its course is well apparent from Fig. I. It will be evident that in proportion to the rabbits in stock or newly purchased stock, the mortality rate increased during winter and rainy seasons. Cold or heat with high relative humidity has deleterious influence and in this case the correlation points out to definite lowering of vitality and, hence, greater susceptibility to infection.

The introduction of newly purchased rabbits in pre-existing stock resulted in the setting up of outbreaks. Carriers among the pre-existing stock were likely sources of infection. Rabbits in the pre-existing stock died side by side with newly introduced stock and this is in accord with the observations of experimental epidemiologists.

Control measure :—As has already been pointed out, haemorrhagic septicaemia serum was of little use. Vaccine prepared with a strain isolated from rabbits was not of great use either. Even with utmost cleanliness maintained in these sheds, it was difficult to control the

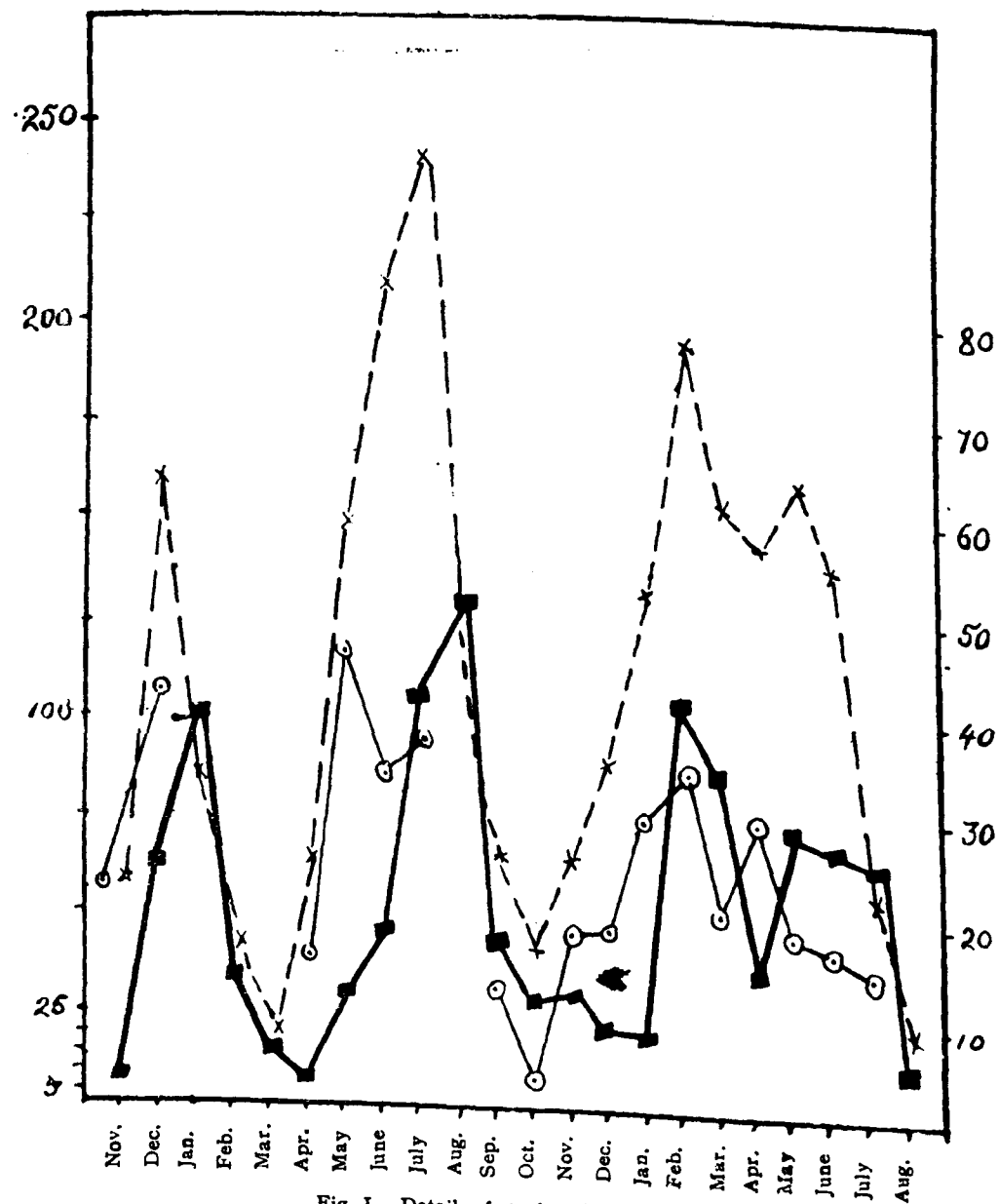


Fig. 1. Details of stock and mortality.

X - - X Total number of rabbits.
 O - - O Number of newly-introduced stock,
 ■ - - ■ % Mortality.

Left hand numbers indicate No. of rabbits
 Right hand numbers indicate % of mortality

infection. Hence, finally, animals were kept individually or in pairs in cages which had been of great help in reducing the incidence of mortality.

Summary

A string of epizootic among rabbits due to pasteurella-like organisms has been described. The bearing of climate on rabbit septicaemia has been set out in detail. The progress of the disease appears to be favoured during cold and hot humid days. At present no satisfactory method of immunisation is available.

Acknowledgment

The authors are thankful to Dr. S. Datta, D.Sc., M.R.C.V.S., D.T.V.M., F.R.S. (Edin.), F.N.I., Director, for his guidance in this work, Sardar Balwant Singh, Head of Division of Biological Products for his keen interest and facilities given for this work. The suggestions of Shri P. R. K. Iyer, Research Officer, Disease Investigation, are acknowledged.

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Introduction of aureomycin oblets after removal of placental membranes or introduced into the uterus with membranes intact prevented any clinical evidence of post operative infection or septicaemia in 610 out of 612 cows treated.

Beattie, J. H. & Leaming, J. P.; *Vet. Med.* Nov. 1952, 452.

A STUDY OF THE PHYSICAL MEASUREMENTS OF KANGAYAM CALVES IN RELATION TO THEIR GROWTH AT PALAYAKOTTAI CATTLE FARM

By

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Introduction:—Of the few recognised breeds of Indian cattle, Kangayam breed stands as one of the foremost. The Palayakottai Cattle Farm, where this breed of cattle is bred and reared, is situated in the Kangayam breeding tract, and is one of the organised cattle breeding stations of South India. The main activity of this Farm is the breeding and rearing of the Kangayam animals which are considered to be of a draught type. The rearing of calves and their classification according to ages is a special feature here.

Calves are not weaned at birth and are allowed to suckle their dams both morning and evening. When they are able to nibble grass, they are sent out for grazing to the pastures nearby, and the calves are kept and reared as far as possible under natural conditions. In raising good livestock, apart from the provision of a good stud bull, the progeny must be well-cared for. In phenotype selection of animals, which is widely practiced under Indian conditions, the measurements and development of the various parts of the body of an animal and their relative aspect to one another form one of the main criteria in selecting animals for specific purposes.

Object of Study:—Though the Kangayam breed has been recognised as one of the well-known breeds of South India, very little information is available about the physical measurements and growth of these animals especially when they are young. An indication of the rate of growth and the developments of the various parts of the body and the correlation, if any, in relation to both will give breeders and those interested in cattle very useful information not only in culling out animals at their younger ages, but in making a good selection for specific purposes. The Palayakottai Farm, being situated almost in the centre of the Kangayam breeding tract and the conditions of calf-rearing being more natural and identical, offers an ideal place for a study of this kind.

MEASUREMENTS AND WEIGHTS OF KANGAYAM CALVES

225

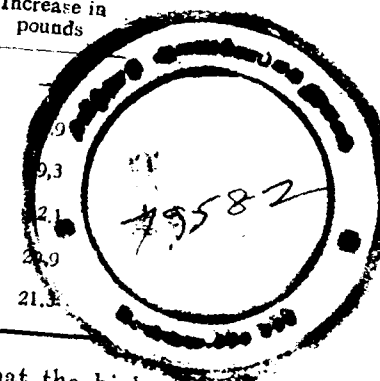
Details of study:—In this Farm, weights of calves have been recorded at birth in pounds and continued to be recorded every fortnight until the calves are 6 months of age. Simultaneously the measurements of the various parts of the body viz. height at withers, length from point of shoulder to pin bone, and girth, all in inches, have been recorded. Such of those figures which varied extremely due to unavoidable and specific causes have been eliminated and observations and records have been included only in respect of calves which were on identical conditions in all aspects.

In all, 1251 observations have been included in this study; weights in respect of 54 calves, birth to six months, have been recorded and a total number of 321 monthly weights have been included. Body measurements comprising of height behind withers, length from point of shoulder to pin bone, and girth of 52 calves, have been taken into account, and in all 930 body measurements have been included.

Results of study:—Three graphs are appended. Graph I gives the details of the monthly weights of calves and their averages in pounds. Graph II gives an indication of the monthly recorded measurements viz. height at withers, length from point of shoulder to pin bone, and girth and their averages all in inches. Graph III indicates the combination of the average monthly weights and measurements.

The average weight of calves during the first month is 59.4 lbs. During the second and subsequent months it increased as detailed below:—

Month.	Av. wt. in pounds	Increase in pounds
1st month	59.4	
2nd "	89.3	29.9
3rd "	118.6	29.3
4th "	150.7	32.1
5th "	180.6	29.9
6th "	201.9	21.3



It will be seen from the above figures that the highest increase in weight is during the fourth month, while the lowest increase is during the 6th month. The reason for this high increase in weight may be attributed to the following factor. Just at this period, calves begin to nibble grass and are sent out to the nearby paddocks where they get plenty of freedom and exercise and consequently there is a sudden

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K2 m2, N24
N53-30-3

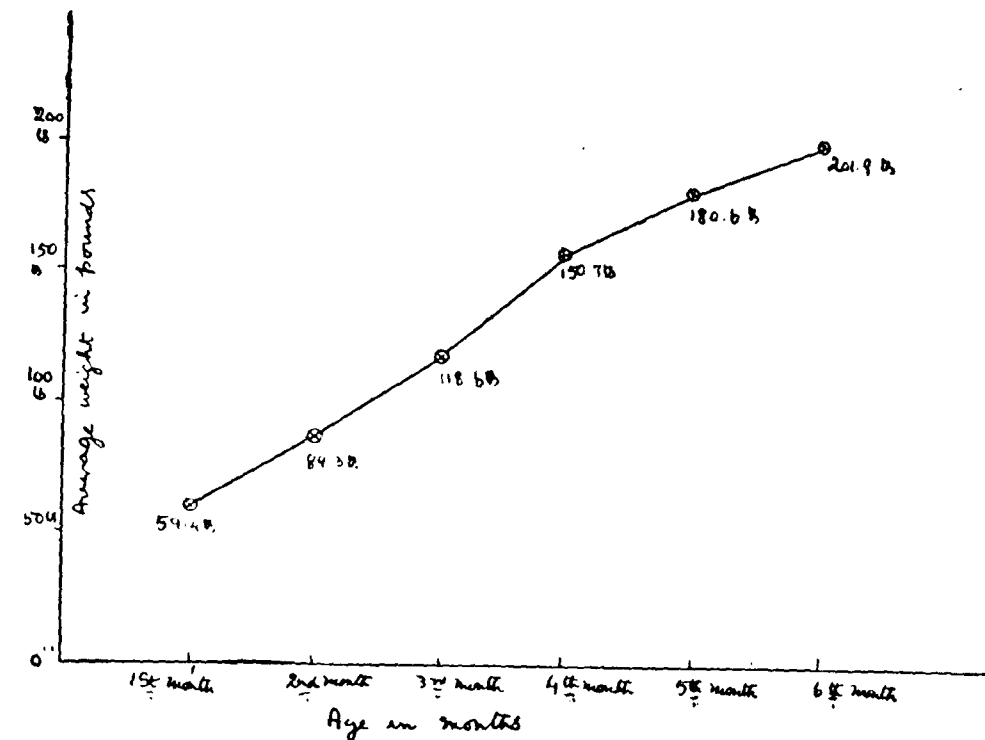
change in the mode of management. It is also interesting to note that just at this stage of their lives the Kangayam calves begin to shed their brown hairs (vide article "Colour and Kangayam breed" by the author published in the *Indian Veterinary Journal* Vol. XXV, No. 6 pages 447 and 448.)

The drop in the increase in the average weights during the 6th month may be attributed to the change in nutritional factors. A drop in the milk yield in the majority of animals start from about the 6th month and this adversely affects the nutritional requirements of the suckling calves at this stage of their life.

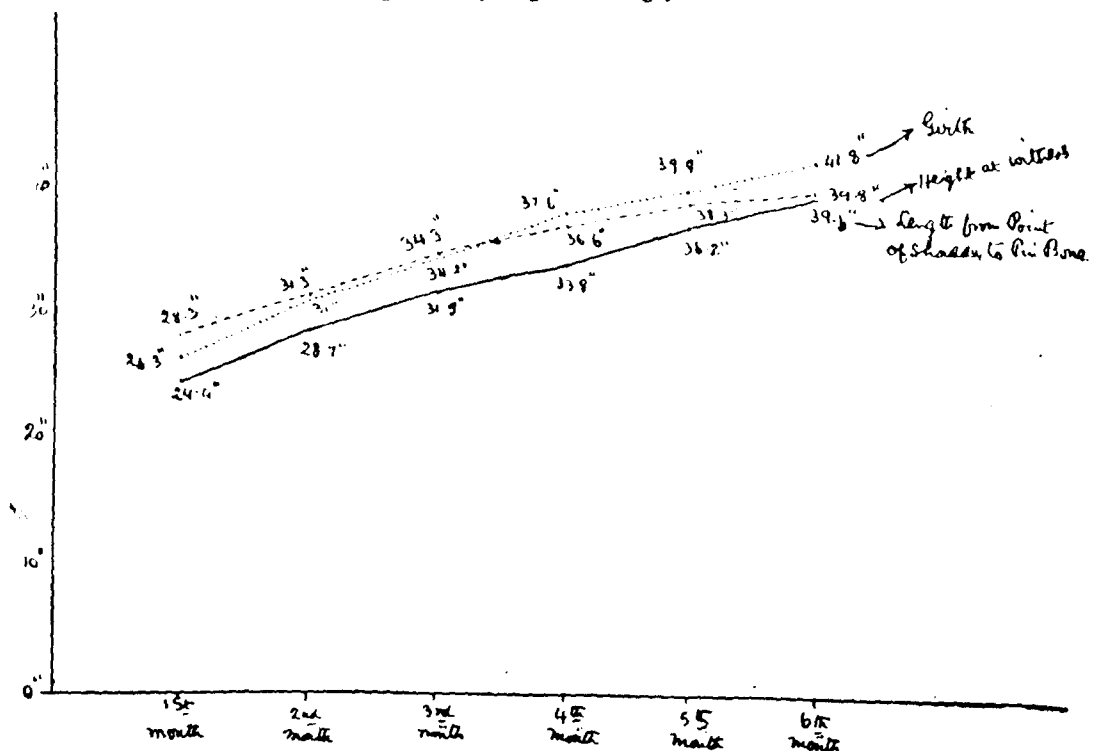
BODY MEASUREMENTS

	Months.	Average height behind withers in inches.	Increase in inches.
(a) Height at withers.	1	28.3"	—
	2	31.3"	3.0"
	3	34.3"	3.0"
	4	36.6"	2.3"
	5	38.3"	1.7"
	6	39.8"	1.5"
(b) Length from point of shoulder to pin bone.	1	24.4"	—
	2	28.7"	4.3"
	3	31.5"	2.8"
	4	33.8"	2.3"
	5	36.2"	2.4"
	6	39.1"	2.9"
(c) Girth.	1	26.3"	—
	2	31.0"	4.7"
	3	34.2"	3.2"
	4	37.6"	3.4"
	5	39.9"	2.3"
	6	41.8"	1.9"

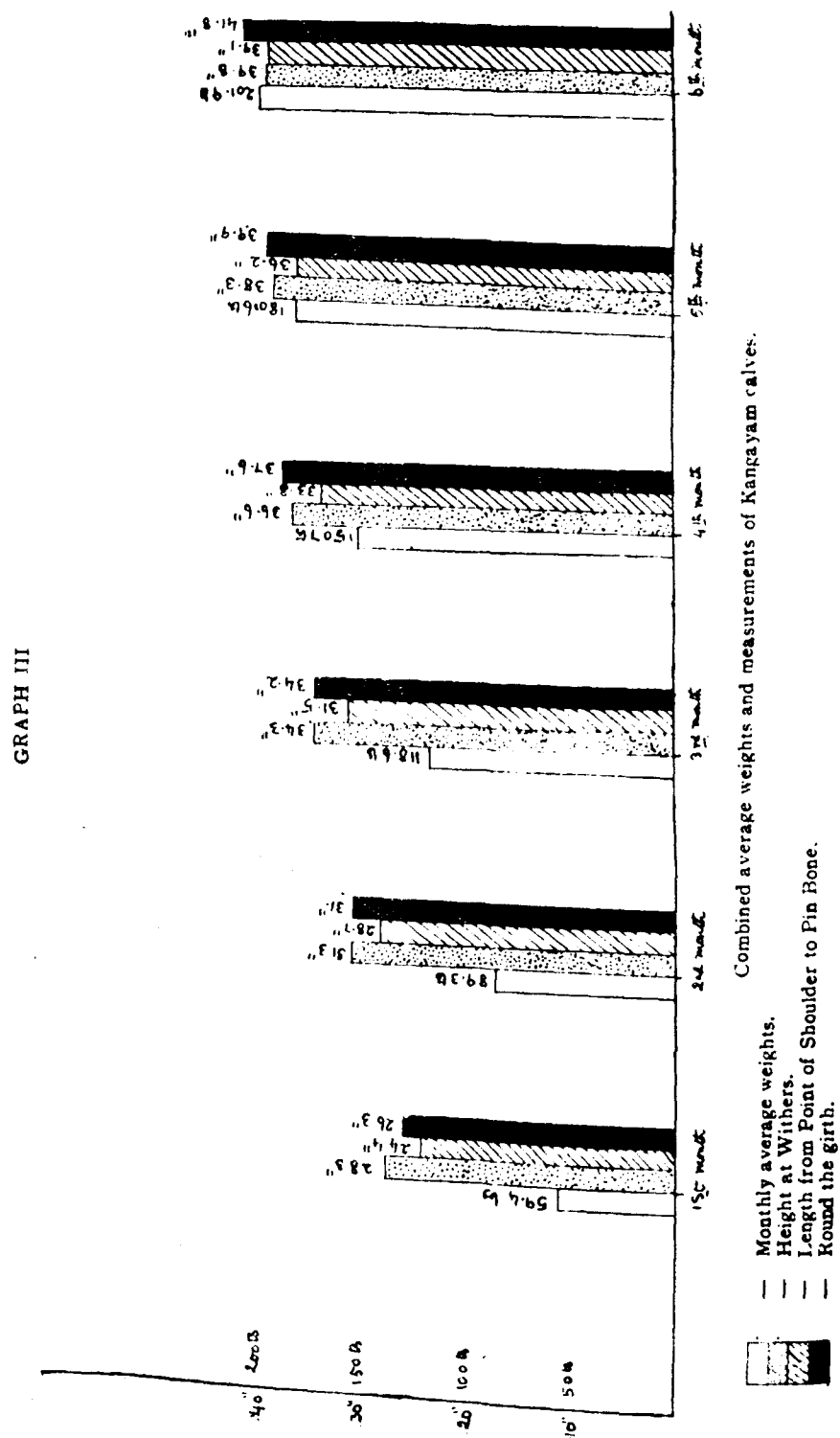
It will be seen from the above figures that the maximum increase of height at withers is during the 2nd and the 3rd months, and the minimum is during the 6th month. The maximum increase in the length from point of shoulder to pin bone is during the 2nd month and the minimum increase is during the 4th month. The maximum increase in girth is during the 2nd month while the minimum is during the 6th month. Summing up, the maximum increase in their body measurements occurs during the second month in all instances while the



GRAPH I
Average monthly weights of Kangayam calves.



GRAPH II
Average monthly measurements of Kangayam calves.



minimum increase occurs during the 6th month in two out of three instances.

Correlation study between the body weights and body measurements :—

The maximum increase in weight is 32.1 lbs. during the fourth month while the maximum increase in the various body measurements is during the 2nd month. The minimum increase in body-weight is during the 6th month while minimum increase in the various body measurements is during the 6th month under items (a) and (c) and the 5th month under item (b). It will be seen therefore that there is correlation between the minimum increase in weight with the minimum increase in body measurements, while there is no correlation between the maximum increase in weight and the maximum increase in body measurements.

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A SURVEY OF DIFFERENT LACTATION PERFORMANCES OF KANGAYAM COWS IN PALAYAKOTTAI CATTLE FARM

By

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*Introduction :—*Not only to the practical breeder, but also to the dairy-man it is of paramount importance to know something about the performances of the cow in different lactations. To the breeder, the information is useful from a calf-rearing point of view while for a dairy-man it is important from an economic point of view.

*Object of Study :—*There are various opinions regarding the performances of a cow during different lactations. It is believed that the peak lactation yield is generally during the lactation following the third or fourth calving. It is also said that the higher the milk yield, the lower will be the fat percentage and vice-versa. The lactation period and the average milk yield during the lactation bear particular significance in determining the quality of the cow. A short lactation

period with a high milk yield will naturally show a good lactation average when compared to an animal with a long lactation period with the same yield. The peak yield of a cow is of indirect importance in determining the value of the animal. The object of preparing this article is to give an idea of the lactation performance, fat percentage, lactation period, lactation average and the peak yield of different lactations of animals which were kept and reared almost under identical conditions, to give an idea as to how the Kangayam cows exhibit themselves in the above respects during their different lactations in this Farm.

Details of Study:—Lactation particulars of such of those animals which were kept and reared almost under identical conditions were included in the study to avoid variations. The age of first calving or the commencement of their first lactation on an average was 3 years and 3 months. The lactation yield is the total yield in pounds from the date of calving till the animal went dry of her own accord under normal conditions. Such of those figures which resulted due to abortion, premature birth, results of after-effects of diseases like Foot and Mouth have been eliminated. The fat in milk was tested at regular periodical intervals during the entire lactation period and the averages worked out for each lactation period for each animal. The lactation average is the average of daily individual yield during the period of lactation and the peak yield is the highest milk yield given by the animal after her normal calving.

In all, lactation particulars of 63 animals which were selected for a particular study, kept and reared under almost identical conditions in all aspects were included in the study. The animals were regular breeders and produced one calf almost every year. The first five lactations were included in the study as the particulars naturally relate to the animals almost before and after the prime of age. A total number of 1385 lactation particulars in respect of five lactations of 63 animals were included in the study and the averages of each lactation particulars were worked out. The nature of feed given, the type of management, the quality and quantity of grazing and water facilities available, the climatic and environmental conditions were almost identical in respect of all the animals, and the averages of the repeated observations of the first five lactations are of additional value to the study.

Results of observations:—A statement showing the details of different lactations as lactation yield, fat percentage, total lactation period in days, daily lactation average and peak yield is appended.

LACTATION PERFORMANCES OF KANGAYAM COWS

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	Lactation average in pounds.	Fat percent.	Lactation days.	Daily individual average during lactation.	Peak yield in lbs.
1st lactation	2027.7	5.7	305.9	6.4	10.1
2nd lactation	1980.9	5.4	289.1	6.8	11.3
3rd lactation	1873.9	5.3	284.6	6.6	11.4
4th lactation	1791.9	5.1	288.9	6.4	10.3
5th lactation	1664.5	5.0	293.3	5.7	9.9

Now it would be more interesting to take into consideration each item separately and then to discuss all put together.

(a) Lactation average:—

		Plus or minus over the first.	Plus or minus over the previous lactation.	Percent of plus or minus over the first.
		lb.		Percent.
1st lactation	2027.7	—	—	—
2nd lactation	1980.9	—46.8	—46.8	—
3rd lactation	1873.9	—153.8	—107.0	—
4th lactation	1791.9	—235.8	—82.0	—
5th lactation	1664.5	—363.2	—127.4	—17.9

It will be seen from the above that there has been a gradual reduction in the milk yield at every successive lactation from the first to the fifth lactation from 2027.7 lbs. to 1664.5 lbs. which works out at a reduction of 17.9 lbs. of milk for every 100 lbs. of lactation yield.

(b) Fat percentage:—

		Plus or minus over the first.	Plus or minus over the previous lactation.	Percent of plus or minus over the first.
	Percent.	Percent.	Percent.	Percent.
1st lactation	5.7	—	—	—
2nd lactation	5.4	—0.3	—0.3	—
3rd lactation	5.3	—0.4	—0.1	—
4th lactation	5.1	—0.6	—0.2	—
5th lactation	5.0	—0.7	—0.1	—12.3

The above statement shows that there has been a gradual reduction in the fat percentage at every successive lactation from the first to the fifth from 5.7 percent to 5.0 percent or at 12.3 lbs. for every 100 pounds of fat content in milk.

(c) *Lactation days* :—

	Days.	Plus or minus over the first.	Plus or minus over the previous one.	Percent of plus or minus over the first.
1st lactation	305.9	—	—	—
2nd lactation	289.1	— 16.8	— 16.8	—
3rd lactation	284.6	— 21.3	— 4.5	—
4th lactation	288.9	— 17.0	+ 4.3	—
5th lactation	293.3	— 12.6	+ 4.4	— 3.9

There has been a general reduction in the number of lactation days from 1st to 5th from 305.9 days to 293.3 days but it is not successive in each lactation. There was a reduction of 16.8 days from 1st to 2nd and 21.3 days from 2nd to 3rd lactation. In the 4th and 5th lactation the reduction is 17.0 and 12.6 days respectively. The difference in reduction over the previous lactation as detailed in column 4 is 4.5 days in the 3rd lactation while in the 4th and 5th lactation there have been an increase of 4.3 and 4.4 days respectively over the previous lactation. But there has been a general reduction of 3.9 days for every 100 days of lactation period from 1st to 5th lactation.

Daily individual lactation average and peak yield :—

	Daily individual lactation average.	Peak yield.
	lb.	lb.
1st lactation	6.4	10.1
2nd lactation	6.8	11.3
3rd lactation	6.6	11.4
4th lactation	6.4	10.3
5th lactation	5.7	9.9

Though there has been a general reduction in the lactation average and peak yields from 6.4 to 5.7 lbs. and 10.1 to 9.9 lbs. from 1st to the 5th lactation respectively, there has been a slight increase

during the 2nd and 3rd lactation under both the items and a very negligible increase in peak yield during the 4th lactation. The daily lactation individual average is almost the same as in the first lactation during the 4th lactation also. But the reduction factor under both the items from the first to the 5th lactation is significant in relation to this study.

Results of observations made in the Survey :—The tabulated averages furnish the following results :—

(1) There is definite fall in the 'lactation yield', 'fat percentage', 'lactation days', 'lactation average' and 'peak yield' in respect of all the items included in the study from the first to the fifth lactation. (2) The fall is gradual in each successive lactation from first to the fifth lactation so far as the 'lactation yield' and 'fat percentage' are concerned whereas under 'lactation days' the decline is gradual upto the 3rd lactation while there is a slight increase in the fourth and the fifth lactation but definitely, however, not exceeding the first. (3) It may also be observed that the "peak yield" and the "lactation average" are almost the same from the first to the fifth lactation indicating a correlation between these two items in respect of each successive lactation from first to fifth.

Acknowledgment

I wish to place on record my grateful thanks to Sri D. Pattabiraman, G.M.V.C., A.I.D.I., Deputy Director of Animal Husbandry, Madras, who was responsible for the maintenance of the lactation particulars when he was Superintendent in charge of the Scheme and from which this study is made, and also to the Pattagar of Palayakottai in whose Farm this study was undertaken.

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Davidson, J. L., *Vet. Med.* June 1952. 241.

AN EASY METHOD OF COLLECTING SERUM SAMPLES FROM THE EAR VEIN OF BOVINES

By

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I. V. R. I. Mukteswar-Kumaon.

Many chemical diagnostic tests are available for the detection of latent Trypanosome infections in different species of animals. Of these, the Bennett's mercuric chloride test (1928, 1929), the Jones's nitric acid test (1936), and Ray's stilbamidine test (1950), require only one drop of the suspected serum for performing the test. The usual method of obtaining this amount of serum (by puncturing the jugular vein) involves much labour when compared with the actual amount of serum required. In similar tests carried out in connection with the human Kala-azar, many attempts have been made to render this process easy and simple. Chopra and Mukherjee (1930) described a finger prick method of diagnosing Kala-azar, in which they collected a drop or two of blood from a pin prick, in a small test tube containing 0.25 cc. of a 2% solution of Pot. oxalate. A finger prick capillary blood test method has been described by Raghavan (1949) for the diagnosis of Kala-azar. In this method blood exuding from a pricked finger was collected in capillary tubes (9 cm. long and 1 mm. wide), containing some 2% plasticine. After about an hour the serum was found to have separated on top and the cells settled down. The lower portion of these capillary tubes with packed cells and the plasticine plug were filed off and the upper part containing the serum were used for the test. Raghavan and Satyaprakash (1949) later described the application of Napier and Chopra tests with "reconstituted sera" collected on filterpapers from finger pricks. Such an attempt was made by Bennett (1933) who tried his mercuric chloride test on camel sera which had been dried on filterpapers. This was done more to study the effect of drying and preservation of sera on the above test, for the serum in question was collected by the usual method of vene-puncture only.

As no such simple method of collecting serum is available for the field veterinarian, the present method is described. This method was evolved to render easy the method of collecting serum samples for the Ray's stilbamidine test (Ray, 1950) to detect latent trypanosomiasis in Indian cattle.

The Method:—The serum sample is collected in capillary tubes from a puncture in the ear vein. The ear of the animal (cattle) is held

flat between the thumb and the fore finger near its base, compressing some of the superficial veins on the upper surface of the ear. Some of the superficial veins become dilated and prominent. The biggest of these veins is pricked by a sharp pin, and big drop of blood collects on the spot. This is collected in a capillary tube 10 cm. long and 1 mm. wide. The capillaries are stuck up vertically on plasticine bands previously placed on a stiff card board. The serial number indicating the source of blood are marked on this card board against each capillary tube. In the field, the filled-up capillaries may be sealed on both ends (with plasticine) and stuck on a long sheet of paper (just like inserting pins) and appropriately marked. These capillaries can be transported at this stage, for shaking does not interfere with the separation of serum which is always clear when used forty eight hours after collection. These capillaries are then taken up one by one and one end of it is rendered open (if both the ends are sealed). Next, the capillary tube is gently broken near the sealed end, and the clot is drawn off in the form of a fine thread. The clot comes off in the form of a continuous thread, leaving the clear serum in the capillary tube if care is taken to exclude air bubbles while filling up these capillaries. A small teat is applied to one end of this tube gently, taking care not to push out the contents. (The small rubber teats supplied with the B. D. H. capillator were used in our experiments). The serum is now ready for putting up the stilbamidine test.

Acknowledgments

Our thanks are due to Dr. S. Datta, Director, Indian Veterinary Research Institute, Izatnagar/ Mukteswar for his encouragement, and for affording facilities for work in the Protozoology Laboratory of the Institute.

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The complicated treatment of iodine followed by surgery in actinomycotic cases in bovines is simplified by injecting 6 to 9 lac units of penicillin procaine in oil direct into the tumour mass.

(Abstract, *Vet. Med.* June '52).

CHEMICAL TESTS IN BOVINE SURRA

By

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Of the protozoan diseases affecting the domestic stock in India, Surra, caused by *T. evansi* (Steel, 1885), is of the greatest economic importance. Severe outbreaks of the disease attended with high mortality among cattle have been recorded. The first outbreak of Surra in bovines was recorded by Lingard (1895) at the Karnal Depot. In this outbreak 26 animals were affected of which 20 died and the remaining were destroyed. Outbreaks with a mortality rate of 90 per cent. and over have been recorded by Chetty (1922), Bachan Singh (1936) and Mahajan (1934). In some of the acute outbreaks the death of the animals was so sudden that some bacterial disease like Anthrax or Haemorrhagic Septicaemia was suspected to be the causative factor.

It is a well known fact that camel and cattle act as reservoirs of the disease and carry it on from one Surra season to another. Lingard (1889-1901), Pease (1906), Schein (1908), Cross and Patel (1922) and Sen (1936) have shown by biological tests that the blood of a recovered animal can remain infective for a period of over five months. Mudaliar and Ray (1947) have shown that the cattle of India can act as reservoir hosts for a period of about 6 months whether naturally or artificially infected.

From the above data it is obvious that attempt at control or eradication of the disease must ensure the detection and suitable treatment of the carrier animals. Bennett (1929) first demonstrated the usefulness of a weak solution of mercuric chloride as a diagnostic agent of *T. evansi* (*T. sudanense*) infection in camels. This afforded a simple and useful tool in the hands of the field worker to detect latent carriers. Hornby (1929) found that the serum of cattle, whether infected or healthy gave white precipitate with mercuric chloride even in the dilution of 1/40,000. Kuppuswamy (1941) found this test to be of doubtful value in cattle surra since the same animal gave at times positives and at others negative results, though animal inoculation was positive at all times. Subsequently Jones (1936) as a result of his studies on *T. vivax* and *T. congolense* infections in African cattle came to the conclusion that nitric acid solution could be used to detect the latent infections. Mudaliar and Ray (1947) obtained some encouraging results with this test in latent cattle Surra and pointed out the possibility of this test being used, in conjunction with the complement fixation test, to obtain evidence of chronic infection.

Till recently we had to rely on the above as well as biological tests for the detection of latent Surra infection in animals. The complement fixation test, though very accurate for the early detection

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of latent infection can be used only in a well equipped laboratory, for it involves the use of some accurately assayed biological reagents and specialised technique. Working on the analogy of these chemical tests and the urea-stibamine test of Kala-azar, Ray (1950) evolved a simple and efficient test, (known as the Stilbamidine or M. B. 744 test), to detect the latent carriers of surra among cattle. The results of his preliminary tests compared favourably with those obtained with the allergic test described by him (Ray, 1945), and the complement fixation test. In the annual report of this Institute for the year 1948-49 it has been stated that, "Though results obtained by all the three above tests (complement fixation test, the allergic test and the stilbamidine test) were to a great extent in conformity with each other, it is believed that the stilbamidine test could pick up the infected ones at a much earlier stage than the other ones". To obtain further information on this, experiments were undertaken to determine firstly, the comparative efficacies of these chemical tests as compared with that of the complement fixation test, secondly, to find out which of these tests detected the disease earlier and, finally, the percentage of success obtained in the field (plains cattle) with the stilbamidine test to determine whether it could replace the complement fixation test.

1. The first set of experiments were conducted on Hill bulls. A set of six hill bulls which were repeatedly negative to the above tests were taken for this work. The sera of these animals were negative to the tests over a period of one month. Five of these animals were infected with the laboratory strain of *T. evansi*, and the sera of these animals were subjected to the Complement fixation test, the Stilbamidine test, the nitric acid test and mercuric chloride test at weekly intervals. The results obtained are incorporated in the following table:

The sixth animal, Hill Bull No. 141, remained as uninfected control during the above experiment and was negative to all the tests during the whole period of experiment.

In the above tests 1/25000 of mercuric chloride was used as described by the original author. The nitric acid and stilbamidine tests were also done as advocated by the original authors.

From the above experiments the following conclusions were arrived at:

1. The stilbamidine test detects the disease alongside with or earlier than the Complement fixation test.

2. The nitric acid test did not detect the presence of the infection in any of the animals at any time.

3. The mercuric chloride test gave precipitate with the sera of both healthy and infected animals and no difference in the reaction could be detected even after infection. The results are in agreement with those of Hornby (1929).

TABLE I

		Complement fixation test	Stilbamidine test	Nitric acid test	Mercuric chloride test
1. Hill Bull No. 1—Infected on 6-10-1951					
4th week	6-10-1951	—	—	—	—
	13-10-1951	—	—	—	—
	20-10-1951	—	—	—	—
	27-10-1951	—	—	—	—
	4-11-1951	—	+	—	—
	11-11-1951	+	++	—	—
	18-11-1951	++	+++	—	—
	25-11-1951	++	+++	—	—
	2-12-1951	+	+++	—	—
	9-12-1951	+	+++	—	—
	16-12-1951	++	+++	—	—
	23-12-1951	+	+++	—	—
2. Hill Bull No. 87—Infected on 16-11-1951					
3rd week	16-11-1951	—	—	—	—
	23-11-1951	—	—	—	—
	30-11-1951	—	—	—	—
	7-12-1951	+	+	—	—
	14-12-1951	+	+	—	—
	21-12-1951	+	+	—	—
	29-12-1951	+	++	—	—
	4-1-1952	+	++	—	—
3. Hill Bull No. 49—Infected on 1-1-1952					
4th week	1-1-1952	—	—	—	—
	4-1-1952	—	—	—	—
	11-1-1952	—	—	—	—
	18-1-1952	—	—	—	—
	25-1-1952	+	+	—	—
	1-2-1952	+	+	—	—
	8-2-1952	++	++	—	—
	15-2-1952	++	++	—	—
4. Hill Bull No. 70—Infected on 8-11-1951					
3rd week	8-11-1951	—	—	—	—
	12-11-1951	—	—	—	—
	16-11-1951	—	—	—	—
	23-11-1951	—	+	—	—
	30-11-1951	—	+	—	—
	7-12-1951	+	+	—	—
	11-12-1951	+	+	—	—
5. Hill Bull No. 165—Infected on 1-1-1952					
5th week	1-1-1952	—	—	—	—
	10-1-1952	—	—	—	—
	11-1-1952	—	—	—	—
	18-1-1952	—	—	—	—
	25-1-1952	—	—	—	—
	1-2-1952	—	—	—	—
	8-2-1952	—	+	—	—
	15-2-1952	+	++	—	—

The second set of experiments consisted in testing complement positive sera received from the different parts of India (plains) by the three chemical tests described above. The results of the experiments are given in Table II.

TABLE II

No.	Complement fixation test.	Stilbamidine test.	No.	Complement fixation test.	Stilbamidine test.
1.	++	+	26.	++	+++
2.	++	++	27.	+	+++
3.	+	+	28.	+	+++
4.	+	?	29.	+	+++
5.	+	?	30.	++	+++
6.	++	+	31.	++	+++
7.	++	+++	32.	+	+
8.	+	+++	33.	+	+
9.	+	+++	34.	+	+
10.	+	+++	35.	+	++
11.	+	+	36.	+	++
12.	+	++	37.	+	+
13.	++	+++	38.	+	+
14.	++	—	39.	+	++
15.	++	+++	40.	+	+
16.	+	+++	41.	++	+
17.	+	+++	42.	++	++
18.	++	—	43.	+	+
19.	+	+	44.	+	—
20.	+	+++	45.	+	—
21.	+	++	46.	+	—
22.	+	—	47.	+	—
23.	+	+	48.	+	+
24.	+	+++	49.	+	++
25.	+	++	50.	+	+
			51.	+	+

Out of the 51 samples of sera positive to complement fixation test, 7 gave negative results and 2 gave doubtful results with Stilbamidine test. Thus, the stilbamidine test was able to detect 84 per cent. of the complement positive sera. The nitric acid test and the mercuric chloride test did not give even a single positive test among the 51 sera tested and so were not included in the above table. On another occasion the nitric acid test gave 6 positive reactions in an area where sera of more than 60 per cent. of the animals were positive to complement fixation test. The formal-gel test gave capricious results as both positive as well negative results were obtained when tested repeatedly. From the above it appears that the stilbamidine test could be used safely in the field for detecting latent carriers among cattle.

Summary

The usefulness of the various chemical diagnostic methods used for detecting latent trypanosomiasis in bovines is discussed.

It is shown that for all practical purposes Ray's stilbamidine (M&B 744) test is as much dependable as the complement fixation test. Other tests such as formal gel, mercuric chloride and nitric acid tests gave capricious results.

Just as Bennett's mercuric chloride test is able to detect camel trypanosomiasis earlier than the complement fixation test, the stilbamidine test could fulfil the same purpose in most cases of cattle trypanosomiasis.

Acknowledgments

Our thanks are due to Dr. S. Datta, Director, Indian Veterinary Research Institute Mukteswar/Izatnagar for affording facilities for work in the Protozoology Laboratory of the Institute and to the Director, Civil Veterinary Department, Madras and the Director Civil Veterinary Department, Bombay, for the supply of serum samples for our studies.

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SCHISTOSOMIASIS IN ELEPHANTS IN BOMBAY STATE

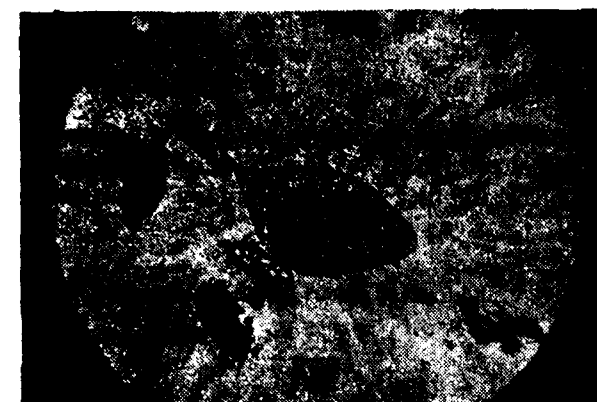
By

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Although a number of schistosomes are described from domestic animals in this country and elsewhere, no schistosomes have been reported from elephants till Mudaliar and Ramanujachari recorded *Ornithobilharzia nairi* in the year 1945. This record of the occurrence of the schistosomes is very interesting. So far the pathogenesis caused by these worms is not known since no elephant has been found to be suffering from Bilharzia infection. Even Mudaliar and Ramanujachari had only found the worms in an elephant which had died of old age and no symptoms which could be attributed to these worms were evident while the animal was alive.



Microphotograph of Ova of *O. nairi* (?)

In recent years six cases of Bilharzia infection in elephants have come to our notice from North Kanara District and among the prominent symptoms observed were loss of appetite, suppression of urine, constipation followed by diarrhoea and vomiting. Examination of the faeces revealed a large number of schistosome eggs which were similar to those found by Mudaliar and Ramanujachari i.e. *Ornithobilharzia nairi*, except that they differed in size. Examination of blood was negative for any protozoon or other infections and consequently the debility and other associated symptoms could not be attributed to any other cause excepting Schistosomiasis.

The eggs obtained varied from 140–160 μ x 65–80 μ . The shape of the egg was that of an elongated cone with one side flatter than the other and a short abrupt spine at one extremity (vide microphotograph.) The measurements of the eggs given by Mudaliar and Ramanujachari are only 80 x 30 μ and, therefore, they appear to be only half as small as the one obtained in the present case. The specific identity of the worm, therefore, raises a little doubt, as it is likely that it may belong to a different species altogether or it may be that the uterine eggs are very much smaller than the eggs that pass out along with the faeces.

There seems to be a good deal of infection in this particular area of North Kanara District, where a large number of elephants are used for transport of timber. The intermediate host of this worm may be either *Limnaea acuminata* or *Indoplanorbis exustus*, as these two types of snails are found in that area; but it requires further study.

Treatment:—Antimosan with an initial dose of 150 c.c. was administered subcutaneously. Three such injections were given at weekly intervals. The animals showed some improvement but did not quite recover. The faeces were, still, positive for schistosome ova even after treatment as, in all probability, the dose administered was insufficient to have a lethal effect on the schistosomes. Unfortunately, the treatment could not be continued for reasons beyond our control.

Schistosomiasis in elephants appears to be more prevalent than is supposed and it is desirable to have samples of the dung of these animals examined whenever debility and alimentary disorders are noted in them.

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VACCINATION AGAINST RANIKHET DISEASE IN POULTRY IN MADHYA PRADESH

By

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A series of experiments were conducted during the last five years for elucidating certain important aspects relating to control of Ranikhet outbreaks in the field by vaccination. The salient findings in this connection are outlined below.

1. The minimum effective age for vaccinating chickens successfully against the disease is 9 days.

VACCINATION AGAINST RANIKHET DISEASE IN POULTRY 243

2. Vaccination after 24 hours of natural or artificial infection *per os* is effective in preventing birds from developing the disease and is of some value even as late as 48 hours afterwards;
3. Vaccination in case of concurrent infections like coccidiosis, spirochaetosis and helminthiasis leads to a considerable increase of mortality over the normal rate of two to four per cent in the inoculated birds during the reaction period of the vaccine;
4. Wholesale inoculation of fowls inclusive of those in the incubative stage is the only means to cut short the course of field outbreaks of the disease;
5. The same needle can be utilised for carrying out inoculation of both diseased and healthy birds without any change or sterilisation in between since the vaccine pushed in at the time of inoculation counteracts the relatively small virus conveyed and confers immediate protection by interference;
6. Chickens can be successfully immunised simultaneously against both Fowl-pox and Ranikhet disease by carrying out scarification with a composite emulsion of Pox and Ranikhet vaccines and there is no increase in the mortality during the reaction period over the ordinary method;
7. Day-old chickens hatched out from eggs of birds protected against Ranikhet disease possess a considerable degree of inherited immunity to the disease while those from uninoculated hens are fully susceptible;
8. In order to control an outbreak of Ranikhet disease and reduce losses in the affected flock to a minimum it is essential to carry out wholesale inoculation with Ranikhet vaccine as early as possible at the first appearance of the trouble. In case vaccine is not immediately available, inoculation if done even as late as 72 hours following infection will be of some use in saving about 25% of the fowls in the incubative stage of the disease, which would otherwise succumb.
9. It is not safe to inoculate day-old chickens from unprotected hens with Ranikhet vaccine.



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THE Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. XXX

NOVEMBER, 1953

No. 3

Editorial

THE MENACE OF MECHANISATION

It was, indeed, a very timely exhortation that Sri C. Rajagopalachari, the chief Minister of Madras—Rajaji, as he is familiarly known to the people—made while declaring open the Cattle Show and Exhibition at the Madras Veterinary College on the 14th November 1953 in connection with the Gosamwardhan Week and warned the people against the growing mania for pump-sets and replacing cattle with these machines for baling water to their fields and gardens. Prefacing his speech with a handsome well-deserved compliment to the efficient working of the Animal Husbandry Department of the State which, in these days when fault-finding with Government Departments had become a fine-art, came with a refreshing and exhilarating effect, Rajaji dwelt on the importance of our cattle to our national economy and stressed on the peculiarity of our civilisation which had grown up with the cattle wealth of the land. He then drew attention to the growing tendency to introduce machinery for farm work and warned the people against its developing into 'devilish' proportions and bringing ruin to the country. As we have been repeatedly writing in these pages, this mania for introducing machinery into farms has been steadily growing during the last few years, more especially after the last war, encouraged chiefly by the industrialists who picture before the simple peasants the glamour of mechanisation as obtaining in foreign countries. It is not easily realised that conditions in different parts of the world are not at all alike and they vary very greatly, indeed. What is good and even necessary for one country is not necessarily so for another country and may even be positively harmful to others. So, it is with mechanisation of

farms in our country. Ours is a very ancient agricultural country with cattle as the mainstay of agriculture. Our farmers, the majority of them, have only small holdings. The human power available is abundant and plenty. Men, women and cattle work and toil for the improvement of the land. The latter live on the chaff and grains of the farms which are not required by the farmer. In return, they work for the owners and enrich the soil with their highly valuable excreta, unlike the machinery which only foul the countryside with their exhaust fumes. They also provide the people with protective foods like milk, meat and eggs besides other essential things. Thus there is a very close intimacy between the man and the cow in our land. As Sri C. R. puts it, we have inherited a civilisation in which the life of the people and the life of cattle are inextricably mixed and both together play an important part in the national economy. There is, as Rajaji expressed, as much pleasure and happiness in bringing cows and calves as there is in bringing up children. This cow-centered economy of ours will surely be shattered if we take to farm machinery indiscriminately and on the score of labour saving. Installing of machinery may be quite spectacular and may even appear cheaper to begin with. But, in the long run, it is bound to land us in great distress. Our Rajaji has put this very succinctly in his own inimitable style as follows:—"In one sense, cattle are also a kind of machine. Just like an engine which converted the fuel consumed by it into power, a bullock converted the food eaten by it into power which they used for ploughing, drawing water from the wells, etc. In these days, the demand for pumps and other machinery was growing, probably on account of the high cost of maintaining cattle and also probably because diseases took a heavy toll of cattle in some parts of the country. But he would like to tell them that they could depend more on their pair of bullocks than on a pump which depended on so many external factors for its running. The liquid fuel for a machine had to come from outside the country and these resources were also not inexhaustible. Coal was also a fuel whose stock got exhausted by continuous extraction. On the other hand, the fuel which produced power in cattle grew every year with rain. The cattle feed formed part

of our food economy. The bulk of the rice plant or cholam plant went to feed cattle. In that way, men and cattle grew up side by side in this land. If their food production were done with the aid of pumps and machinery, what was to become of the straw and the stem of cholam? Were they to be utilised for the manufacture of only paper? Or was it possible in the 'pump age' to grow paddy with only the corn sprouting from the earth or the cholam with only the ears showing up?" (*The Hindu*) Sri Rajagopalachari did not stop there but went on to explain what happened to the hand-loom weavers after the advent of textile machinery and explained as follows: "The weavers and the general public never at first expected textile mills to grow to their 'devilish' proportions. Nobody had taken them seriously, but what was the result today. Like the 'devil', it spread and developed". (*The Madras Mail*). Concluding his speech, Rajaji said, 'I do not suggest that the fate of the hand-loom weavers will overtake our agricultural economy very soon. I am only giving a warning of the distant danger and also stressing how our cattle are more dependable than machines'. These warnings and exhortations, coming as they do from a veteran publicist and statesman as Rajaji, should be taken note of in all its seriousness and the menace of mechanisation of farms checked in time before it assumes its 'devilish' proportions to endanger our cattle wealth and shatter our economy.

THE BIRTH OF A NEW STATE

The 1st of October 1953 has been a red letter day in the annals of the Andhra people and in the history of our country. That day witnessed the birth of the new State of Andhra and the realisation of the dreams of the people inhabiting the Andhradesa. These people have been working very hard for this objective for nearly half a century with a perseverance and steadfastness worthy of the cause they espoused and the consummation of their cherished goal so soon after our country's Independence must be a source of great satisfaction and happiness to everyone concerned. We share in their joy and happiness and extend to the people of Andhra State our hearty felicitations and our best wishes for all round prosperity and economic advancement.

The Andhra State has got an illustrious history and a glorious culture. It has got great potentialities of wealth not only in the mighty rivers of Kistna and Godavari but also in mineral wealth. It is, above all, the home of the world-renowned Ongole breed of cattle. These animals, we need hardly remind our readers, are noted for their dual purpose—for high milk-yielding qualities and for heavy draught work. These animals and also the other livestock of the farm like sheep, goats and poultry, add to the resources of the State and we are sure that, in years to come, there would be intensive developmental work all round bringing plenty and prosperity to the common man.

May He guide the destinies of the State in the proper direction!

INDIA'S CATTLE WEALTH

Important Role in Nation's Economy

"As Indians we have inherited a civilisation in which the life of the people and the life of cattle are inextricably mixed and both together played an important part in the national economy", stated Mr. C. Rajagopalachari, Chief Minister of Madras, while opening on the 14th November 1953 the Cattle Show and Exhibition organised at the Madras Veterinary College, Vepery, to observe Gosamvardhana Day of the Gosamvardhan Week which concluded that day.

Speaking in Tamil "in order that the majority of those interested in the care of cow and cattle could follow him," Mr. Rajagopalachari said that the detailed account read by the Director of Animal Husbandry gave them an idea of the nature of the work done in this State and the success the efforts had met with. There was no doubt that the Department was working well and he would take the occasion to express to the officers concerned his thanks on behalf of the people. If the work of the officers of the Government produced good results, Ministers took credit for them. But, if anything went wrong, the blame went to the officers. That was politics. Any work was done well in Madras and he was not surprised at being told that the Animal Husbandry Department of Madras was the best in the whole of India and that the Madras Veterinary College was the best institution of the kind in India. That was why he had given to the Department a Minister (Mr. V. C. Palani-swami Gounder) who knew everything about cattle and whose heart was in work connected with the promotion of the cattle wealth of the country.

If they heard complaints of defects in the working of this Department or that in Madras, the Chief Minister said, it was because those departments were working well and people had begun to evince an interest in their work. When no work was done, there would be no complaint. Therefore, if there were agitations of one kind or another, there was no need for them to worry. There were people in this country who made it their business to look for flaws here and there and to focus public attention on them. They need not bother, at any rate, nor feel disheartened, because of those complaints.

He was mentioning this especially for the benefit of students of the College, Mr. Rajagopalachari said. The products of this college were sought after in all parts of India and it was their duty to concentrate on acquiring as much knowledge of the subject as possible and not merely to concentrate on marks.

Coming here and hearing the tinkling of bells and the bellowing of bulls, Mr. Rajagopalachari said, took his mind back to early days. There were cows in his own house and they were milked and looked after without any outside help. He was glad to see some good animals at the show. On account of the heavy demand for milk, it was but natural that good cows found their way to a city like Madras. It was only when one personally attended to the needs of a cow or the bullocks of one's cart that one realised the joy of bringing up cattle. India had a civilisation in which they had grown up with the cattle wealth of the land.

Uses of Cattle

In one sense, cattle were also a kind of machine, the Chief Minister said. Just like an engine which converted the fuel consumed by it into power, a bullock converted the food eaten by it into power, which they used for ploughing, drawing water from wells, etc. In these days, the demand for pumps and other machinery was growing, probably on account of the high cost of maintaining cattle, and also probably because diseases took a heavy toll of cattle in some parts of the country. But he would like to tell them that they could depend more on their pair of bullocks than on a pump which depended on so many external factors for its running. The liquid fuel for a machine had to come from outside the country and these resources were also not inexhaustible. Coal was also a fuel whose stock got reduced by continuous extraction.

On the other hand, the fuel which produced power in cattle grew every year with rain. The cattle feed formed part of their food economy. The bulk of the rice plant or cholam plant went to feed cattle. In that way, men and cattle grew up side by side in this land. If their food production was done with the aid of pumps and machinery, what was to become of the straw and the stem of cholam? Were they

to be utilised for the manufacture of only paper? Or was it possible in the "pump age", to grow paddy with only the ears sprouting from the earth or the cholam with only the corn showing up? Did the handloom weaver think, when the first textile mill was established in this country, that it would grow up into a veritable monster and render him unemployed?

The Chief Minister said he did not suggest that the fate of the weaver would overtake their agricultural economy so soon. He was only giving a warning of the distant danger and also stressing how cattle power was more dependable. They could derive from bringing up cattle the same joy they derived from bringing up a child.

Problem of useless cattle

Referring to the need for improving the quality of the cattle, the Chief Minister said it had been established that it was uneconomical to maintain useless cattle. Their civilisation was against the slaughter of cattle and there were also organisations which exploited this sentiment about cow slaughter. So, this question of useless cattle had become a problem with the Government and they were proceeding on the basis that, if they encouraged good breeds, and helped the production of pedigree cows, the uneconomic variety would disappear in the natural course. Their ancestors also resorted to castration to prevent the multiplication of useless breeds. The Chief Minister expressed the hope that in course of time the country would have only good breeds of cattle. He also asked the officers of the Department to move sympathetically with the people to attain their objective.

Earlier, Dr. V. R. Rajagopalan, Director of Animal Husbandry, welcomed the Chief Minister and requested him to declare the cattle show and exhibition open. He said the prosperity of this country depended on agriculture. Bullocks were the tiller's property and also the means of livelihood. The rural economy, therefore, revolved round the bullock. The cow as the progenitor of the bullock assumed importance and as the giver of the protective food, milk, became venerable. Cattle also fertilised the soil through dung and urine. But in India, the cow came to be neglected because she had become a liability. If she were to be restored to her ancient glory, they should start by making her a source of wealth.

Dr. Rajagopalan said the cow was comparable to an engine. Just as a good engine would convert all fuel supplied into power a well-bred cow or bullock would convert most of the food consumed into milk or work. A poor quality animal would return very little of the food as milk or work. Given patience, the quality of cattle could be improved by the exclusive use of pedigree bulls.

Govt. Livestock Farms

The Government maintained seven livestock farms with 2,000 pedigree cattle of various breeds, besides buffaloes, sheep and poultry, the Director said. In order to make their work spectacular, intensive work was being undertaken in restricted compact areas. They had 20 such intensive cattle improvement centres. Artificial insemination was used to raise the rate of progress in certain places. The Madras Animal Husbandry Department had over 1,100 pedigree bulls in stud under the different schemes and over 1,10,000 calves were born of them during the last one year alone. The appreciation in value of the stock was valued at about Rs. 30,00,000. But there was still a lot to do.

The general conception of a good cow was that it should subsist on nothing and give a big pail of milk morning and evening. Those who thought so forgot that a cow could only convert and not create. A well-bred cow should also be fed adequately; otherwise, it would degenerate into a poor-bred one in a few generations. Useless animals in India were growing at an alarming rate. They should stop their multiplication by castrating all poor quality bulls and breeding a limited number of the best. They could then manage with a tenth of the present number of cattle.

The problem of the dry cow was very acute for city dwellers, particularly professional milkmen. A salvage scheme was started for the first time in 1944-45. This scheme was intended not only to preserve valuable dry animals but also to improve their breeds with suitable breeding bulls. So far, 1,834 cows were salvaged and cared for, of which 1,451 cows were returned with calves or in pregnancy at owners' request. Admission to this farm had been steadily increasing and on an average 270 cows were in the farm, as compared with 176 cows at the beginning. The number of such farms must increase, and they should have at least one for each district to begin with.

Care of Calves

To prevent good calves from being starved to death a calf subsidy scheme was introduced in Madras City, under which milkmen who looked after calves for a period of nine months were given a sum of Rs. 35 as subsidy. About 5,000 heifer calves were included in the scheme. Though it had since been withdrawn, the scheme had worked long enough to impress upon milkmen that it was worth while to rear calves.

Any livestock industry must have an efficient health service. They should control cattle diseases efficiently if they were to build a superior stock. Dr. Rajagopalan felt proud to announce that the

Madras Animal Husbandry Department had eradicated rinderpest, known as cattle plague, from the State. They had also made considerable progress in the control of other diseases. These achievements were made possible by the establishment of the Veterinary Biological and Research Institute. Every endeavour was being made to organise and develop this institute into a fully equipped modern one. Fortunately, it was possible to obtain through the good officers of the F.A.O. modern equipment for it at little cost to the State. It was the first of its kind in India to be provided with such equipment and the Madras Veterinary College continued to lead in the sphere of veterinary education. The B.V.Sc. Degree of the Madras University was keenly sought for. The College had also several students from a number of Asian countries.

Concluding, Dr. Rajagopalan said that the requirements of animal medicine and animal husbandry had not yet attracted the same public attention as those of many other worthy causes. In Western countries private benefactions had stepped in for livestock improvement and research. In this country also, cows must be improved in the interest of their health and economy and Dr. Rajagopalan looked forward to greater public attention to this matter.

Dr. B. A. D'Souza, Deputy Director of Animal Husbandry, proposed a vote of thanks.

The Chief Minister had a look at the cattle that were coming in for the show and also went round the exhibition organised by the staff and students of the Veterinary College. All aspects of the work done at the College and by the Animal Husbandry Department were illustrated. Control of disease, nutrition, artificial insemination, and other branches of work were explained through exhibits. There were also charts pertaining to the care of cattle and the improvement of breeds. Model cow byres under urban and village conditions were also on view.

"The Hindu", Madras.

Menges, Larsh and Haberman (1953) report two cases of actinomycosis in dogs. In one, cavities were found in the lungs, containing pus and granules, which gave positive cultures of *A. bovis*. In the second two tumorous masses containing abscesses were found in the omentum. The first probably got infection due to a gun shot perforating the lungs, it being a hunting dog. These are probably the 38th and 39th canine cases. *J.A.V.M.A.*, 122, 73.

(G. A. S.)

Notes and News

XVth International Veterinary Congress:—The Proceedings of the XVth International Veterinary Congress, Aug. 9th to 15th, 1953, can be ordered from the Secretariat of the Congress, c/o Mr. Axel Isaksson, Stockholm 50.

Part I, divided into two volumes, is ready for despatch now, Part II probably within a couple of months.

Part I contains more than 1,200 pages and includes 261 sectional papers covering all branches of veterinary medicine and food hygiene.

Part II will contain the ten plenary lectures delivered during the Congress week, the contributions to the discussions after the sectional reports, the bibliographies of the sectional papers, speeches made at the Congress, data concerning elections, resolutions, etc., and the composition of the Permanent Committee for the International Veterinary Congress and of the national congress committees.

The price of the Proceedings is Sw. kronor 45, including postage and other expenditure. The sum should, if possible, be sent at the same time as the Proceedings are ordered, by cheque direct to the Secretariat of the Congress, c/o Mr. Axel Isaksson, Stockholm 50 or to Inteckningsbanken AB, Stockholm 16 for account of the Congress.

The Organising Committee of the XVth International Veterinary Congress hope that many colleagues, institutions and libraries will be interested in obtaining the Proceedings which, in a nutshell, gives the topic problems of the day within all branches of Veterinary Medicine and Food Hygiene.

First Calves from frozen semen:—Artificial Insemination with semen frozen for storage purposes was first attempted in this country in September 1952; therefore several calves were due in June. Dr. James Pirie of Cedar Rapids was one of the first users. Ten of the first 12 cows bred conceived on the first service and the other 2 on the second service, even though 2 had been considered as problem cows. Several thousand cows in various locations have now been similarly bred. It is evident that semen frozen and stored at a 79°C. is just as potent after sixty days as it is after three days. How long it will retain its potency is not yet known.

One advantage in this method is that, where it is desired, the large quantity of semen which can be stored makes it possible to breed all the cows in one herd with semen from a single bull. *Hoard's Dairyman*, June, 10, 1953.

Jour. A.V.M.A. August 1953.



Sri C. K. Subbu Singh of the Animal Husbandry Department, Madras, who had gone to the United Kingdom for Post graduate studies has returned home after the studies and resumed his duties, greatly benefitted from the tour abroad. He spent six months in the United Kingdom undergoing a post-graduate training in Animal Breeding, Artificial Insemination and problems of Infertility. His headquarters were at the Ministry of Agriculture and Fisheries Cattle Breeding Centre at Reading where he spent the greater part of his time. He also visited all the important Institutions and Stations concerned with his work.

Essay contest:—The Indian Dairy Science Association has organised an Essay Contest open to all *Bona fide* students of dairy, agricultural, veterinary and other educational institutions and research institutes. The subject of the essay is "Application of refrigeration in

improving the Dairy trade in India". The essays should be written in English, not exceeding 3,000 words, and three typed copies must be sent to the Association before 15th January, 1954. Further particulars about the Essay can be obtained from the Hon. Secretaries, Indian Dairy Science Association, Hosur Road, Bangalore 1.

Sri Narayana Kashi Iyer, G.B.V.C. (1910), who retired from the Gwalior State Veterinary Department on the eve of the formation of the Madhya Bharat State, it is reported, has not taken payment of his gratuity and arrears of his T. A. bills which are with the Director of Animal Husbandry and Veterinary Services, Madhya Bharat, Gwalior. He or his legal heirs may claim the amount from the Director with an application duly attested by the District Magistrate.

The Bombay Veterinary Practitioners' Act, 1953*

The following Act was passed by the Bombay Legislative Assembly in its sessions held in August 1953.

WHEREAS it is expedient to provide for the registration of veterinary practitioners in the State of Bombay and for certain other purposes; It is hereby enacted as follows:—

PART I

Introductory.

Short title, extent and commencement.

1. (1) This Act may be called the Bombay Veterinary Practitioners Act, 1953.
- (2) It extends to the whole of the State of Bombay.
- (3) It shall come into force on such date as the State Government may, by notification in the *Official Gazette*, direct.

Definitions.

2. In this Act, unless there is anything repugnant in the subject or context,—
 - (1) "Council" means the Bombay Veterinary Council established under section 3;
 - (2) "prescribed" means prescribed by rules;
 - (3) "President" means the President of the Council;
 - (4) "register" means the register of veterinary practitioners maintained under section 11;
 - (5) "registered veterinary practitioner" means a veterinary practitioner whose name is for the time being entered in the register;
 - (6) "Registrar" means the Registrar appointed under section 9;
 - (7) "Registration Officer" means the Registration Officer appointed under section 12;

* Abstracted from the Bombay Government Gazette wherein the Act was published as L. A. Bill No. LVI of 1953.

- (8) "Regulation" means a regulation made under section 32 (2);
 (9) "Rule" means a rule made under section 32 (1);
 (10) "Schedule" means the Schedule appended to this Act.

PART II

*Bombay Veterinary Council: establishment, constitution, meetings and proceedings.**Establishment and constitution of Council.*

3. (1) The State Government shall, as soon as may be after the preparation of the first register, by notification in the *Official Gazette* establish a Council to be called the Bombay Veterinary Council.

(2) The Council shall consist of the following members, namely:—

- (a) The Director of Veterinary Services, Bombay State, *ex officio*;
 (b) Two members to be elected by registered veterinary practitioners from amongst themselves;
 (c) one member from each university in the State in which provision is made for instruction, teaching or training in veterinary science, to be elected by members of the Senate or the Court of the University, as the case may be, from amongst themselves;
 (d) one member to be elected by the members of the Bombay Legislative Assembly from amongst themselves;
 (e) members not exceeding two in number, if any, to be nominated by the State Government.

(3) The Director of Veterinary Services, Bombay State, shall be the President of the Council.

Nomination of member in default of election.

4. If any of the members is not elected under clause (b) of sub-section (2) of section 3, then the State Government may, notwithstanding anything contained in sub-section (2) of the said section, nominate such member to represent the registered veterinary practitioners and the member so nominated shall for the purposes of the Act be deemed to have been duly elected under clause (b) of sub-section (2) of section 3.

Election of members.

5. The election of the veterinary practitioners under clause (b) of sub-section (2) of section 3 shall be held at such time and place and in such manner as the Council may by regulations provide in this behalf:

Provide that the first election of such members shall be held at such time and place and in such manner as the State Government may, by notification in the *Official Gazette*, determine in this behalf.

Tenure of office.

6. (1) The members of the Council, other than the President, shall hold office for a term of five years from the date of their election or nomination or until their successors have been duly elected or nominated, whichever is longer, and shall be eligible for re-election or re-nomination, as the case may be:

Provided that a member elected under clause (c) or (d) or sub-section (2) of section 3 shall hold office only so long as he is a member of the Senate or the Court of the University or of the Bombay Legislative Assembly, as the case may be.

(2) Any elected or nominated member may at any time resign his appointment by letter addressed to the President. Such resignation shall take effect from the date on which it is received by the President.

(3) If any vacancy occurs in the office of a member of the Council through death, resignation or otherwise previous to the expiry of the period of his office, the vacancy shall be filled in accordance with the provisions of sub-section (2) of section 3, and such person shall hold office for the remainder of the period for which the member in whose place he is appointed was elected or nominated.

(4) (a) Leave of absence may be granted by the Council to any member for a period not exceeding six months.

(b) Except in the case provided for in clause (a), if any member of the Council other than the President shall absent himself from three consecutive ordinary meetings of the Council, the Council may forthwith declare his seat vacant and such declaration shall have the same effect as resignation of his seat by the member concerned.

(5) No act of the Council shall be deemed to be invalid merely by reason of any vacancy in, or defect in the constitution of, the Council or absence of any member on account of leave or otherwise.

Time and place of meeting of Council.

7. The Council shall meet at such time and place and every meeting of the Council shall be summoned in such manner, as may be provided by regulations:

Provided that until such regulations are made, it shall be lawful for the President to summon a meeting of the Council at such time and place as he may deem expedient by letter addressed to each member.

Procedure at meetings of Council

8. (1) The President shall preside at every meeting of the Council. In the absence of the President, the members present shall elect one from amongst themselves to preside.

(2) All questions at a meeting of the Council shall be decided by votes of the majority of the members present at the meeting. Three members shall form a quorum.

(3) At every meeting of the Council, the President for the time being shall, in addition to his vote as a member of the Council, have a second or casting vote in case of an equality of votes.

PART III

Registrar and other officers and servants.

9. The Deputy Director of Veterinary Service, Bombay State, *ex-officio*, or such other officer of the Veterinary Department as the State Government may specify, shall be the Registrar and shall be assisted by such officers and servants in his office as the State Government may determine in this behalf.

Payment of travelling expenses to members.

10. The members of the Council shall be paid travelling expenses at such rates and subject to such conditions as may be approved from time to time by the State Government.

PART IV

*Registration and powers and duties of the Council.**Register.*

11. (1) The State Government shall, as soon as may be, cause to be prepared a register of veterinary practitioners of the State.

(2) The register shall be prepared and thereafter maintained in such form as the State Government may direct. The register shall contain the name, residence and qualification of every person registered under this Act, together with the date on which such qualification was acquired.

Preparation of first register.

12. (1) For the purposes of the preparation of the first register, the State Government may by notification in the *Official Gazette* appoint an officer as the Registration Officer.

(2) The State Government by the same or like notification shall appoint a date on or before which the application for registration shall be made to the Registration Officer.

(3) The Registration Officer shall examine every application received on or before the appointed date, and after making such enquiry in the prescribed manner, if he is satisfied that the applicant is qualified for registration under section 14, shall direct the entry of the name of the applicant in the register.

(4) The register so prepared shall thereafter be published in such manner as the State Government may direct.

Custody and maintenance of register.

13. (1) Upon the constitution of the Council for the first time after the commencement of this Act, the register shall be given into its custody and the State Government shall direct that all or a specified part of the application fee for registration in the first register shall be paid to the credit of the Council. The State Government shall notify in the *Official Gazette* the date on which the register is given in the custody of the Council.

(2) The Registrar shall keep the register correct as far as possible and may from time to time enter therein any material alteration in address or qualification of the registered practitioners. The names of registered practitioners who die or whose names are directed to be removed from the register under section 16 shall be removed from the register.

(3) The State Government may direct that any alteration in the entries as respects additional qualifications shall not be made except on payment of any such fee as may be prescribed by it in that behalf.

Persons entitled to be registered.

14. (1) Subject to the provisions of this Act, every person shall, if he holds any of the qualifications included in the Schedule be entitled on application to be registered, on payment of a fee of Rs. 15 and on giving evidence to the satisfaction of the Registration Officer or the Registrar, as the case may be, of his possession of a qualification entitling him for registration.

(2) The State Government may, after consulting the Registration Officer or the Council, as the case may be, permit the registration of any person who has been actually conducting veterinary practice in the State of Bombay since a date prior to the 1st day of January 1944, notwithstanding the fact that he may not be possessing qualifications entitling him to have his name entered in the register.

(3) Every person for the time being registered with the veterinary Council of any other State in India under any law for the registration of veterinary practitioners Council, be entitled to be registered under this Act, on making an application in that behalf, on payment of a fee of Rs. 15 and on his informing the Registration Officer or the Registrar, as the case may be, of the date of his registration under the said law and on giving a correct description of his qualifications with the dates on which they were granted.

(4) Any person who has been convicted of a cognizable offence as defined in the Code of Criminal Procedure, 1898, or who, being or having been subject to military law, has been convicted under the Army Act or under the Indian Army Act, 1911, or under the Army Act, 1950, of an offence which is also a cognizable offence as so defined, and any person who after due enquiry has been held guilty by the Council of infamous conduct in any professional respect may be refused registration under this Act.

Appeals and erasure of incorrect entries.

15. (1) Any person aggrieved by the decision of the Registration Officer or Registrar regarding the registration of his name or any entry in the register may appeal—

(a) against the decision of the Registration Officer, to the State Government and

(b) against the decision of the Registrar, to the Council.

(2) An appeal—

(a) to the State Government shall be filed within 30 days from the date of publication of the first register under sub-section (4) of section 12 and on payment of a fee of Rs. 5; and

(b) to the Council shall be filed within such period and on payment of such fee, and shall be heard and decided by the Council in such manner as may be provided by regulations.

(3) The State Government in the case of the first register, and in other cases the Council, may on its own motion or on the application of any person after due and proper enquiries and after giving an opportunity to the person concerned of being heard, cancel or alter any entry in the register if in the opinion of the State Government or the Council, as the case may be, such entry was fraudulently made or caused to be made.

Removal from register.

16. The Council may direct that the name of any registered veterinary practitioner who has been convicted of a cognizable offence as defined in the Code of Criminal Procedure, 1898, or who, being or having been subject to military law, has been convicted under the Army Act or under the Indian Army Act, 1911, or under the Army Act, 1950, of an offence which is also a cognizable offence as so defined, or who after due enquiry has been held guilty by the Council of infamous conduct in any professional respect, shall be removed from the register and may direct that any name so removed shall be re-entered.

Renewal fee.

17. (1) Notwithstanding anything contained in section 14 or 21, the Council may direct that a renewal fee of such amount as may be approved by the State Government shall be paid by each veterinary practitioner for the continuance of his name on the register.

(2) Where the renewal fee is not paid before the date fixed by the Council in that behalf, the Registrar shall remove the name of the defaulter from the register.

Provided that the name so removed may be re-entered in the register on payment of the fee in such manner and subject to such conditions as the Council may, by regulations, direct.

Certificates by veterinary practitioners.

18. No certificate required by or under any law for the time being in force from any veterinary practitioner or veterinary officer shall be valid unless the person signing the same shall have been registered under this Act.

Unregistered persons not to hold certain appointments.

19. No person shall, except with the sanction of the State Government, hold any appointment for the performance of veterinary duties in any veterinary dispensary, hospital or infirmary which is not supported entirely by voluntary contributions, or which belongs to a local authority or in any public establishment, body or institution, unless he is registered under this Act.

Notice of death.

20. Every Registrar of Deaths on receiving notice of the death of a registered veterinary practitioner shall forthwith transmit by post to the Registrar a certificate under his own hand of such death with the particulars of time and place of death and may charge the cost of such certificates and transmission as an expense of his office.

Annual list of veterinary practitioners.

21. (1) The Registrar shall, in every year on or before a date to be fixed by the Council, cause to be printed and published a correct list of the names and qualifications of all persons for the time being entered in the register and the dates when such qualifications were acquired, in alphabetical order according to the surnames of the persons registered.

(2) The list of names and qualifications printed and published in pursuance of sub-section (1) shall be evidence in all cases (until the contrary is proved) that the persons therein appearing are duly registered; and the absence of the name of any person from such list shall be evidence (until the contrary is proved) that such person is not registered.

Provided that in the case of any person whose name does not appear in such list a certified copy under the hand of the Registrar of the entry of the name of such person in the register shall be evidence that such person is registered.

Council authorised to call for information and attend examination.

22. The Council shall have authority to call on the governing body or authority of any veterinary college, school or other institution and on any examining body included in or desirous of being included in the Schedule—

(a) to furnish such particulars as the Council shall require of any course of study prescribed or examination held by such body or authority or in such college, school or institution, with reference to the grant of any veterinary qualification, and

(b) to permit any member of the Council deputed by the Council in this behalf to attend and be present at any such examination.

Disposal of fees.

23. All moneys received by the Council as fees under this Act shall be applied for the purposes of this Act in accordance with such rules as may be made in this behalf by the State Government.

PART V.**Offences and Penalties.**

Veterinary practitioners not registered under this Act not to sign or authenticate veterinary certificate, etc.

24. Notwithstanding anything contained in any law for the time being in force, no person other than a person registered under Part IV of this Act—

(a) shall sign or authenticate any veterinary or physical fitness certificate required by any law or rule to be signed or authenticated by a duly qualified veterinary practitioner, or

(b) shall be qualified to give evidence as an expert under section 45 of the Indian Evidence Act, 1872, on any matter relating to veterinary science.

Prohibition against addition of any title, description etc., to name of any person unless authorised to do so.

25. No person shall add to his name any title, description, letters or abbreviations which imply that he holds a degree, diploma, licence or certificate as his qualification to practise any system of veterinary science unless—

(a) he actually holds such degree, diploma, licence or certificate; and

(b) such degree, diploma, licence or certificate is specified in the Schedule or is recognized by law for the time being in force in India or any part thereof or has been conferred, granted or issued by an authority empowered or recognized as competent by the State Government to confer, grant, or issue such degree, diploma, licence or certificate.

Penalty for contravening provisions of section 24 or 25.

26. Whoever contravenes the provisions of section 24 or 25 shall be punished in the case of a first conviction with fine which may extend to two hundred and fifty rupees and in the case of subsequent conviction with fine which may extend to five hundred rupees.

Penalty for falsely claiming to be registered.

27. Whoever falsely pretends to be registered under this Act or not being registered under this Act uses in connection with his name or title any words or letters representing that he is so registered shall, whether any person is actually deceived by such pretence or representation or not, be punished, on conviction, with fine which may extend to three hundred rupees.

Court competent to try offences under this Act.

28. No Court other than the court of a Presidency Magistrate or of a Magistrate of the First Class shall take cognizance of or try an offence under this Act.

PART VI**CONTROL.****Alteration in list of qualifications mentioned in Schedule.**

29. If it shall appear to the State Government on the report of the Council or otherwise, that the course of study and examinations prescribed by any of the colleges or bodies conferring the qualifications described in the Schedule are not such as to secure the possession by persons obtaining such qualifications of the requisite knowledge and skill for the efficient practice of their profession or if it shall appear to the State Government, on the report of the Council or otherwise, that the course of study and examinations prescribed by any college or body conferring a qualification not entered in the Schedule are such as to secure the possession by persons obtaining such qualification of the requisite knowledge and skill for the efficient practice of their profession, it shall be lawful for the State Government from time to time by notification in the *Official Gazette* to direct that the possession of any qualification entered in the Schedule shall not entitle any person to registration under this Act, or to direct that the possession of any qualification not entered in the Schedule shall, subject to the provisions of this Act, entitle a person to be so registered, as the case may be, and the Schedule shall thereupon be deemed for all purposes to be altered accordingly.

Power of State Government to give directions and to appoint authorities in place of those not validly appointed or constituted.

30. (1) The State Government may give to the Council such directions as may be necessary for carrying out the purposes of this Act and it shall be the duty of the Council to comply with such directions. If the Council fails to comply with the directions so given the State Government may direct the carrying out of such

directions and the expenditure incurred in carrying them out shall be paid out of the moneys credited to the Council.

(2) If at any time it shall appear to the State Government that the Council or any other authority has not been validly constituted or appointed under this Act, the State Government may direct that the powers to be exercised or duties or functions to be performed by the Council or such authority shall, notwithstanding anything contained in this Act, be exercised or performed by such officer or authority, in such manner and for such period as it deems fit.

PART VII.

Miscellaneous.

Indemnity to persons acting under this Act.

31. No suit, prosecution or other legal proceeding shall be instituted against any person for anything which is in good faith done or intended to be done under this Act, rules or regulations.

Rules and Regulations.

32. (1) The State Government may, after previous publication, by notification in the *Official Gazette* make rules to carry out the purposes of this Act.

(2) The Council may, with the previous sanction of the State Government, make regulations not inconsistent with this Act or the rules made under sub-section (1) for all or any of the following matters, namely:—

- (a) the time at which and the place and manner in which election of the members of the Council shall be held under section 5;
- (b) the time and place at which the Council shall hold its meeting and the manner in which such meeting shall be summoned under section 7;
- (c) the period within which and the manner in which appeals against the decisions of the Registrar shall be filed and heard and decided by the Council under section 15 and the fee payable with such appeals;
- (d) the manner in which and the conditions subject to which the name of a veterinary practitioner shall be re-entered in the register on payment of renewal fee under section 17.

(3) All regulations shall be published in the *Official Gazette*.

(4) The State Government may by notification in the *Official Gazette* cancel any regulation.

THE SCHEDULE.

(See sections 14, 22 and 29).

1. Bachelor of Science (Veterinary) (Bombay).
2. Bachelor of Veterinary Science (Madras).
3. Bachelor of Veterinary Science (Punjab).
4. Bachelor of Science (Veterinary) (Uttar Pradesh).
5. Bachelor of Science (Veterinary) (Madhya Pradesh).
6. Graduates of Bombay Veterinary College.
7. Graduates of Madras Veterinary College.
8. Graduates of Bengal Veterinary College.
9. Graduates of Punjab Veterinary College.
10. Graduates of Bihar Veterinary College.
11. Members of the Royal College of Veterinary Surgeons, London.
12. Doctors of Veterinary Medicine or Bachelors of Veterinary Science of Universities in countries of the Commonwealth other than the United Kingdom.

13. Doctors of Veterinary Medicine of Universities in the United States of America.

Statement of Objects and Reasons.

It has been represented to Government that certificates granted to graduates of veterinary colleges in India are not recognized by Race Clubs, Breeding Establishments, Insurance Companies, etc., as these graduates are not controlled by any recognized body which would be responsible for their professional conduct; that dispensing chemists can refuse to dispense the prescriptions of these graduates because there are not registered; that the graduates legally speaking, cannot obtain poisonous drugs and such drugs as are controlled by the Excise Department. These are some of the handicaps and disqualifications under which veterinary practitioners are required to work. To overcome them and to provide a statutory organisation representing the veterinary profession that will serve as a liaison body between Government and the veterinary profession and will control and regulate the practice of the profession and the conduct of its members and thus uphold the status and dignity of the profession, the enactment of the Bombay Veterinary Practitioners Act is proposed.

Clinical Articles

TUBERCULOSIS IN A CHEETAH: THE USE OF ANTIBIOTICS AND MODERN CHEMOTHERAPEUTIC AGENTS*

By

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The following case record is that of a carnivore usually found in a zoological collection.

The writer feels that this case is worth recording on the grounds that, in sick wild animals in captivity, it is always desirable, for obvious reasons, to attempt oral treatment. Hence, in a case of tuberculosis in which the usual therapy involves the use of injections at regular intervals, say, of streptomycin, it is interesting to note the success of oral therapy using *iso*-nicotyl-hydrazide (I. N. H.) and *para* aminosalicylic acid (P. A. S.). This cheetah was selected because it was typical, and also because both routes of administration had been employed.

A head keeper reported that, on February 19th, 1952, one of his charges, "Faduma", a female cheetah aged 17 months, was ill-significantly so, in view of the fact that her cage-mate, a male cheetah, had died some months previously from generalised tuberculosis. Initial examination showed the animal to be weak, off her food, dehydrated, with a distended abdomen and showing respiratory distress. Mucous

**Vet. Rec.* 65. 453.

membranes were quite heavily jaundiced, and the animal presented a bad clinical picture.

In view of the possible tuberculosis infection from the food, as well as of contact with her previous companion, and from the clinical picture, a tentative diagnosis of tuberculosis of the liver was made. Palpation of that organ elicited tenderness and revealed swelling and bulging beyond the costal arch. For her age, the cheetah was reasonably quiet but would not allow her temperature to be taken without struggling and heavy restraint, accordingly, owing to the fact that this would both distress the patient and distort the reading, the attempt was discontinued. A dung sample was collected and sent to the Society's laboratory for examination; it revealed, after antiformin, several nests of acid-fast bacilli. Respirations were found to be 38 p.m. as against a normal 24 in another cheetah.

Following the work of various medical authorities, the use of streptomycin in this case was thought desirable: advice was sought, and it was decided that a combination of streptomycin, P.A.S. granules and Sterogyl-15 oral might prove useful, since this seemed to be beneficial in human cases (Jacquelin, *et al.*, 1942; Stobbaerts, 1950; Fielding and Maloney, 1951; Huriez, 1951; Guillemin, *et al.*, 1951). Therefore streptomycin, 0.5 g., was given twice daily by intramuscular injection, together with 16 grammes of P.A.S. granules on the food, and one ampoule of Sterogyl-15 orally weekly for two weeks, then one ampoule fortnightly for one month. This treatment was commenced while the animal was in her own den; after two days, however, it was realised that her intolerance of manual restraint was rapidly increasing and, in view of the fact that one keeper already had been bitten during the course of treatment, it was decided to remove the patient to the sanatorium. Daily treatments were continued and 10 days later (27-2-52) a slight improvement in the animal's condition was noted; appetite returned enabling the P.A.S. granules to be more readily administered on meat. Meanwhile, liver injections were given daily. Improvement was maintained, and after another 10 days (8-3-52) streptomycin was withdrawn, but oral administration of P.A.S. and Sterogyl-15 was continued. A fortnight later (24-3-52) a further course of streptomycin was commenced and continued for a fortnight (until 12-4-52), when the clinical picture was so improved that all medication other than tonics was stopped, "Hepovite" being administered on the food daily. The animal went back on exhibition shortly afterwards, final laboratory tests having indicated no open infection.

The same cheetah was reported sick by the head keeper on December 9th, eight months after returning to the house and having remained clinically very fit and increased in size and bodyweight during

this period. Upon examination, the animal was found to be depressed and weak, with a degree of abdominal distension less than that of her previous illness. There was no jaundice, but any effort induced bouts of soft sibilant coughing which seemed typical of a pulmonary tuberculosis infection. Her respiration rate was about 120 p.m. It is not intended at this point to digress into a discussion over whether this suspected infection was related to a previous one or not. Faecal examination revealed acidfast bacilli. In view of the fact that the animal was no longer trustworthy, she was immediately removed to the Sanatorium, and, because of the difficulties of carrying out a lengthy course of treatment involving the use of injections, it was decided to attempt the oral administration of I.N.H. plus P.A.S. only. This method is new, but has already been referred to by the Medical Research Council (Report, 1952); it has also been used on the Continent (Aitoff, 1952) and in the United States (Thomson, 1952), where a compound tablet is manufactured.

Six grammes of P.A.S., plus 150 mg. of I.N.H. were administered daily on the food. This proved satisfactory until 10 days later (19-12-52), when the patient ceased feeding. Coercion was tried, but only produced severe distress. Injection of streptomycin was therefore again considered, but was decided to be impracticable. The condition of the beast deteriorated rapidly, and, by the turn of the year, she presented an emaciated picture, and was barely able to stand. During this period she had two bouts of diarrhoea which seemed to be dysenteric plus an ascarid infection, and distinct from the presence of tubercle bacilli. After a fortnight (4-1-53) the animal commenced feeding, and immediately I.N.H. and P.A.S. were administered again in the food. Within four days (8-1-53) the bowel disorders appeared to have disappeared and thereafter recovery was uninterrupted until nearly three months later (20-4-53), when, after negative bacteriological findings the animal was put back on exhibition.

Ungulates, known to be tuberculous, are under similar treatment by the writer, who hopes to report results at a later date.

Acknowledgment

My thanks are due to Roussel Laboratories, Ltd., for generous supply of Sterogyl, I.N.H. and P.A.S., and particularly to Dr. A.E. Greameaux for helpful advice.

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TREATMENT OF HAEMORRHAGIC SEPTICAEMIA

By

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An article contributed by Mr. Ruhai Ameen, had appeared in the *Indian Veterinary Journal*, Vol. XXX, No. 1 of July 1953 on "Haemorrhagic Septicaemia in East Bengal and its incidence and treatment" wherein the author says that Sulphamezathine 33½% solution (I.C.I.) is more or less specific for treatment of H. S. in cattle. This article prompts me to record my experiences in the treatment of these cases of H.S.

My method of treatment is to inject Seclophen (Procaine Penicillin with crystalline Penicillin G) 4 to 20 lakhs and follow it up with Sulphatriad tablets 5 to 10 T.D.

For cases up to 2 years of age, 4 lakhs of Seclophen are enough and 5 tablets of Sulphatriad T.D. for only one day.

For adult bullocks, 8 to 10 lakhs of Seclophen and 5 to 10 tablets of Sulphatriad T.D. according to their size. For buffaloes, 8 to 20 lakhs of Seclophen with 10 tablets of Sulphatriad T.D. If necessary, the tablets may be repeated for a second day.

In advanced cases when respiration becomes much distressed and the patient is not fit to be drenched safely, the only course left is to inject "Procaine Penicillin" in the above doses till respiratory symptoms subside, and then give the Sulphatriad tablets. But, in early stages, where the patient is able to swallow without difficulty, Sulphatriad tablets are administered either by drench or electuary thrice daily along with penicillin. The animal gets cured in 24 hours and it is rarely necessary to repeat treatment.

In addition to the above treatment, I had also applied warm mustard paste over throat region thrice on the same day in almost all such cases.

I have treated 3 buffaloes and 30 bullocks of various sizes and with complete success by this method which in my opinion is easier to administer and less costly to the owners of the animals.

PANTING IN CATTLE—A SUGGESTED TREATMENT

By

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The economical loss due to the incidence of Foot and Mouth in India is estimated at crores of rupees every year, in spite of the fact that the mortality rate from the disease is not even 2 per cent in adult cattle and not more than 3 per cent in young ones. It is because the affection has very great deleterious effect on the animals.

The working bullock becomes emaciated and incapacitated for work; the pregnant cow aborts or, if it be a milch cow, it becomes dry or sometimes develops mastitis. The severest and worst sequel, however, is that a recovered animal may develop a "tanned" coat with the grey hairs becoming a slowly dark brown in colour. Such animals develop panting and dyspnoea and start foaming at the mouth even if they walk a short distance in the sun. Though experts estimate that this kind of dreadful consequence occurs in affected animals to the advent of only 2 to 3 per cent, a veterinarian in the field is likely to meet with a fairly large number of such animals.

These panting cases defy treatment.

Most of the research workers found that panting is caused by the upset of heat regulation centre consequent on dysfunction of pituitary, thyroid and adrenal glands, and they suggested the treatment of "panthers" with thyroid extract and the whole thyroid gland, if possible.

Having this in mind, I treated three cases of 'panting' in bullocks at Chinnadharapuram with thyroid extract tablets. Each animal was given ten tablet (10 mgm each) of this preparation daily and treatment was continued for twenty days. Some improvement could be noticed in 'panting', the treated animals not showing much of dyspnoea in the sun but the "tanned coat" condition did not improve at all. The owners dissatisfied with the slow progress of treatment stopped away their animals from further treatment.

One year afterwards I had an opportunity for treating five such cases at Uppidamangalam. This time I decided to treat these cases with parenteral injection of thyroid extract. Since such an injectable form of thyroid extract is not available in the market, I used "Thyroxine Sodium" tablets (10 mgm.), a Glaxo product, for preparing the injections with distilled water. Twenty five tablets of this preparation when powdered and boiled in 20 c.c. of distilled water, make a yellow coloured uniform suspension. This was given subcutaneously to each animal. Four such injections were given at an interval of one week, each time with freshly prepared solutions. Improvement could be

noticed even after the first injection in the "panting" condition. After the full course of treatment, the treated animals did not show signs of dyspnoea at all when worked in the sun. One animal which was just developing "tanned coat" after a recent attack of Foot and Mouth disease responded to the treatment well and the changing coat regained its original colour and the animal looked normally. In the other four animals the dark brown hairs had fallen here and there and normal hairs had grown in their place but the general improvement in the "tanned coat" condition was not much. This was probably because a year had elapsed since the attack and probably the derangement of the heat regulating mechanism was complete in these animals. The site of injection when seen after a week was normal and did not show any induration or swelling.

Summary

Three cases of 'panting' in cattle were tried with thyroid extract tablets orally and only a slight improvement could be noticed. Five cases were tried with subcutaneous injections of Thyroxine Sodium (Glaxo) tablets dissolved in distilled water and all the cases got cured of the affection.

Conclusion

From the above, the value of Thyroxine in the treatment of "panting" in cattle can be said to be promising. Probably if this preparation is given to the affected animals in the course of an outbreak, much of the serious consequences like loss of milk yield, panting, tanned coat and loss of working capacity etc., may be averted. It appears worth trying.

I am deeply indebted to Dr. D. Neelakanta Iyer, G.M.V.C., the then District Veterinary Officer, Tiruchirapalli, for his inspiring guidance. My thanks are due to Dr. P. Satyendra Rao, B.V.Sc., for his kind permission to publish this article.

A PECULIAR OUTBREAK OF HAEMORRHAGIC SEPTICAEMIA IN CATTLE

Symptoms akin to Rabies

By

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On the 27th July '53, I attended an out-break report of cattle disease in the village Akalpa, Jaoli Taluka, Satara-North Ot. The out-break started on 14th July '53 and by 28th July '53, 8 cattle and 2 buffaloes were affected with the disease. At the time of my visit,

there were four affected cases. The symptoms reported, heard and seen in affected cases were as follows:—

First day: The animal was a little bit uneasy and slightly dull but feeding normally. Second and third day, partially off feed, increased dullness and bowels costive. On the fourth day, the animal becomes furious and goes completely off feed with profuse salivation, drinks no water, eats mud, tries to bite or horn any body or any object. From 4th to 8th day, no passing of dung or urine, continuation of profuse salivation, goes on rapidly loosing condition and dies on the 8th or 9th day. All the animals that were affected with the disease showed exactly the same set of symptoms detailed above. It was reported and heard and seen that there was no swelling of any kind on any part of the animal that died of the disease. Blood smears from the tip of the ear were negative for any organisms. Heart-blood and brain were obtained for examination. Heart-blood which was sent for biological-test to the Bombay Veterinary College proved positive for Haemorrhagic Septicaemia. Brain-pieces which were sent for examination to the Haffkin-Institute, Bombay, proved negative for Rabies. Sample of dung, on examination, showed the presence of *oesophagostomum radiatum* and *strongyloides pappillosus*.

The above outbreak of Haemorrhagic septicaemia is interesting as the symptoms exhibited by the animals were akin to rabies and hence is thought worth recording.

Correspondence

[The views and opinions expressed in correspondence are those of the writers themselves. Ed. I.V.J.]

Recognition of Veterinary College, Osmania University by the
Royal College of Veterinary Surgeons, London.

Sir,

I request you to be kind enough to give publicity to the following information recognising the Osmania University Degree of B.V.Sc. for exemption of studies for the M.R.C.V.S. of the United Kingdom:—

I am directed to inform you that the Royal College of Veterinary Surgeons, London, has recognised the Veterinary College of Osmania University for the purpose of concessions which are granted to Veterinary graduates for the admission to the Diploma Course in M.R.C.V.S. Therefore, from now onwards graduates in Veterinary Science of the

Osmania University will be permitted to take the Diploma of M.R.C.V.S. together with an examination in the other subject, after a minimum attendance of two years at an affiliated veterinary school or a school of a University, just as the other veterinary graduates of the Universities of Madras, Punjab (Lahore), Bombay, Agra (U. P).

Yours faithfully,

K. S. NAIR,

Dean, Faculty of Veterinary Science,
Osmania University,
Hyderabad Dn.

'LOREXANE' IN SARCOPTIC MANGE IN BUFFALOES

With reference to the article published in Vol. XXX, 1, 65-66 (July 1953), we note that four applications at intervals of two days of a 1 in 50 solution of the 5% Miscible Oil (=0.1% gamma isomer of benzene hexachloride) were successful in twelve cases at a cost of about one rupee each. The total duration of treatment was therefore 18 days. This frequency of application was stated to be necessary because "clients expect their patients to be treated daily and expect quick improvement, if not cure within the shortest possible time".

We recommend one thorough application after cleansing the skin of debris, repeated if necessary two weeks later, a total duration of treatment of 14 days, at half the previous cost. More frequent applications, though perhaps pacifying the owner, will not give a quicker cure, and in fact the routine used took four days longer than necessary.

Light infestations are usually cured by one thorough application, though chronic cases, with gross thickening of the skin often require two treatments as recommended. The high persistence and deep penetration of the gamma-BHC in this formulation guarantees acaricidal activity for at least 14 days in the tropics. In temperate climates the activity persists for three weeks.

It will be seen, therefore, that 'Lorexane' Miscible Oil 5% diluted 1 in 50 of water, in addition to being most effective, is far cheaper than the oily dressings formerly used. It is also free from the danger of blistering so often seen in animals exposed to sunlight after oily dressing.

Calcutta }
16-11-53 }

G. V. SHORT, M.R.C.V.S.,
For I.C.I. (India) Ltd.

College News

MADRAS VETERINARY COLLEGE GOLDEN JUBILEE

Members of the profession and the past and present *alumni* of the Madras Veterinary College are informed that this institution completes fifty years of existence this year and that it is proposed to celebrate the Golden Jubilee in a fitting manner in August 1954. Further details of the celebrations will be released in the next issue of this Journal, but suggestions are welcome from those interested and desirous of helping.

I. M. AZIZUDDIN,

Principal,

and

President, Madras Veterinary College
Association.

Madras Veterinary College, }
Vepery, Madras, }
19th October 1953.

Reviews

Zebu Cattle of India and Pakistan.—F.A.O. publication, March 1953.

This is a commendable publication of the cattle wealth of this great sub-continent. It is no doubt a mere "assembling" of already available information but what makes it of particular value is the information furnished on the environmental factors under which each breed thrives and has its being. These facts are no doubt partly determined by Nature and partly by the economic condition of the people in each tract; but their wide range furnishes much interesting data.

The information under Topography, soil, climate, vegetation, management practices, performance in the native tract and in other areas and sources of getting the necessary breeding stock, etc., should prove very helpful for Livestock Development workers in several countries. The publication is a veritable "Ready-reckoner" on the cattle wealth of this land, which should be in the hands of every good livestock worker here and elsewhere.

We wish the Indian Council of Agricultural Research brings out a similar exclusive publication of the buffaloes of this land. (T.V.M.)

Annual Report of the Veterinary and Animal Husbandry Services, Madhya Bharat, for the year 1949-50.

The most important feature of the year under report, writes Mr. H.K. Mehra, the Director of Veterinary and Animal Husbandry Services of the Madhya Bharat Government, has been the co-ordination

and consolidation of the Department under the new integration. Previous to this, he goes on, each unit of the Covenanted States was working independently while the Director was busy in collecting and compiling first-hand information by visiting these States personally. Under the new scheme, the State has 3 divisions each under a Deputy Director with 6 to 8 districts for supervision. Each district or sub division was supervised by a District Veterinary Officer with 5 to 10 Tahsil and Tappa dispensaries under him. These dispensaries were in charge of Salihotris (Stockmen). There were 29 hospitals and 149 dispensaries in the State during the year under report. In addition to the abovementioned administrative and executive set-up, the following new sections were organised for epidemic control and development of livestock work. Vaccine and Research Institute, Livestock Development, Goshala development, Veterinary Training School, and Propaganda. Over 4 lakhs of animals have been treated for non-contagious diseases. 44349 castrations have been done and 3,38,935 G.T.V. inoculations have been performed against Rinderpest. Substantial progress has been made in the Research and Biological section and improvements have been effected in the preparation of the vaccines. The other sections have also done good work and it is seen that while the requirements of the stud bulls for the State were 18,010, the shortage was as much as 17,971. This means there are very few stud bulls available in the State and it will require tremendous work to make up this deficit. Artificial Insemination Centres may help to remedy this defect to a certain extent.

Propaganda about veterinary activities must be an essential item in the programme of activities of Veterinary Departments and it is gratifying to note that this is being done in this State through a special propaganda section. This is a sure means of educating the people in livestock matters and enable them to take a live interest in that work.

Now that the Department has been stabilised under the new integration, it is hoped that the good work that has been started will be improved in years to come.

Administration Report of the Animal Husbandry Department Government of Travancore-Cochin, for the year 1951-52.

"This State has been suffering very badly since years past for want of the required technical staff. This has, to a very great extent, stood in the rapid progress and development of the Department in all directions. In spite of the manifold difficulties, the staff of the department strived hard to fulfill the duty and task imposed on them successfully with diligence and hope". In these words the Director of

Animal Husbandry of this State (Sri V.K. Madhava Menon) concludes his very interesting record of the work done during the year 1st April 1951 to 31st March 1952. This is indeed a great pity and it is to be hoped that this defect in the adequacy of trained staff is being vigorously rectified. In recording this report, the Government of Travancore-Cochin make the following observations.—

On the whole 35 veterinary hospitals (including the S.P.C.A. Hospital, Trivandrum, the management of which was taken over by the Government during the period under review), 22 Dispensaries and 11 Stockmen stations continued to function during the period. About 148,559 cases were treated in these institutions and 5,034 operations conducted. The number of inpatients admitted in these institutions came up to 551.

The work in the veterinary hospitals was attended to by the Veterinary Surgeons and Veterinary Inspectors. They also supervised and directed the work carried on in the dispensaries and Stockmen stations. In addition to their normal work the Veterinary Officers attended to other duties such as ante-mortem examination of animals intended for slaughter for human consumption, free anti-rabic treatment of agricultural livestock, issue of permit for slaughtering animals, meat inspection in non-municipal areas, periodical inspection of bulls issued to the public under the grant-in-aid system, control of epidemics and attending to the elephants of the Devaswom Board and Forest Department. The Livestock Department Officers conducted propaganda work on scientific breeding, feeding and management of cattle, poultry, etc., cultivation of fodder, the methods of preparing silage, the advantages of grading up local cattle with good breeds of bulls, etc. In the Trivandrum city itself 10 bulls and 2 bucks were stationed for stud purposes. 773 cows and 112 goats were served by them and the results were satisfactory.

The control of diseases was effected efficiently and satisfactorily. Among the contagious diseases which appeared in the various parts of the State and which were treated successfully Anthrax, Black-quarter, Haemorrhagic Septicaemia, Foot and Mouth disease among cattle and Ranikhet disease among poultry were the most important. For the effective prevention of further spreading of these diseases, Sera and vaccine were got down from the Serum Institute, Bangalore, Indian Veterinary Research Institute, Izatnagar and Veterinary College, Madras. For the Ranikhet disease among poultry, vaccination was resorted to on a mass scale and about 5700 birds were vaccinated. The Research Officer, Veterinary Diagnostic Laboratory, concentrated his attention on problems relating to control of contagious diseases among

cattle and poultry by experimenting on specimens from infected animals.

The department is maintaining a livestock farm at Ollukara, Trichur and the farm continued to be under the charge of a veterinary surgeon. The milk produced was distributed to the Government institutions and the public in Trichur. The young ones born in the livestock farm were reared under natural conditions in Calf Rearing Station, Nelliampathies. The department is also maintaining a poultry unit at Petta where hatching of eggs the White Leghorn and Rhode Islands are being supplied to the public.

With a view to improve the conditions of livestock in the State many development schemes were undertaken. They were mainly.—

1. Pilot Key Village scheme
2. Poultry development scheme
3. Key Farm centres,
4. Disease investigation scheme,
5. Goat Improvement scheme.

The object of the Disease Investigation Scheme which has to be started is to conduct a detailed survey of common contagious diseases prevalent and to study the effect of different types of vaccine and serum under field conditions, the use of spore vaccine in epidemic areas and to assess the extent and kind of certain Helminthic infections.

The total expenditure of the Department for the period was Rs. 3,83,656 and receipts Rs. 50,414.

The working the department during the period under review was satisfactory.

ERRATA

1. In the article published in *I.V.J.* Vol. XXX. No. 2, on pages 124-31, read *B. bubalis* for *Bos. bubalis*.
2. In the article "Vasectomy in Bulls", published in *I.V.J.* Vol. XXX. No. 1., the author's name should read M. M. Rao instead of H. M. Rao as printed.
3. On page 72 of the same issue under the heading Weight of bulls, the maximum weight has been misprinted as 7000 lbs. instead of 700 lbs.



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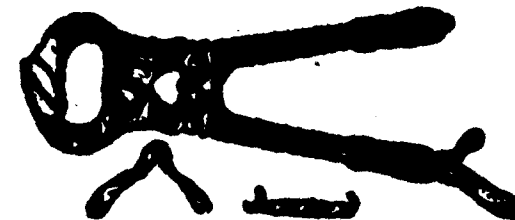
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Printed by T. Kannabiran, at The Paramount Press, (Proprietors: Jaya & Co.) High Road, Triplicane and published by Dr. P. Srinivasa Rao, C.M.V.C., Editor, The Indian Veterinary Journal, 26, Wallajah Road, Madras 2