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PUBLISHED BI-MONTHLY

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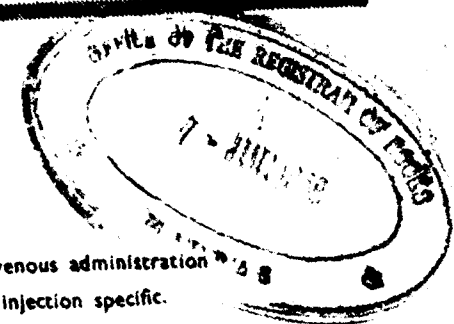
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(Forman, C. R. (1946) *J. Amer. Vet. Med. Ass.*, 109, 126

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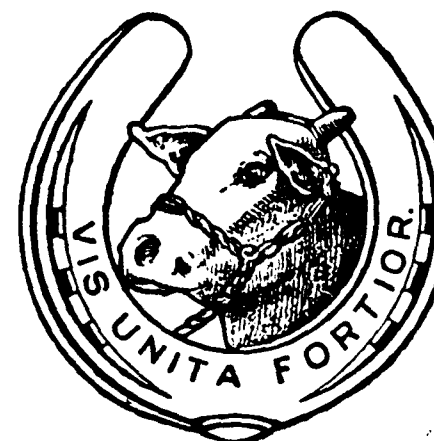
No. 5

THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION]

PUBLISHED ON ALTERNATE MONTHS

A BI-MONTHLY
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(ESTD. 1924)

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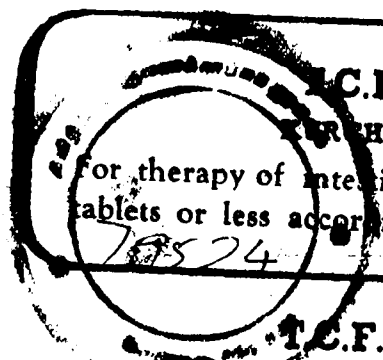
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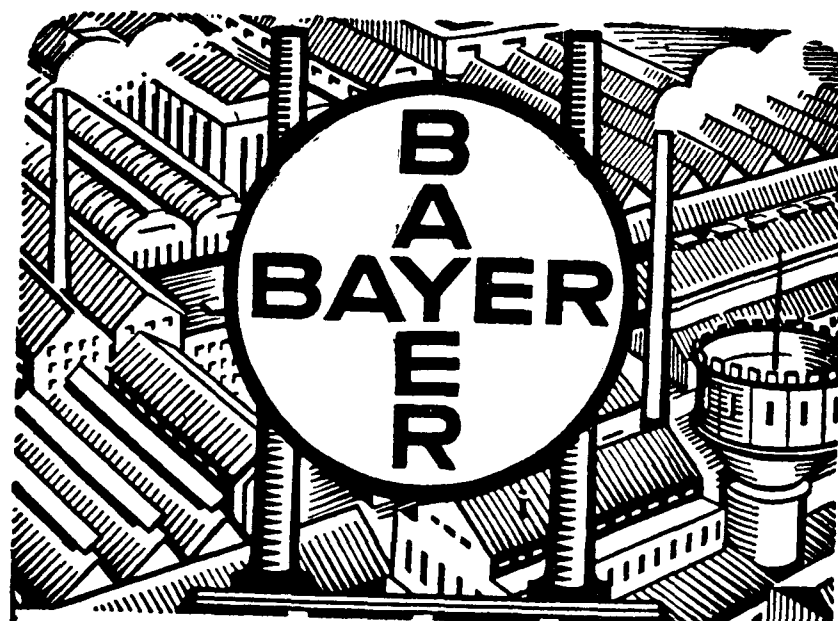
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Vol. XXVIII

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No. 5

General Articles

SPORULATION AND VIABILITY OF *B. ANTHRACIS* IN RELATION TO ENVIRONMENTAL TEMPERATURE AND HUMIDITY*

By

F. C. MINETT,

Indian Veterinary Research Institute, Mukteswar.

INTRODUCTION

In India the problem of anthrax and its control remains as important as it has been for years. The matter of course concerns not India alone but all countries to which raw products of her animal industry are sent. Although at the present time a good deal of reliance is placed on vaccination, every step ought to be taken to prevent contact between the parasite and susceptible animals, and for this knowledge of the natural history of the parasite should be as clear as possible. Previously (Minett and Dhanda, 1941), one particular aspect had been considered, namely, the old hypothesis that the bacillus might find suitable conditions for multiplication in the outer world in soil and in water. Our experiments gave no support to this suggestion, but bearing in mind conditions in India, there seemed to be scope for further observations, now reported, in which emphasis would be laid on temperature and humidity relationships as affecting (a) the viability of the bacillus in the wet or dry state; (b) sporulation, the property around which centres the viability of the organism in nature. It is necessary to test the organism's power of survival when sporulation is prevented by desiccation, unfavourable temperature or other factors, since should conditions later become favourable, sporulation will occur. Moreover, as long as the bacillus remains alive, there is a risk of dissemination of the disease by various agencies, such as insects and carrion-feeders.

* The Journal of Comparative Pathology and Therapeutics, Vol. 60, No. 3, July, 1950.

METHODS

For most of the work the anthrax strain used, which was the same as in the previous soil experiments, was an old laboratory strain, still tolerably virulent, which had been isolated from an elephant. In a number of cases tests were made with five strains isolated in France between 1940 and 1945, three from cattle and two from sheep. For the various tests, unless otherwise stated, "diluted anthrax blood" was used; that is, blood from an animal taken as soon as possible after death from anthrax, was diluted with fresh citrated blood, usually from a sheep, such that in tenfold serial dilutions of the mixture 1 c.c. 10^{-4} plated in agar gave some 200 to 400 colonies. At intervals as necessary, the blood under test was taken up in saline and similarly plated, the examination for spores being made from the first dilution after it had been heated at 60° C. for 30 minutes. Doubtful colonies were frequently checked by inoculating mice. A preliminary experiment suggested that for demonstrating spores subjected to this moderate degree of heating a plain agar medium was as good as agar containing 2.5 per cent ox blood or agar containing 1 per cent. sheep serum and 2 per cent. glucose. Nevertheless, the agar used was occasionally unsatisfactory in that it exhibited a break effect, a certain dilution giving large numbers of anthrax colonies and the succeeding dilution no growth. Partly for this reason, too much attention has not been paid to actual counts.

SPORULATION OF THE ANTHRAX BACILLUS

Sporulation under laboratory conditions

Towards the beginning of the century the conditions in which sporulation occurs received much attention. The following statement summarises much of the early information available as to the time required for spore formation at different temperatures. Temperature, of course, although a most important factor, is not the only one.

Author.	Temp. (F.)	Time (hours)	Material and method.
Koch (1876)	...	95	Anthrax spleen; micro
		86	
		64-68	
Stephanidis (1899)	...	98	Agar cult.; micro.
Weil (1899)	...	98-88	Blood; cult. test.
		75	
		64	
Jacobsthal and Pfersdorff (1901)	...	98	Blood; cult. test.
		72	
		61	
Preis (1904)	...	98	Agar cult; micro.

*Not indicated as shortest time.

Koch's classical observations were made on unstained preparations of the tissue suspended in a suitable fluid, such as ox serum, on slides in a moist chamber. Below 64°F sporulation was exceptional. Weil sealed a mixture of anthrax blood and broth in pipettes; after they had been exposed at the various temperatures they were heated to destroy vegetative organisms, and the contents of the pipettes were then seeded to broth at 98°F. Jacobsthal and Pfersdorff added the blood to blocks of gypsum soaked in warm broth, and then tested for spores by heating and sowing in agar.

Migula (1897) refers to experiments with five anthrax strains which had been maintained for some time in the laboratory. At lower ranges of temperature (64° to 75°F.) some of these strains sporulated more slowly than others; at 61° F., after 96 hours, three of the strains showed no spores and two a few only. Migula's results were presumably based on microscopical examination, and it is also questionable how far they would apply to freshly isolated strains.

It was decided to test the rate of sporulation of the anthrax strains available at Mukteswar in the light of these early observations, firstly under appropriate laboratory conditions and next under conditions intended to simulate the natural.

Sporulation in a thin layer of liquid medium.—Two or three drops of citrated blood from a guinea-pig or mouse shortly after death were transferred to 50 c.c. sterile saline containing 1 per cent heated ox serum. The medium was held in a 250 c.c. conical flask so as to form a layer not more than 1 cm. deep. It was usually warmed to the temperature required before the blood was added and the flask was frequently shaken to promote aeration of the medium. The temperatures usually selected were 90°F. and laboratory temperature ($\pm 70^\circ\text{F.}$), while in some experiments a control flask was kept in the cold ($\pm 6^\circ\text{C.}$). Samples for test were taken after eight to ten, 24 and 48 hours, sometimes later, and plated out before and after heating at 60°C. From a number of experiments it was clear that at 90° F. a small proportion of the bacilli had reached the heat-resistant stage of sporulation within eight hours, while at 70°F. sporulation was first evident after 24 hours. At both temperatures with continued incubation more and more organisms formed spores, so that in general by 24 to 48 hours at 90°F., and a day or two later at 70°F. great numbers of spores were present. There was some multiplication of the bacilli, especially at 90°F., and no doubt some germination of spores also. Owing to the errors involved, no attempt was made to construct curves showing the numbers of spores in relation to the total number of organisms.

In flasks, which shortly after seeding were placed in the cold, the viable count dropped very considerably within the first two or three days

and was negative within ten to 23 days. In two experiments the flasks were kept between 55° and 60°F. In one of these the viable count was very low after 90 days and negative after 121 days; in the other it was practically negative after 55 days. No spores were formed in either case.

The above experiments were carried out with the elephant strain of anthrax. The five French strains were examined later. Among these there seemed to be variations in the capacity of sporulation, though in all cases some bacilli had completed the process within 10 hours at 90°F. This variation appeared to be connected with the particular experiment and not with any intrinsic character of individual strains. There was no evidence that the variation was due to storage of the blood for some hours at $\pm 60^\circ\text{F}$., which was sometimes necessary when the blood-producing animal died at an inconvenient time.

Sporulation in thin layers of blood exposed to air at various temperatures and humidities.—In nature, blood from an anthrax carcass may be splashed or split. The bacilli contained therein may then encounter environmental conditions varying in respect of atmosphere and humidity, thickness of the blood layer formed, and the kind of surface on which the blood comes to rest. To study the atmospheric conditions, diluted anthrax blood was spread on microscope slides and exposed at various temperatures from 98° to 70°F., and at relative humidities varying from 100 to 20 per cent. The amount of blood was generally 12 "drops" (about 0.35 c.c.), spread over a surface 2.5 cm. square, this area being demarcated by transverse strips of plasticine. The layer of blood was such that at 90°F drying occupied from, say, four to 20 hours at relative humidities ranging from 20 to 80 per cent. while at 100 per cent. humidity the blood remained wet for at least 48 hours. The slides for receiving the blood were set up in containers (desiccators or mouse jars) of 2.2 to 3.2 litre capacity, the humidities required being obtained with sulphuric acid-water mixtures, as follows:—

R. H. per cent.	...	20	40	60	70	80	90
Acid per cent. (by weight).	...	57.7	48.0	38.6	33.7	27.1	16.4
S. G.	...	1.486	1.38	1.295	1.23	1.19	1.125

These are roughly the amounts of acid required for relative humidities at 93°F., but for convenience the same mixtures were used for all temperatures between 70° and 98°F. (A convenient formula for the acid-water mixtures is also given by Buxton and Mellanby, 1934).

At intervals, between eight and 48 hours or more, the blood on the slide to be examined was thoroughly dispersed in 10 c.c. normal saline and titrated for bacilli and spores. To obtain closely reproducible results, it appears necessary that the containers should be of the same size and shape,

that the surface area of the acid mixture should be constant and that the slides should be maintained quite level. There is also the difficulty that, after the atmosphere in the jars has been brought to the humidity required, the jars have to be opened for distributing the blood and for removing slides for examination. In the absence of special apparatus, these difficulties were dealt with as far as possible, and at times an experiment had to be repeated using a smaller or larger amount of blood. From an analysis of the results of eleven experiments, of which it is unnecessary to give details but which involved all six anthrax strains, it was concluded that, unless the blood has dried before the times stated, sporulation may be expected to occur at 98°F. by eight hours, at 90°F. by ten hours, at 79°F. by 18 hours and at 70°F. by 24 hours. Sporulation does not occur much below 70°F. With the same acid mixture the rate of drying of course increases as the temperature rises. The statement of times just given may be considered in relation to the following estimate of the rate of drying (hours) of blood of uniform thickness, at the various temperatures and humidities:—

R.H./T.	98°F.	90°F.	79°F.	70°F.
100	Over 48			
80	13 (7)	15 (8)	22 (3)	33 (8)
60	10 (7)	10 (7)	17 (3)	24 (7)
40	5 (5)	6 (8)	7 (1)	11 (8)
20	4 (1)	4 (1)	8 (1)	8 (1)

(Number of observations in brackets.)

Thus, for instance, in seven observations the average rate of drying in air at 98°F. and 80 per cent. R. H., was 13 hours. According to the figures, in *still* air sporulation is unlikely to occur at any temperature when the relative humidity is below 60 per cent. It was also noted that bacilli which have survived drying can sporulate later when wetted and put at a suitable temperature. (See also Bongert, 1904a).

Sporulation in exposed body tissues

The common statement that it is dangerous to lacerate anthrax carcasses, while administratively sound, requires some amplification. It is certainly dangerous to do so when the air temperature is much above 70°F. If the temperature is much below 70°F. anthrax bacilli are unable to sporulate, they disintegrate more or less speedily, and are liable to be overgrown by contaminants. In fact, in blood which is fully exposed to natural contamination there is a race between sporulation and putrefaction, and the outcome depends at least in part on the prevailing air temperature.

The following observations were made on the effect of different air temperatures. At the time of sampling, the material to be examined

was taken up on a cover slip, both sides of which were brought lightly in contact with the surface under test.

Experiment 1.—The livers were removed from two guinea-pigs dead of anthrax, and suspended in beakers over water at 90°F. or at 70°F. At 90°F. sporulation occurred on the exposed surface of the liver within 24 hours; at 70°F. from the 48th hour only.

Experiment 2.—A goat just dead of anthrax had its neck skin cut and the jugular vein punctured. The prevailing air temperature was 66° to 71°F. Anthrax bacilli, but no spores, were present in the neck blood, when examined 24 hours later. Examination after 68 hours showed contaminants only. Incidentally, a pure culture of anthrax was obtained from the skin of this goat after five days, by which time the carcase was quite putrid.

Experiment 3.—A goat dead of anthrax was treated as in the last experiment. Some blood was collected in a watch glass which was enclosed in a petri dish; in addition, 15 drops of the blood were spread on each of the four slides, of which two were exposed and two covered in petri dish. The watch glass and slides were left by the carcase, which was kept in a small shed in air, the recorded temperature of which just above the carcase ranged from 62° to 66°F. (mean during week, 63.4°F). The results were as follows: on the neck wound anthrax bacilli were numerous at first, but by 101 hours they could not be recovered in culture. Spores were not encountered up to the last examination at 129 hours. On the exposed slide the blood had become sticky after 30 hours, but no spores were present up to 57 hours. On the covered slide an examination after 129 hours, when the blood was still quite wet, showed great numbers of spores. In the blood in the watch glass a few spores were present after 78 hours and these increased in numbers up to 129 hours.

Experiment 4.—In this and the next two experiments, animals were examined in pairs in an attempt to show more clearly the effect of differences in air temperature. Two guinea-pigs shortly after death from anthrax had the neck skin reflected and vessels severed. One was put at 90° F., the other at 70° F. In the former abundant spores had formed in the oozing blood within 24 hours; in the latter repeated cultural examination upto 120 hours showed no spores. Up to 48 hours anthrax bacilli were abundant but later were overgrown by contaminants and could no longer be recovered.

Experiment 5.—Two goats one hour after death from anthrax had the skin and neck vessels severed. The blood ran over the iron tray on which the carcase was lying, and some of it was also collected in petri dishes which were then closed and left on the tray. One carcase was

placed in a small room, the temperature of which during the first 15 hours was about 90°F. and then fell to 80°F. The relative humidity was gradually raised from about 40 to 60 per cent. The other carcase was exposed in a shed, the temperature of which ranged from 62° to 66°F. The results were as follows: at 90° to 80° after 17 hours abundant sporulation had occurred in the petri dish and slight sporulation in the neck blood. The blood on the tray was rich in bacilli, but spores were absent. Re-examination seven hours later gave the same result. At 62° to 66°F. spores were not found at tests made from the three sites (neck, dish, tray) after 24, 29, 48 and 96 hours. Bacilli, however, were present in large numbers for at least 48 hours and were mixed in culture with discretely growing contaminants.

Experiment 6.—Another pair of goats, one hour after death from Anthrax, had the skin and neck vessels severed, the still liquid blood spurting over the neck and tray. One goat was at once put in the small room at 90°F. for the first 24 hours and at 80°F. for the next 21 hours, the relative humidity throughout being at 50 percent. The other goat was exposed in air maintained at about 70°F. for the first 48 hours, after which it was placed in the room at 80°F. for the following 21 hours. Blood from both goats was taken into petri dishes and the lids immediately replaced; blood from the goat at 90°F. was also taken into small dishes made of iron, copper, and zinc, the dishes being tilted so that the blood ran towards one corner to form a layer up to about 2 cm. thick. The blood in all these dishes clotted, and the clot was then sliced up and chopped with saline. The various dishes were left with the respective carcase. The 90° was of iron with some incomplete tar painting, the 70° tray was of rusted iron. The results of this experiments were as follows: with the goat at 90°F. spores had formed within 17 hours on the neck wound, in the blood in the various dishes and on the tray. The numbers at the different sites appeared to have increased during the next seven hours and were relatively high in the neck blood and in the petri dish, but sporulation was somewhat retarded in the metal dishes. With the goat at 70°F. no spores were present after 24 hours but by 44 hours they were present in small numbers on the neck wound and in the petri dish. Spores appeared in small numbers in the blood on the tray after 68 hours only the carcase then being at 80°F. Contaminants in appreciable numbers began to appear on the plates from 44 hours onwards.

The common occurrence of bacteria that are antagonistic to *B. anthracis* has long been known, while Schipp (1906) has also shown that filtered tissue juices from putrid bodies are highly bactericidal for the anthrax bacillus. In my experiments the fact that sporulation sometimes occurred slowly in blood taken from the carcase and exposed alongside it

but at the same time largely protected from desiccation and contamination, contrasts sharply with the inhibition of sporulation at sites exposed to contamination. Mennucci (1934) has made a similar observation.

Minimum moisture requirements for sporulation in soil

As anthrax bacilli can live for a long time in dry soil (see below), it was of some interest to determine how much water has to be added to it to permit sporulation. Two experiments were made, in which undiluted anthrax blood was dried, powdered and then incorporated in finely divided, chemically dry, sterile soil in corked tubes. To some of them, varying amounts of sterile water were added. The tubes were placed at 90°F. for 48 hours when the soil was "washed" and examined for spores. Duplicate series of bottles were prepared for moisture determinations.

The conclusion from the two experiments was that sporulation is possible in *sterile* soil when its contents of added water reached about 3 per cent., but not when it is 2 per cent. or less. In these estimations allowance has been made for the blood added to the soil, since the loss of weight when the soil is burnt for moisture determination will be due to both to water and organic matter. As a corollary, the moisture content of 12 samples of "dry" soil dug from three plots at Mukteswar during May varied from 2.8 to 9.0 per cent. (mean 5.365). The samples included unestimated amounts of organic matter, as well as bound water.

Viability of spores in water

In a previous paper, Minett and Dhanda (1941) gave references to the literature on the viability of anthrax bacilli and spores in water. The strong resistance in general of spores includes the particular case of anthrax spores immersed for long periods in water. The matter is not quite simple. It seems that anthrax spores survive in sterilised water longer than in unsterilised, and that survival is likely to be shorter at 95°F. or even at 64° to 68°F. than at somewhat lower temperatures. In garden earth saturated with water, Sirena (1906) noted survival of anthrax spores for 14 years. Observations on the survival of spores, estimated at 500,000 per c.c. in sterile water over a deposit of soil, were made at Izatnagar from December, 1944, to January, 1947. Four-ounce bottles, nearly filled with the water, were sealed and kept partially immersed in a shaded pond. The general result was that during two years there was no sign that the number of viable spores in the water had declined.

The mean monthly temperatures (°F.) of the pond water during the first year of observation are tabulated below. The means were from morning and evening readings taken every two to four days.

SPORULATION AND VIABILITY OF *B. ANTHRACIS*

Dec.	Jan.	Feb.	Mar.	Apr.	May
56.1	54.1	56	64.1	73.1	79.1
64	61	64.7	75.7	81.4	86.6
June	July	Aug.	Sep.	Oct.	Nov.
84.7	83	84	82	76.3	63.4
91.7	87.5	91.6	86.3	81.9	71.1

VIABILITY OF ANTHRAX BACILLI.

Viability in dry blood at various temperatures and humidities

Possibly the first real contribution to this subject is that of Momont (1892) who stored anthrax blood in very thin layers *in vacuo* or in air in tubes at 61° to 72°F. and at 91°F. He noted survival up to 60 days at the lower temperature and for rather less at 91°F. Viability was tested by incubating the tubes after the addition of broth. Bongert (1904b) in similar experiments obtained survival for 35 to 50 days and showed by agar plating that death of the dried bacilli occurred gradually. The importance of the conditions of drying and storage in viability tests is now more fully appreciated (Rahm, 1945). In my experiments, diluted anthrax blood in amounts of five to 12 drops was spread on slides and subjected to different atmospheres. The results may be considered as a whole and are as follows.

Relatively rapid drying is more destructive than slower drying when the difference in rate is due to differing humidities of the atmosphere. Thus, when five drops of blood in a thin layer are exposed at 30 per cent. R. H. at laboratory temperature ($\pm 65^\circ\text{F.}$), drying may be complete as early as three hours, while in the same conditions at 80 per cent. R. H. drying may take upwards of eight hours. In both cases, drying causes considerable destruction of bacilli, but at 80 per cent. R. H. the proportion of bacilli surviving is almost invariably greater than at 30 per cent. R. H. It must here be noted that the term "drying," as used in the everyday sense, is a relative one. That is to say, films that are dry to the naked eye after they have been exposed at 80 per cent. R. H. contain more moisture than ones similarly exposed to a 30 per cent. atmosphere. With continued exposure at 80 per cent. R. H., the numbers of survivors decline at a more rapid rate than is the case with the survivors of the 30 per cent. R. H. exposure. At this lower R. H. survival of a few organisms was noted up to 30 days in one experiment.

When the observations are extended to include higher temperatures (98° or 90°F.), the issue is likely to be complicated by sporulation. In fact, the tendency for this to occur sharply reduces the practical value of observations on the viability of the bacilli. In cases at the higher temperature where drying occurs before sporulation can be completed, comparison with room temperature shows more prolonged as well as a

higher level of survival at the lower temperature, especially at lower humidities. At 98°F. also, a lower humidity (say 20 per cent.) is more favourable to survival than one of 50 per cent. Thus, in two experiments considerable numbers of bacilli were surviving at laboratory temperature at 20 per cent. R. H. after 60 to 90 days, whereas at 90° and 98°F. at the same humidity very few bacilli survived for this time. The longer survival compared with the 30-day survival in the previous experiment mentioned above, was probably due to the layer of blood being twice as thick.

In two experiments blood was dried quickly (three hours or less at 90°F. and 20 per cent. R. H.) and slowly (seven hours or more, mostly exposed to the air of the laboratory). The quick-dried slides were then kept at 90°F. and at room temperature (62° to 67°F.) at both temperatures in dry (20 per cent. R. H.) as well as in damp (80 per cent. R. H.) conditions. The slow-dried slides were similarly distributed. This experiment provided the following conclusions. Storage under moist conditions is quickly fatal to anthrax bacilli, none surviving beyond ten days. This was so whether the storage was at 90°F. or at room temperature and irrespective of whether the previous drying had been rapid or slow. When stored under dry conditions, the result depends on the temperature of storage. At 62° to 67°F. some bacilli live for over 40 days; at 90°F. the bacilli die more quickly than this, but the rate seems to depend on whether the blood has been dried quickly or slowly. Bacilli which survive quick drying can remain viable for some time even at temperatures as high as 90°F. To sum up, the conditions which are relatively optimal for survival of anthrax bacilli in dried blood are drying which is not very rapid, followed by storage in a dry atmosphere at a low temperature.

Viability in dry blood under more natural atmospheric conditions

It was intended to expose blood at Izatnagar at three different seasons, viz., December, March, and June, but it was only possible to carry out the December exposure. One drop of fresh undiluted anthrax blood was deposited at the bottom of small tubes, 25×8 mm. The blood was gently spread over the bottoms of the tubes, where it promptly clotted. Two such series were prepared from two different guinea-pigs, and blood was also spread on slides. The unplugged tubes and slides were dried over CaCl₂, drying of the blood on the slides taking one to six hours according to thickness. The specimens were placed in a sheltered spot in a garden beneath a wire cage containing the necessary thermometers and covered by a sack as protection from sun but not from wind. Both tubes and slides were 6 inches from the ground and were freely exposed to the air except for a single layer of muslin to avoid dust.

Detailed results are omitted. The drying process lowered the viable count in the tubes to about 10 per cent. of the original, which was

estimated at 9.45 million bacilli in the drop. After 20 to 25 days in the case of the slides all the bacilli which had survived drying were dead. With the tubes the numbers of living bacilli had fallen to a few thousands after 13 to 20 days but persisted in very small numbers up to 108 days. Frequent checks throughout the experiment revealed no spores. The longer survival of a few bacilli in the tubes was probably due to the more restricted exposure to atmospheric moisture. The air temperature and humidity during this experiment were as follows:—

Month.	Mean daily temperature (°)	Relative humidity, per cent.	
		10 a.m.	4 p.m.
December	63.5	66	42
January	60.7	79	50
February	66.6	72	39
March	77.3	50	27

(*) From four daily readings: maximum and minimum, dry bulb at 10 a.m. and 4 p.m.

Influence of various types of surface on viability

Six to eight drops of saline containing fresh guinea-pig anthrax blood were evenly applied to the substrate over an area 1 cm. square and put at 50° to 60°F. or 90°F. or both, in a vessel with water to keep the blood wet for 48 hours. The blood was then serially plated, unheated in the case of the low temperature exposure, and after heating at 60°C. following the 90°F. exposure.

Surfaces which proved to be non-bactericidal, and on which spores were readily formed, were: lead, glass, polished stone, soil, wool and feathers. With hair, straw and bran sporulation for some reason was delayed. Bactericidal surfaces were: iron, zinc, copper, brass, limewash, leather and lead paint. On all the above surfaces tests were made at both temperatures. Spores were also readily formed on tin, bone, wood, green leaf, filter paper, cloth and India-rubber. With aluminium, tar and rope results were rather irregular but there was usually a distinct bactericidal effect at both temperatures.

In these experiments metal surfaces were clean and polished. Wood, bone and leather, being absorbent, were not satisfactory to work with, and the apparent bactericidal action of leather may have been due to the tendency of the surface to dry off. Wool, hair, feathers, straw and rope—all finely chopped—filter paper, bran, fine soil, limewash and tar, were spread in thin layers on glass slides. Where possible, all the materials were previously sterilised by autoclaving or hot air.

Viability in soil

Dry soil.—In July, 1943, at Mukteswar, eight drops of diluted anthrax blood were mixed with fine soil and spread on slides over areas 2.5 cm. square. As controls, the same amounts of blood were spread over similar areas on polished stone and glass. The specimens were kept in a dark laboratory cupboard in a desiccator at 40 per cent. relative humidity. Drying was slow, being complete after 48 hours. Repeated tests of the dry material showed no spores. Titration after nine days' storage gave the following numbers (thousands) of anthrax bacilli on the soil, stone and glass: 187, 112 and 107. After 340 days the numbers of living bacilli had declined to 560 on stone and 400 on glass; after 478 days to 45 on stone, glass being then negative. After 634 days (April, 1947) the stone was negative, whereas nearly 5,000 anthrax colonies grew from the soil. Two of these set up anthrax in mice; also the surviving bacilli were still capable of sporulating when suspended in saline at 90°F. The specific gravity of the acid mixture in the desiccator had changed during the 634 days from 1.38 to 1.47 *i.e.*, the relative humidity from 40 to near 20 per cent. The air temperature in the cupboard was taken almost daily; mean monthly readings varied between 70°F. in the summer and 54°F. in winter, except for a fall in January, 1947, to 48.6°F.

The prolonged survival of the bacilli on dry soil is noteworthy, while the longer survival on glass compared with the previous experiments is presumably due to the almost unvarying dryness of the atmosphere. The result may be compared with that of Heim (1905), who found that the bacilli in anthrax blood dried on silk threads and stored CaCl₂ lived for nearly two and a half years. Comparison may also be made with the work of Watts (1945), who showed that *Str. agalactiae* in dried milk showed optimum survival, actually for over three years, at laboratory temperature in air at 15 to 25 percent. relative humidity.

Wet soil.—An experiment of January, 1947, at Izatnagar was designed to test viability under more normal conditions, *i.e.* when the soil is damp or wet and when exposure occurs at naturally varying air temperatures. Two c.c. diluted anthrax blood were mixed with 10 g. of dry soil in tubes (2.5 cm. diameter), to constitute "damp" soil; for "wet" soil 4 c.c. water was also added. The damp soil was estimated to contain 4,000,000 anthrax bacilli per gramme. In some cases the soil was sterilised in others unsterilised. To a few tubes of unsterilised soil spores were added instead of bacilli. The tubes were exposed in air at below 70°F., and at intervals 1 g. of damp soil, and the equivalent amount of wet soil were plated at agar. The results indicated survival of bacilli in the damp soil for eight and probably 20 days with the sterilised and for eight days with the unsterilised samples; in the wet soil for 38

days with the sterilised and 20 days with the unsterilised samples. Examination for spores was confined to the first 20 days and results were negative. As expected, it was easier, both by culture and by mouse inoculation, to reisolate the spores from the soil after it had been heated at 60° C.

Anthrax bacilli in water.

A few drops of blood containing anthrax bacilli were added to paper-filtered unsterilised water from a cattle trough; some of the water was then kept at 50° to 57° and some at 90° F. In the first case the bacilli died within five days and in the second a fair proportion sporulated within that time. Two separate experiments gave the same result. In a further experiment the water was autoclaved before the blood was added. Here also at the cool temperature the bacilli declined in numbers, but many of the survivors sporulated when the water was transferred to 90° F. These results conform with the findings of others.

Temperature of natural water in North and South India

In amplification of the few observations just mentioned, some records were taken at Izatnagar (United Provinces) and Sitarampet (Hyderabad-Deccan). These relate to two small ponds, varying in depth up to 9 and 14 inches according to season; temperatures were taken every few days just below the surface and near the bottom. The Izatnagar water was shaded during May and June. The figures given are the monthly means (°F.) of temperatures recorded at 10 a.m. and 4-30 p.m. for one year, May 1944 to April 1945. Mean surface temperatures were usually up to 2° F. higher than those shown.

	Jan.	Feb.	Mar.	Apr.	May	June.
<i>Izatnagar.</i>						
A.M.	52.3	56.3	63.5	70.3	73.9	79.3
P.M.	61.3	68.0	76.1	84.2	80.6	82.4
<i>Hyderabad (Deccan).</i>						
A.M.	71.6	76.6	78.8	81.0	87.8	80.6
P.M.	80.6	90.2	95.0	103.0	98.6	93.2
*Max.	85.3	91.8	98.8	99.5	105.0	96.3
Min.	59.4	60.5	67.9	74.5	82.0	76.3
	July	Aug.	Sept.	Oct.	Nov.	Dec.
<i>Izatnagar.</i>						
A.M.	84.7	86.9	85.1	72.7	60.8	52.3
P.M.	93.2	96.8	95.0	85.1	72.5	63.5
<i>Hyderabad (Deccan).</i>						
A.M.	79.7	82.4	84.2	84.6	78.8	71.8
P.M.	83.8	90.2	89.6	91.4	85.1	77.9
*Max.	85.5	88.4	87.2	86.9	84.6	85.8
Min.	73.4	73.1	72.5	70.1	62.4	55.6

*Mean maximum and minimum air temperatures, recorded at the nearest meteorological station (Begumpet).

Survival of anthrax bacilli in the unopened carcass

Although there are a number of previous observations on this point, the opportunity was taken to collect a few more details, with due regard to environmental temperature. Tissues were plated in agar and doubtful colonies checked by mouse inoculation.

With guinea-pig carcasses at 82°F. the organisms survived in the spleen and bone marrow for less than two days. In similar carcasses at 52°F. they survived in the spleen and heart blood for over six days and in the bone marrow for between eight and 12 days.

Carcasses of goats dead of anthrax were left lying in a shed at Mukteswar during June and July, at air temperatures ranging from 64° to 74°F. Results were as follows:—

Bone marrow (femur)	12 goats.
Positive on days	3, 5, 6, 7, 7, 7, 8.
Negative „	6, 6, 7, 7, 7, 9, 9, 10
Spleen. Ten goats.	
Positive on days	2, 3½, 4.
Negative „	3, 4, 4, 5, 5, 5, 5½.
Heart blood. Nine goats.	
Positive on days	3, 3, 4
Negative „	3, 4, 4½, 5½, 6.

In a carcass stored at 50° to 60°F (October at Mukteswar), bone marrow was positive for anthrax for 24 days after death. Wulff (1912) and Grabert (1915), in Europe, have noted still longer periods of survival in the case of bone marrow.

Pfeiler and Neumann (1912) have pointed out that anthrax bacilli may survive in the vessels of the skin longer than in other tissues, e.g., in sheep for eleven to 43 days. This point was examined in the case of goat carcasses, other than those above, kept in air at 50° to 60°F. With five such goats, anthrax bacilli survived for days: >5, 7, 12, 16, >11 and <21.

DISCUSSION

In connection with the epizootiology of anthrax under conditions like those of India, at least three important points, touched on in this work, emerge: (1) the relatively long survival of the bacillus in the bone marrow and skin of animals dead of anthrax; (2) survival of the bacillus in dry soil; (3) the period of time necessary for the bacillus to form spores.

The first point needs no further comment. The prolonged survival of the bacillus in dry *sterile* soil under laboratory conditions may have some practical importance. This, however, is conjectural, partly because moisture and solar effects, which may act as opposing influences, are

liable to intervene. Nevertheless, one can imagine conditions in practice where anthrax blood is shed on light or sandy dry soil in shaded localities or where bacilli are sheltered from the sterilising influence of the sun by superficial layers of soil. When sooner or later temperature and moisture conditions become favourable, sporulation might occur. The third point, rate of sporulation in nature, is important, partly again in view of possible intervention by opposing forces, in this instance desiccation or putrefaction. As regards putrefaction, the action of certain putrefactive bacteria in "antagonising" anthrax bacilli has long been known and the practical significance of this fact is realised particularly in the matter of diagnosis. The importance of putrefaction in the epizootiology of the disease has probably not been sufficiently emphasised. Again, although the temperature of the water in streams and pools is often very favourable for sporulation, competition by saprophytic bacteria is a possibility to be considered.

CONCLUSIONS

1. Under favourable temperature (98° to 90°F.) and other conditions, sporulation of the anthrax bacillus, whether in a dilute serum medium or blood, has commenced by eight to ten hours; at less favourable temperatures (70°F.) by 24 hours.

Sporulation on the opened carcass is largely dependent on the surrounding air temperature. At 90°F. spores are formed in the blood exuding from severed neck vessels, whereas at 60° to 70°F. the bacilli gradually disintegrate with the growth of contaminants. In blood removed from the carcass and stored at this lower temperature but at the same time protected from gross contamination, sporulation may proceed slowly.

Sporulation is possible in dry sterilised soil to which water is added to give a moisture content of about 3 per cent.

Spores in bottles of sterile muddy water, stored in a pond on the plains of North India, survived in undiminished numbers during an experiment lasting just over two years.

2. Survival of anthrax bacilli in blood dried on glass slides depends on the rate of drying and the conditions of storage. Survival is promoted by slow drying in relatively moist air at room temperature followed by storage in dry air at room temperature. Survival for 60 and 90 days was noted under these circumstances. The converse conditions bring about comparatively rapid death of the organism.

A few bacilli survived as long as 100 days in anthrax blood dried in tubes and exposed in the winter on the plains of North India to the daily fluctuating temperature and humidity.

Of surfaces tested, the following were bactericidal for anthrax bacilli in blood; iron, zinc, copper, brass, limewash, lead paint and tar.

The bacilli survived for over 634 days in blood mixed with dry sterile soil and stored in dry air at room temperature; in wet soil at air temperatures of 60° to 70°F. they survived for 20 days in unsterilised and 38 days in sterilised soil.

In goats dead of anthrax the bacilli commonly survive for a week in bone marrow (air temperature 64° to 74°F.) and for about two weeks in the skin (air temperature 50° to 60°F.). Survival in these situations is mainly a question of air temperature, and much longer periods have been noted by other workers.

3. Records are given of the mean temperatures of the water in ponds in North and South India over one year.

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EPIZOOTIC LYMPHANGITIS

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Introduction

I am writing this article for the benefit of veterinarians who have not come in contact with an outbreak of epizootic lymphangitis. The material for this article has been collected from reports submitted by field workers.

History

This disease was introduced amongst army animals during World War II from Burma. A considerable research work was carried out there but it has met with very little success. The disease was eliminated by weeding out infected cases.

Since 1947, the disease has been prevalent amongst various units of the Army and it has offered an opportunity for a careful study of the condition. Destruction of microscopical positive cases was suspended as an experimental measure and the following observations were recorded :—

- (a) The affected animals otherwise looked quite healthy and fit. The post mortem examination performed on a few positive cases failed to reveal any macroscopical/microscopic lesions in any of the internal organs.
- (b) In approximately 99% cases, only the eyes were affected and the microscopical examination of discharge from the eyes revealed the presence of organisms indistinguishable from *Cryptococcus farciminosus*.
- (c) In due course of time the eye discharge became negative without exhibiting any typical clinical signs of the disease whatsoever and the animals continued to give negative results consistently over a period of six months.
- (d) Except for minor eye lesions which did not interfere with the working usefulness of the animals, no other typical lesions of Epizootic Lymphangitis occurred.

Susceptible Animals

The disease has been observed exclusively amongst horses and mules of all ages. The disease has not a seasonal incidence as cases have been reported practically throughout the year.

Symptoms

In almost all the cases reported, all were atypical eye cases showing symptoms of conjunctivitis with a watery muco-purulent discharge and in

a small percentage of cases small pin-head sized ulcers on the membrana nictitans. In a very few cases, unilateral swelling and later suppuration of sub-maxillary lymph glands occurred. Not a single case with the classical symptoms of the disease was noticed and the characteristic cording of the lymphatics was markedly absent in the positive cases.

Method of Diagnosis

The disease was diagnosed by the microscopical examination of

- (a) Pus smears from the wounds,
- (b) Nasal discharges and
- (c) Eye discharges.

Cryptococcin tests were also carried out with cryptococcin supplied by Captain Bullen and also prepared locally by Command Veterinary Laboratory, Lucknow. Reactions observed were varied and uncertain.

Experimental Work

- (a) During World War II, Captain Bullen R.A.V.C. did some very useful work on the development of cryptococcin as a field diagnostic agent.
- (b) The OC No. 2 Command Veterinary Laboratory, Lucknow, made efforts to produce synthetic media to culture *cryptococcus farciminosus*. A good growth was obtained on this medium.

A few rabbits and guinea-pigs were inoculated with (i) Epizootic cultures and (ii) eye discharge from positive cases but no lesions were produced in them.

The possibility of cryptococcin as a field diagnostic agent for detection of epizootic lymphangitis could not be established due to inconsistent results and non-specific reactions obtained in both microscopically positive and negative cases.

Control Measures

Formerly all cases of epizootic lymphangitis which were confirmed microscopically were destroyed, the affected unit placed in "working isolation" and all wound incontacts strictly isolated. The unit was declared free of infection after six months from the date of occurrence of the last case.

In the light of experience gained of the present atypical form of outbreak which has been found to be very mild and curable, the following policy in regard to the discharge of Epizootic Lymphangitis cases is being followed in the Army :—

- (a) All Epizoo. positive cases which subsequently become negative and show consistently negative results for a period of 6 months and no further lesions which could be doubted for fresh infection or relapse of the disease are observed in them are released from isolation and discharged as cured.

- (b) A unit is declared free of infection provided no fresh cases occur for a period of 6 months from the date of occurrence of the last case and that all the positive cases in isolation have either been discharged cured as under (a) above or have been otherwise disposed of.

Conclusion

Army veterinarians have come to the conclusion that the outbreak of Epizootic lymphangitis as noticed during the period under review is not much to be taken notice of except that all strict precautions i.e. segregation of affected cases should be taken and the procedure outlined in (a) and (b) under Control Measures should be followed. The causal organism of these atypical outbreaks has yet to be diagnosed. Though these organisms resemble to all intents and purposes the original organism which has a slightly ovoid body, one end being more pointed than the other, a clearly defined contour, and a very refractile double outline and measuring 3μ to 4μ in diameter, yet these organisms appear to be less dangerous than the original organisms.

BARTONELLA IN GOATS

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Nagpur, Madhya Pradesh.

Historical

Hutyra and Marek (1938) assign a few lines in their fourth edition to *Bartonella bacilliformis* causing Oroya fever in men at Peru. They did not definitely say whether they were bacteria or Protozoa. But recent opinions have considered them to be allied to Anaplasma. Similar bodies are also found in animals, *Bartonella muri* (Mayer) in rats, *Bartonella bovis* in cattle, etc. These organisms give rise to no symptoms under natural conditions, but if the spleen of infected animals is removed, or if the reticulo endothelial system is otherwise artificially injured, anaemia develops in a few days with the appearance of numerous Bartonella in red corpuscles when it may run a fatal course.

Bartonella bacilliformis causing Oroya fever in men at Peru was noted by Barton in 1905 and 1909 and studied by Strong in 1914. The parasites are usually in the form of minute rods about 2μ long lying in red cells.

Wenyon (1926) has described organisms causing Oroya fever in men. This is of interest in the present connection for, in association with marked anaemia, there appear in red cells, and to a less extent in the

endothelial cells, curious dot and rod like bodies to which the American commission gave the name *Bartonella bacilliformis*. Attempts to transmit the blood forms to lower animals did not succeed.

The minute slender rods and granules in the erythrocytes of men suffering from Oroya fever were, as quoted by Bayon (1928), first seen by Biffi and Gastiaboru in (1905), but the original description of the organisms was attempted by Barton in (1905).

Mayer (1921) described *B. muris* from laboratory rats and a guinea pig affected with trypanosomes and observed that with the appearance of Bartonella in rats a deadly pernicious anaemia followed.

Zuelzer (1927) described *B. arvicola* from the field mouse (*Arvicola arvalis*) as chronic infection. The organism was not inoculable to rats but was infective to dogs.

Neitz (1939) has recorded cases of latent infection of Bartonella canis in non-splenectomized dogs which according to his observations may be activated by Babesia canis, B. gibsoni or Rickettsia canis.

In 1937 (Ray and Idnani) recorded for the first time the presence of *Bartonella canis* in Indian dogs and described the pathological effects incited by the parasites. In 1940 the same authors described this infection in dogs to produce fatal anaemia accompanied by high thermal reaction.

Material and methods

Bartonella was found in the Central Veterinary Laboratory, Nagpur, in goats kept for goat virus productions. The smears of these goats are examined a day before the transfer of the attenuated goat blood virus against Rinderpest. The blood of goats destroyed for goat virus production is also examined on the fourth and fifth days of injections. The goats are not given any special diet but they depend solely upon grazing. The temperature of these goats are noted daily, both in the morning at 7 A.M. and in the evening at 5 P.M. Table I shows that 100 goats showed Bartonella after the transfer of blood and only 19 before it and in the former, Bartonella has been found on the fourth day of injection of blood. Bartonella is found mostly during the months of October to February, which are the cold months.

Goat No. 194 V with a heavy infection of Bartonella where practically every erythrocyte had been invaded by the organism had a temperature of 103°F at about 5 P.M. (*vide* Temp. chart III). The goat was injected with 1 c.c. of 1% solution of desiccated virus (spleen) of a she-goat which was negative for Bartonella. From the next day, the blood of the goat was examined, both in the morning and evening, and it was found negative for Bartonella. The goat was without any macroscopical as well as microscopical signs of anaemia.

Goat No. 220 (*vide* temperature chart I) negative for Bartonella on 28-12-50 was injected on 29-12-50 with blood of a good reactor (goat) free from Bartonella. The blood of this goat was examined every day and on 2-1-51 at 4 P.M. i.e. on the fourth day of injection it was found positive for Bartonella, and on 3-1-51 at 10 A.M. about 90% of erythrocytes were invaded by these organisms. It was dull and there was discharge from eyes and nose. At 4 P.M. 3/4th cc. of citrated blood from this goat was injected into a pup of 3 months old subcutaneously. The blood of the goat was examined at 4 P.M. and hardly a few Bartonella organisms were found in the blood film. The blood of the pup was examined daily and its temperature recorded daily. It was returned to the owner in a good condition on 9-1-51 with no thermal reaction or any infection.

A healthy goat No. 183 (*vide* Table II) was injected on 8-12-50 with attenuated blood of a good reacting goat free from Bartonella. The blood of the goat was examined daily and on 12-12-50 the blood was found positive for Bartonella. On 13-12-50 the blood of the goat (positive Bartonella) was transferred to 4 healthy goats (No. 189 to 192 *Vide* Table). This batch of 4 goats did not show Bartonella and the blood of the goat

TABLE I

Showing number of blood smears confirmed for Bartonella before (B) and after (A) injection of attenuated Rinderpest Goat blood virus in goats.

Year	...	1946.	1947.	1948.	1949.	1950.
Month	...	A. B.	A. B.	A. B.	A. B.	A. B.
January	...	—	3 6	1 —	6 1	— —
February	...	—	3 —	2 —	1 1	— —
March	...	1 —	— —	1 —	— —	— —
April	...	5 —	— —	— —	— —	— —
May	...	2 —	3 —	— —	— —	— —
June	...	— —	5 —	1 2	— 1	x —
July	...	3 —	— —	4 2	— —	— —
August	...	3 —	3 —	2 3	— —	— —
September	...	2 —	1 —	4 —	— —	2 —
October	...	7 —	3 —	— —	— —	1 —
November	...	2 —	— —	3 —	2 —	— —
December	...	— —	12 3	3 —	6 —	2 —
Total.		25 —	33 9	22 7	15 3	5 —

TABLE II

Passage of blood of Goat number 183.

No. of goats injected.	Date of injection.	Date of confirmation.	No. of goat confirmed.	No. of goat bled.	Remark.
189 to 192	13-12-50	Nil	Nil	191	Tem. Ch. I.
197 to 200	18-12-50	22-12-50	200	197	Tem. Ch. II.
207 to 210	24-12-50	26-12-50	209	209	Tem. Ch. IV.
215 to 217	27-12-50	Nil	Nil	216	
222 to 224	1-1-51	Nil	Nil	224	
1 to 3	5-1-51	9-1-51	2	3	Tem. Ch. I.

No. 191 was transferred to another batch of 4 healthy goats (No. 197 to 200) on 18-12-50. Out of this lot, only one goat, No. 200, showed Bartonella and the rest 3 were negative. As the goat No. 197 showed a good reaction, it was bled and its blood was transferred to a third batch of 4 healthy goats (No. 207 to 210) on 22-12-1950 and only one goat No. 209 showed infection on 26-12-50 just 4 days after injection. The blood of this goat was transferred to a fresh lot of 3 healthy goats (No. 215 to 217 vide Table II and temperature Chart IV) on 27-12-50 and they did not show any Bartonella. The passage of the blood was continued in fresh goats of batches of 3 (Vide Table II) but no Bartonella was found in any of these goats. The blood of the goat No. 224 was injected on 5-1-51 into 3 fresh healthy goats and only one goat No. 2 was found positive for Bartonella on 9-1-1951 (vide temperature Chart I). On 10-1-51, 2 cc. of warm blood of this goat (positive for Bartonella) was transferred to a calf aged 2 years which had been protected for Rinderpest 3 months before with goat blood virus. The blood of this calf was examined daily and its temperature recorded every day for 21 days, but the blood did not reveal Bartonella, nor was there any thermal reaction.

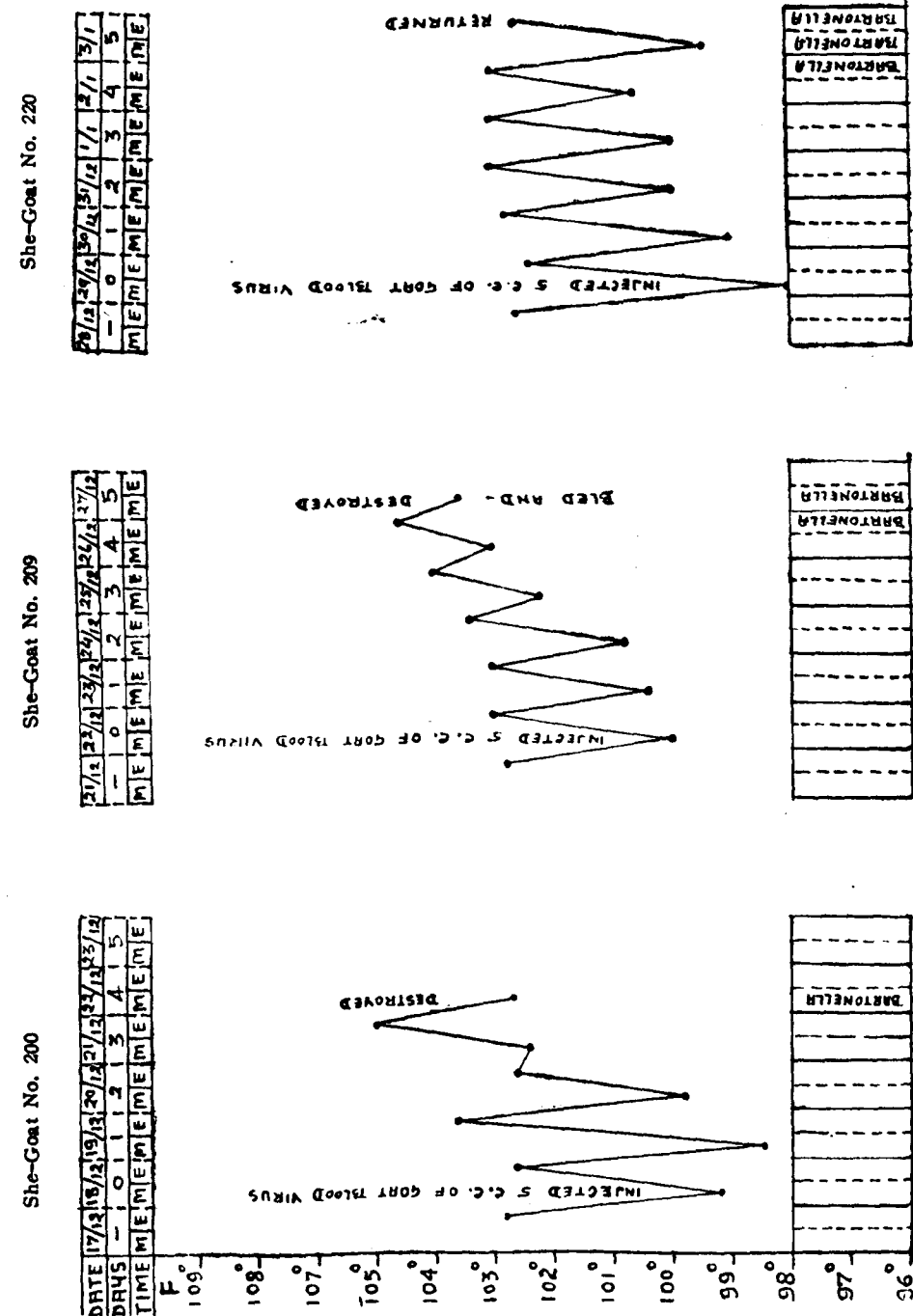
A goat (vide temperature chart II) whose blood showed a heavy infection of Bartonella was kept under observation for 9 days and its temperature was recorded daily. The blood smears were examined daily and Bartonella was not found nor any anaemic changes. The animal was feeding well, the temperature was normal and it did not show any symptom leading to any suspicion of disease.

Morphology

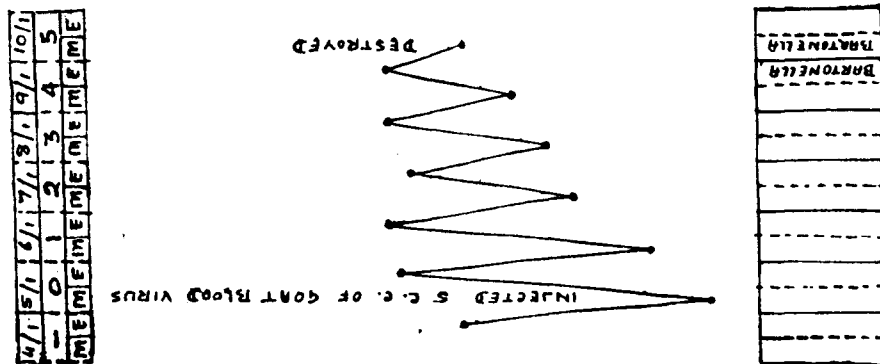
As would be seen from the plate, Bartonella organisms were found of rod shapes with average length of 2 to 3.1 μ x 5 to 7 μ in breadth in the erythrocytes. For examination of blood films, the blood smears of goats were stained with Leishman's stain. According to the intensity of infection, sometimes only one, sometimes 2 of the same size at the sides of the cells or joined at their ends, sometimes 2 of different sizes and very rarely even 3 rods of the same size or of different sizes were to be seen in an erythrocyte.

Smears made from the various internal organs e.g. heart, lung, liver, revealed presence of this organism but the smears from spleen never showed this organism. This finding is identical with the observations of Shree Ray and Idnani in dogs as mentioned in their article published in the Indian Journal of Veterinary Science and Animal Husbandry Volume 10, part III, September 1940.

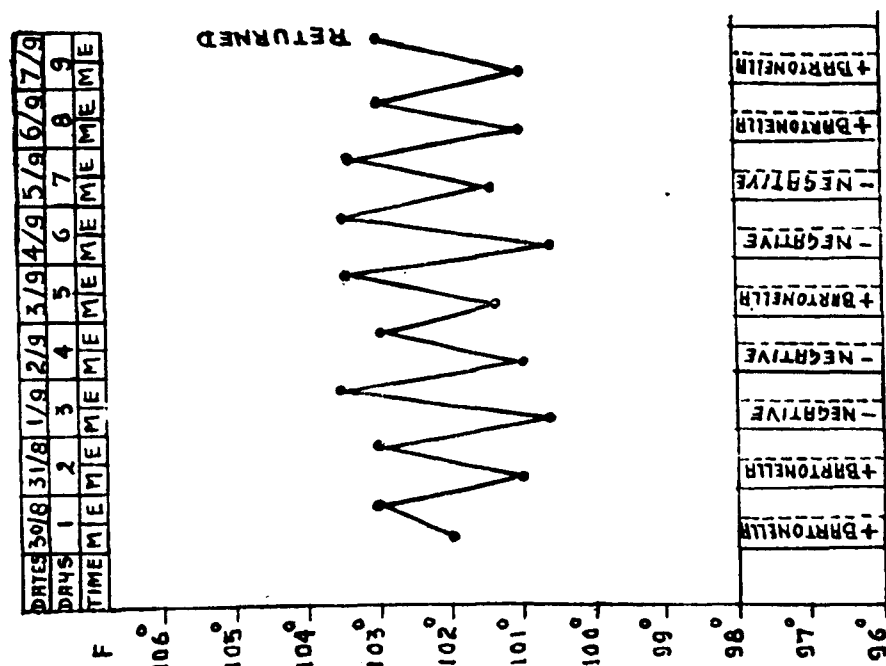
Temp. Chart I of She-goats positive for Bartonella



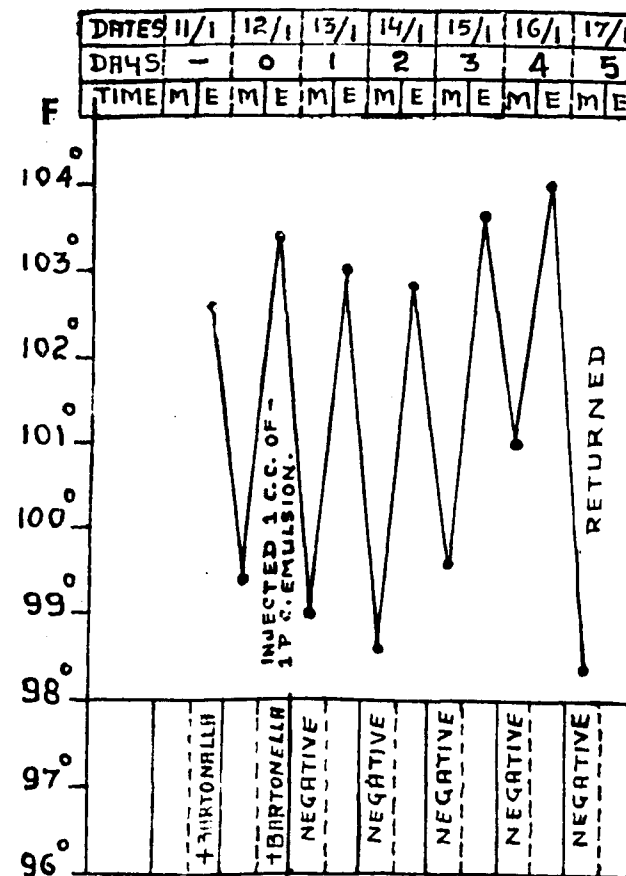
She-Goat No. 2



Temp. Chart II of A. She-goat positive for Bartonella



Temp. Chart III of She-goat No. 194-V
Positive for Bartonella and then injected with virus.



Summary

1. Bartonella invades and disappears from erythrocytes without showing signs of anaemia.
2. Bartonella cannot be transferred from one species of animal to another.
3. Bartonella is mostly found during winter months i.e. October to February.
4. Bartonella appears on the fourth day of injection of Goat blood virus in a goat.

Temp. Chart IV of 3 She-Goats injected subcutaneously with Goat Blood virus infected with Bartonella

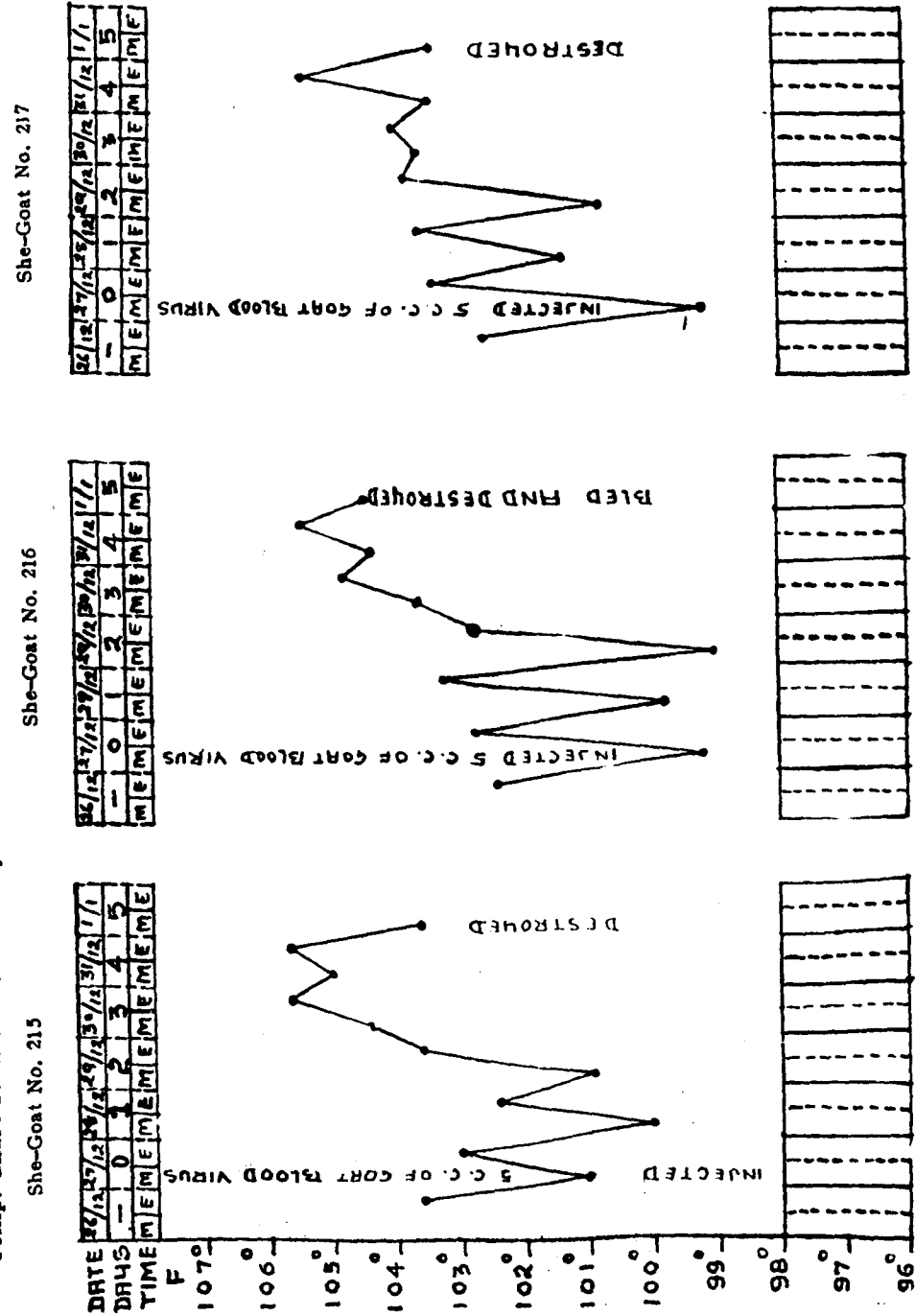


Plate No. 24 THE INDIAN VETERINARY JOURNAL Vol. XXVIII, No. 5
A case of acute lymphatic leukaemia in a bullock.

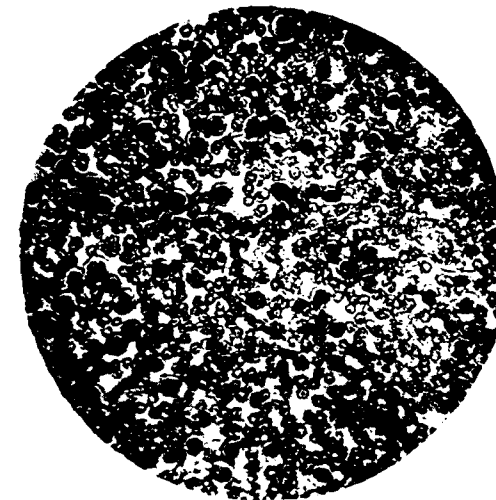


FIG. 1



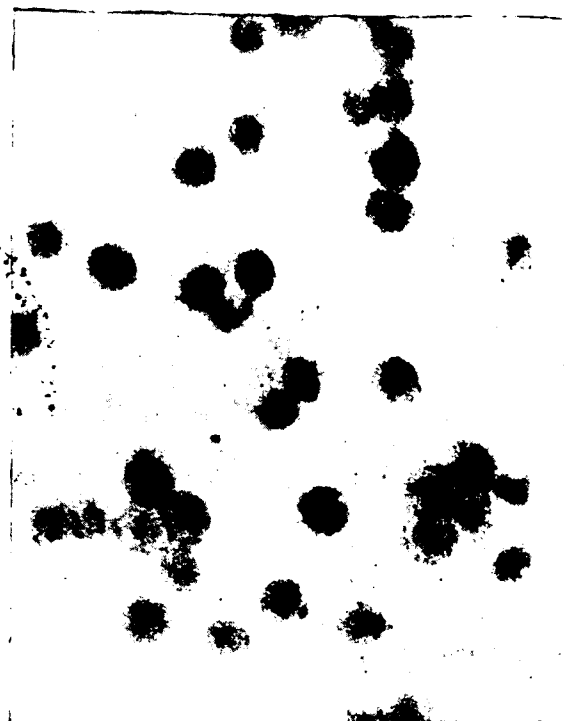
FIG. 2

Note the symmetrical bilateral enlargement of the lymph glands.



Bloodsmear from a case of leukaemia—microphotograph
Note the very high percentage of lymphocyte cells in the field.

Bartonella in Goats.



Photomicrograph of a blood film of a goat stained with Leishman showing rod-like forms of Bartonella in red cells.

[To face page 346]



Photo illustrating the contrivance used for treating the fracture of the lower jaw in a calf.

[To face page 376]

Acknowledgment

The author is indebted to Dr. H. N. Ray, M.Sc. Ph.D. (London), officer in-charge, section of Parasitology, Indian Veterinary Research Institute, Mukteswar-Kumaon, U.P., for identification of this organism and to Shri. J. A. Idnani, Deputy Director of Veterinary Services, Jabalpur Division, Jabalpur, for helpful suggestion and criticism.

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A CASE OF ACUTE LYMPHATIC LEUKAEMIA IN A BULLOCK

BY

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A grey bullock (O.P. 1942/ 1950-51) of indigenous breed, aged about 8 years, in a poor and emaciated condition, was presented at the Agricultural College Veterinary Hospital, Coimbatore, on 13-1-51 for treatment.

According to its owner, the animal was quite normal three months previous to presentation at the hospital. Gradual running down in condition was observed in these 3 months, showing bilateral chronic enlargement of the lymph glands in the throat, sub-parotid region, sub-maxillary region, front of the shoulder, pre-crural region etc. (Vide Photo).

From one week prior to visiting the hospital, the animal was quite unable to do any work; it was not even able to walk the distance of 7 miles to the hospital.

Temperature per rectum was 100.6°F. Blood smears examined revealed typical lymphatic leukaemia.

The following is the report of the Principal, Madras Veterinary College, on the duplicate blood smears sent.

"Microscopical examination revealed numerous immature lymphocytes, most of which being lymphoblasts. Blood picture typical of acute lymphatic leukaemia."

"Kindly send 8 thin slides (of which two stained immediately). Also ascertain total W. B. C. and R. B. C. counts and haemoglobin content of the blood of this animal. If possible, please dissect and send in 10%

JL
KZ m 2, N 2-4
NS 2-28-5

formalin one of the enlarged lymph glands for histopathological examination".

The writer could not supply these materials as the animal failed to attend hospital afterwards. However the requirements of the Madras Veterinary College are included here for the benefit of those who may come across a similar case and desire to go ahead.

A microphotograph of a typical field from the blood smears of the bullock is included.

Figures 1 & 2 are photographs of the said bullock (right and left side view) showing the bilateral symmetry of the enlarged lymph glands.

This disease is remarkable for its unsolved etiology, its varied clinical and pathological manifestations and the absence of any definite known treatment. The latest line of treatment suggested is that of Das (1951) who prescribed synthetic oestrogens in a leukaemic male Afghan Hound taking into consideration the possibilities of a relationship between sex hormones and tumour-like growths and evidences available to show that the endocrine system and their hormones affect both the development and regressions of neoplastic growth.

Acknowledgment

The author is grateful to Sri. P. D. Karunakar M. Sc. (Rudgers) A. R. I. C., Principal, Agricultural College, Coimbatore for kindly arranging to take a micro-photograph of the bloodsmear through Dr. N. Krishnaswami B. Sc., Ph. D. (Kiel), Cytogeneticist, Agricultural College, Coimbatore and to Sri. Francis Joseph G. M. V. C., P. G., Lecturer in Animal Hygiene, Agricultural College, Coimbatore, for permission granted to publish this case report.

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ESSENTIALS OF SILAGE MAKING

By

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Preservation of green fodder for the livestock in the form of silage is very economical and at the same time a very interesting project. It has been practiced on many Government Agricultural Farms for a pretty long time. But, despite its popularity at the experimental farms and the immense possibilities which it offers, its use is practically unknown to the common man

in the street. General information on the subject is, therefore, a *sine quanon* for all those interested in the problems of feeding livestock. With a view to give an insight to the readers in the art of making silage, necessary information, backed by a long experience at the Indian Agri. Res. Institute and its Sub-Station Karnal, has been compiled in this short note.

Green fodder like sorghum, various kinds of grasses and legumes are buried in the pits at the time of harvesting. After a period of about six weeks the product known as silage, can be taken out, and used as fodder. The process is known as Ensiling or silage making.

Silo pits and silo towers:—The various kinds of pits and towers used in silage making are called silos. They are in the form of *kachcha* or *pukka* pits or silo towers.

Kachcha Silo pits:—These are dug in the ground. The number of pits and their dimensions are fixed according to the strength of the milch herd. If the number of the herd is large, bigger pits will be dug, and if the number to be fed is small, smaller pits will be dug. The silage pit should generally be consumed within a period of 4-6 weeks, as it is then liable to be affected by outside agencies like rain and sun.

The pits are ordinarily made rectangular. Care is taken to make the pits on a ground, which is not very yielding to rain and a site near which water does not collect during rains. Green fodder is filled in the pits thus dug out, upto a height of 6 to 7 feet from the ground level sloping on both sides. All the air is expelled out by trampling the forage. Then these are covered with earth about twelve inches in thickness. The slope should be so made that no water may stand on the pit, when it rains. After rains if some cracks or crevices are formed, they should be repaired by putting more earth over them.

Pukka silo pits:—In this case the pits are made in the soil with bricks and cement lining. The size and number of the pits is fixed as before. The method of filling and covering remains the same as in *kachcha* silo pits. The quality of silage is better in this case as the earth has no chance of getting mixed with it near the edges. But there are also several disadvantages to this practice. The site and size of the pit is fixed permanently and cannot be changed later. It involves higher initial cost.

Silo towers:—They are constructed square, round or hexagonal. They are made either of wood, stone or bricks. The dimensions are generally as follows:—Diameter 16 ft. height 43 ft. with a wall 24 inches in thickness at the base and 12 inches at the top. There is one door on one side in the circumference of the tower, which is fitted with iron railings and is just like a ladder for climbing up and down the silo tower. The roof is made *pukka*. These towers contain a huge quantity of silage and are useful only for large dairies having big herd.

Useful data for fixing the dimensions of silos:—Milch cow is generally fed 20 to 30 seers of silage per day. Assuming that the cows are given 20 seers of silage per diem each cow should be allowed 4-5 square ft. of feeding surface in the silo. Thus a cow approximately requires 5/6 cubic ft. of silage every day. Six cows will, therefore, require 5 cubic ft. of silage per day. The total requirement of the herd for a given period and the necessary dimensions of the pits can thus easily be computed. For example 30 cows will require 25 cft. of feeding surface. A silo, 8 ft. in diameter, will have a cross section of 50 sq. ft. Thus for a herd of 30 cows a tower 8 ft. in diameter, and 30 ft. in height, would suffice to store silage for 60 days.

Harvesting of green fodder:—For making silage, next thing is to see that the green fodder is harvested at the proper stage. The proper time is the flowering time of the crop. Silage made from over-mature fodder will not be relished by the milch herd, because it becomes woody and dry. Also the crop should not be harvested in very early stages, as firstly the food value of the crop does not reach its maximum in early stages, and secondly the out-turn of the crop is reduced to a great extent. The crop should be allowed to grow to its full, but care should be taken that it does not become over-mature. The flowering stage is the most appropriate time for harvesting.

Chopped and Un-chopped Fodder:—Silage can be made from chopped or unchopped fodder. The disadvantages of the chopped silage are the advantages of the unchopped silage and vice versa. For chopped silage the green fodder is first chopped by the ensilage cutter, and then ensiled. For the unchopped silage, the fodder is ensiled as such and has to be chopped afterwards before supplying it to the cattle.

The table below gives the relative values of each method.

CHOPPED	UNCHOPPED
1. Labour has to be employed for chopping at the time of harvesting, when it is scarce.	It can be chopped conveniently afterwards, when labour is available in plenty.
2. It can be supplied to the cattle direct at the milking byre.	Good deal of time is required in chopping the silage afterwards. At this stage the stuff is rather tenacious, and unless the silage cutter is very sharp, the silage will be drawn into threads, which troubles the cattle. Moreover there is some acidity in the silage which corrodes the knives and they are worn out quickly.
3. More forage can be ensiled in a pit as it can be pressed down evenly.	Less forage will be ensiled in a pit of similar dimensions as it will not press down evenly.

The normal practice here is to fill unchopped green fodder in *kachcha* silo pits. The forage is well pressed to expell all the air out and then covered well with 12 inches thick layer of earth on all sides. Very good silage of yellow colour and having an agreeable odour is thus obtained. These are the essential qualities of well preserved fodder. Labour is always scarce at harvesting time, and the silage has to be made in bulk quantities within a limited time limit, so it is essential to complete the filling operations within the shortest possible time. Silage is therefore generally prepared here from the unchopped fodder.

The following table gives the loss per hundred maunds of silage at the Indian Agricultural Research Institute, New Delhi.

Year	Name of silo pit,	Quantity stored	Quantity fed	Quantity dried & wasted	Loss per hundred maunds
1943	Bullock line	9578.13	7123.75	2454.38	25.6
	S. Chandman	2084.58	1334.3	750.27	36.0
1944	Chandman	1411.4	906.68	504.72	35.8
	Khalyan	4377.23	2726.88	1650.35	37.7
1945	Chandman	1563.35	1064.95	498.41	31.9
	Khalyan	2920.73	1972.15	948.41	32.5
	Bullock line	12094.48	8068.89	4025.59	31.1
1946	Bullock line	17054.5	9245.88	7808.62	45.8*
	Khalyan	3923.75	2163.9	1759.85	44.8**
1947	Bullock line	8635.18	6056.5	2578.68	29.9
1948	Khalyan	6031.2	3924.25	2106.95	34.9
	Bullock line	6060.25	5095.25	965.00	15.9***
	Tara	2650.75	1895.5	755.25	28.5
1949	Tara No. I	2627.00	1877.00	750.00	28.5
	Tara No. II	2569.75	2038.00	531.75	20.7
	N. Chandman	2301.63	1683.63	618.00	26.8
	S. Chandman	1576.75	1095.00	481.75	30.5

The above table reveals a very substantial loss in the year 1946 pits marked (*) and (**)

Pits marked (*) was opened on 20—12—46 and finished in June 47, thus kept open for about 6½ months.

Pit marked (**) was opened on 7—3—47 and finished in May 1948, thus kept open for over 14 months.

Evidently this abnormally high loss occurred on account of unduly long exposure to sun and rain.

Minimum loss was recorded in 1948 in the pit marked (***). Incidentally it was the pit which was kept exposed for the shortest period of time. It was opened on 9—7—49 and consumed by 27—9—49, thus kept exposed for about 2½ months.

Ignoring these abnormal losses, the average loss comes to 29.5% and even this could be minimised to a great extent by reducing the total period of exposure.

Sethi (1940) has also reported that the silage worked out from 67 to 70% of the total grass ensiled at Agri. Res. Station, Pattambi (Madras). He has further stated that the percentage loss in ensiling green juar in *kachcha* silo pits amounted to 30% at Sakrand Farm during 1938.

Thus, to minimize the loss, it is very necessary that the silage should be consumed within a short period. This will prevent the drying and weathering of the stuff on account of outside agencies. The dimensions of the silo pit should be so regulated that the stuff in one silo pit may be finished within a period of about 4 to 6 weeks.

Silage with Preservatives:—Addition of preservatives to silage is an innovation of recent years. Molasses, Phosphoric acid, salt and even water can be added with advantage as a preservative in making silage.

Molasses is cheap and unless used for making power alcohol, is quite useless and a nuisance due to its repellent odour. But, if added to silage, it means adding extra food value at a very low cost.

Molasses is sprayed on the green fodder by means of a pressure pump at the time of filling in silo pits. Addition of molasses makes the silage much more palatable for the cattle and imparts more nourishment to the milk. The vitamin A potency of the milk of cows consuming such silage has been found to be much higher than the milk of the cows, who were fed upon ordinary rations.

Hosaid (1945) reported from Izatnagar that the addition of roughly 1% molasses of the weight of green oats showed a distinct advantage in providing good quality silage.

Trials at Karnal:—19 mds. 8 seers of molasses diluted with four times its weight of water was sprinkled over 385 mds. of green juar ensiled on 5th and 6th October 1949. This works out to 5% molasses of the green weight of juar ensiled. The silage obtained was very good in colour and aroma. The milch herd relished it very much and, when fed to them, nothing remained behind as wastage.

Acknowledgments

The author is deeply indebted to Rai Saheb M. R. Sharma, P.V.S. (I) Superintendent, Government of India Cattle Farm, Karnal, and Dr. B. P. Pal, M.Sc., Ph.D. (Cantab), Director, Indian Agricultural Research Institute, New Delhi, for their valuable guidance.

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IMPROVEMENT OF SHEEP AND WOOL AT THE GOVERNMENT LIVESTOCK FARM, HISSAR

By

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and

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Introduction

The importance of sheep and wool in the agricultural economy of the Punjab State is unquestionable not only as a part and parcel of agricultural operations but also as the best utilisation of dry and waste lands in the arid tracts and to meet the clothing requirements of the populace during the winter season. Although the professional and traditional sheep rearers are known from remote times, still, there has not been much improvement in the prevalent sheep types and the quality of wool as compared with other sheep-raising countries. Evidently, the ignorance of the breeders to adopt improved methods of breeding has to be blamed for the existing poor types of sheep. Besides this, the State help for the improvement of sheep industry had not been adequate for many years for want of sufficient number of trained personnel.

The average wool production of an Indian sheep has been estimated at 1.9 lbs a year. This denotes that the types are too uneconomic. The wools are all hairy, lack uniformity of fineness, length and colour. Most of them are dry, harsh and devoid of grease and character.

The total production of wool in the Punjab State is estimated at 4,300,025 lbs. (Brochure on the marketing of wool in India 1948) which forms 10.3 per cent of the total wool production in the Indian Union. The contribution is thus quite appreciable in view of the small size of the divided Punjab. In order to keep up the economy of the State in relation to world's economy, it is essential that the sheep and wool must be improved, both for fleece weights and wool quality.

The activities regarding the improvement of sheep and wool in the State are controlled by the Civil Veterinary Department, Punjab, and are mainly concentrated at the Government Livestock Farm, Hissar. The function of this Farm is to develop and fix improved types of sheep and to establish a nucleus for the issue of pedigreed stock to breeders for the grading up of the local flocks. The earliest experiments in this respect commenced in 1906. It was not, however until the year 1928 that concerted efforts were made to achieve the objective. Since 1936, selective breeding of indigenous Bikaner sheep and cross breeding of Bikaneri with Australian

merinos has been in progress, the first part of the work being conducted under a research scheme subsidised by the Indian Council of Agricultural Research. A well-equipped wool analysis laboratory to help in the selective breeding work is also attached to the Farm since 1942. During the first 10 years, attention was mainly directed towards problems relating to improved sheep husbandry, feeding, management of sheep and wool, control of diseases and improvement in fleece weights. Since 1946-47, efforts are being made to improve the quality of local wool by selection. Some of the important results achieved under different heads are of interest and advantage to sheep breeders in general.

Breeding problems.—The system of sheep breeding practised by the shepherd is very haphazard and irregular. He allows his sheep to breed all the year round and also before maturity. These are obviously unsatisfactory.

With a view to find out the possibility of obtaining two crops of lambs a year as an economical proposition, a well planned experiment was conducted over a period of 9 years. The results revealed that, in an attempt to have two crops of lambs a year, an average of 27 percent more lambs were obtained as compared with the practice of getting one crop a year. The practice, however, proved uneconomical due to retarded growth of lambs, higher mortality rate, lower wool yields and lesser number of young progeny coming upto the standard for breeding. The last effect also retarded the improvement in a flock.

The best time to obtain the lambs has been worked out from August to October, and the mating is carried out from March to May.

Close in-breeding was found to adversely affect the physical development of the stock. Line breeding, judiciously and carefully practised, brought out the potentialities of sheep in a shorter time and selective breeding on these lines improved the average fleece weight of sheep by about one pound.

Contrary to the general belief that white faced Bikaneri sheep are unable to withstand heat, it was proved that such a strain compared quite favourably in every performance with the tan or black-faced sheep.

The average age up to which a sheep could be economically kept in a flock has been found to be 6½ years and the rams could successfully be used for breeding upto the age of 7½ years.

Feeding Problems

Adequate feed is essential for the successful rearing of any class of livestock and it holds particularly true in the case of sheep. The weight records of sheep during different years and their performances showed that the potentialities of the flocks were only apparent when the level of nutrition was high. Under a planned experiment for a comparative study

of grain feeding plus grazing and grazing alone, it was evident that the maximum performances of sheep could only be brought out when nutrition level was high and these could never be achieved by grazing alone. At the same time grain feeding was not found to be an economical practice.

It was further observed that the flocks were unable to maintain an uniform level of their body weights throughout the year due to lean periods during May and June and the winter months of January and February. The winter period was more adverse and it sometimes resulted in a loss of 16 to 20 per cent of the body weight. To meet this a supplementary ration consisting of 2 to 4 ounces of 'guar' seed¹ and 12 to 14 ounces of hay, 'pala' leaves², chaffed 'juar' or wheat 'bhoosa' or 3 lbs of green burseem alone per animal per day was worked out as an effective measure. Some work was also conducted to find out the fattening rations for sheep. A combination of 'guar' seed and wheat bran in the ratio of 2:1 or 'guar' seed, wheat bran and cotton seed cake in the ratio of 2:1:1 gave the best results. Since sheep subsist on grazing alone, certain rules were laid down by which maximum advantage can be gained from the grazing fields.

Management and care of wool

The common management operations like dosing for worms, occasional washing of sheep, dipping, crutching and hoof paring were carried out at different times of the year. It was seen that the flocks can be kept in perfect state of health by following the above operations as a routine.

Occasional washing of sheep helped to maintain the health of the flocks but too many washings were found to deteriorate the quality of wool. On an average two washings during winter months and 4 to 5 washings in the summer months were quite useful. The washing of sheep gave the best results when carried out in running water.

Washing of sheep before shearing, under normal conditions, did not prove economical for the shepherd. Washing caused a decrease in the fleece weights. The sale proceeds of the washed wool did not make good the loss which the wool suffered in the washing. The cause for this is apparently the lack of organised and controlled wool markets. Establishment of such markets in the country is absolutely essential if it is desired to encourage shepherds to wash their sheep before shearing.

Classifying or grading of wool at the time of shearing also proved an uneconomical practice for the shepherd. Again the cause is partly due to ill-organised markets but mostly due to lack of official standards of carpet

1. 'Guard' seed—Seeds of *Cyamopsis psoralioides* or Cluster Bean.
2. 'Pala' is *Zizyphus nummularia*

wools in the market. Grading of wool is essential and, to achieve it, it is necessary that the above two pre-requisites are properly remedied.

It was noticed that the average growth of wool in the Bikaneri sheep is about one inch per month. The winter growth is white, while the summer growth is yellow in colour. Two clippings a year, therefore, are essential. One clip a year, though it produces a long stapled wool, causes a loss of about 6 per cent in the fleece weight; it does not affect the health of sheep if carried out from April to April.

Improvement in the quality of wool

India produces only a carpet or mixed type of wool which is suitable only for the manufacture of carpets, mats etc. In spite of being a surplus country in wool production, imports of clothing type of wool are necessary to meet the domestic requirements. With a view to evolve a fine-wool-type sheep, cross breeding of Australian merino rams with Bikaneri sheep was carried out at the Farm with the successful evolution of a fine woolled merino type of sheep named as Hissar-dale. This process, besides being very expensive and beyond the reach of an average farmer, needs special attention of the stock as it shows higher mortality rate as compared with local sheep. One of the worst handicaps has been the difficulty in the marketing of this wool. Our handicraft work being unable to handle this fine wool for spinning and weaving, there has always been a poor demand for such a type of wool in the local markets and very often lower price is offered for fine wool than for Bikaneri type. It is only the bigger mills which come forward to buy this merino type of wool at better prices. Since the average farmer is the owner of a small flock, his consignments are not likely to attract buyers from the mills. It is for this reason that the Hissar-dale sheep has not found favour with the shepherd. The difficulty can be overcome by establishing organised markets (on co-operative marketing system) or through special attention of the Industries Department with the object of evolving new type of spinning wheels which could handle the wool properly in the handicraft work.

The examination of a large number of Bikaneri wool samples in the wool laboratory revealed that the hairiness (medullation) in the samples varied from 0 to 100 per cent and a few samples were as fine as 24 microns (about 56s) in fibre thickness and the variability in fibre thickness in some cases was as low as 10.13 per cent. The results opened a new field for evolving a fine-woolled clothing-type sheep by selection which is a more practical method with our shepherds. This work has been taken in hand since 1945 and is still in progress. The object at present is first to eliminate hairiness in the fleece and then to concentrate towards fineness and homozygosity. For selective breeding work, the whole flock has been classified into 4 groups as described below :—

- A type:—Fleece with 0 to 10 per cent hairiness. (Clothing type).
- B type:—Fleece with 20 to 40 per cent hairiness. (Ideal carpet type.)
- C type:—Fleece with 40 to 70 per cent hairiness. (Poor carpet type).
- D type:—Fleece with 70 per cent and higher hairiness. (Hairy type).

The plans for improvement include breeding within A type sheep to evolve a true wool type animal. Similarly breeding within B type to fix its character for producing ideal carpet wool and to grade up C and D types to establish a flock of true wool type sheep. The results so far obtained indicate that evolution of A type sheep and grading up of C and D type sheep is not difficult and in fact has already been achieved to quite a good extent. Fixing of B type sheep has not afforded the desired results due to reversion to A and C types. Through the intensive use of A type rams and gradual elimination of C and D types, the percentage of A and B type progeny has shown an increase from 22.8 to 81.4 per cent during the period from 1942 to 1950 and the percentage of D type progeny has dropped from 41.1 to 0.4 per cent during the same period. After a pure A type flock is established, the work will be extended to the villages under an extensive development programme. The process is slower than cross-breeding but as the indigenous sheep is already adapted to local environments, there are no risks of high mortality as encountered in the cross-bred stock. Consequently the wool quality will improve gradually and the handicraft industry will be able to develop suitable equipment to utilise the improved wool.

The review of the work done at the Farm brings out the following salient points which need special attention for the improvement and development of sheep industry in the State :

1. The shepherds should be taught to follow improved methods of sheep husbandry in order to obtain the maximum potentialities from the various sheep breeds of the Punjab.
2. The production of fine wool, for clothing purposes, is essential to meet the domestic needs. This process should preferably be encouraged through selective breeding of indigenous breeds of sheep. This is more practicable, less expensive and can easily be handled by the shepherd.
3. In order to encourage the shepherd to produce fine quality wool, it is desired that the Department of Industries develops suitable process for carding and spinning fine wool to be handled in the handicraft industry which is the main-stay of the farmers.

4. Establishment of well organised and controlled wool markets and evolution of official standards for different grades of wool is essential in order to encourage the shepherd to wash their sheep before shearing and to grade the clip before it is put in the market.

ANAESTHESIA FOR THE EYE—NEW TECHNIQUE

By

F. D. WILSON, G.M.V.C., B.V.Sc.,

Department of Surgery, Madras Veterinary College.

Introduction.—In dealing with surgical affections of the eye and its appendages, it is absolutely necessary to have the patient under perfect control and for this purpose an anaesthetic is necessary. Though general anaesthesia was formerly used for eye surgery, local anaesthesia is being preferred of late for most operations on account of its safety, convenience and economy. The most effective of these is the topical application of a 5% solution of Cocaine Hydrochloride, which produces anaesthesia in 1 to 3 minutes. The infiltration method of injecting a local anaesthetic into the eyelid and into the muscles of the eye, is also popular for the extirpation of the eye in this country. But according to the Animals Anaesthetic Act of 1919 of Great Britain, this operation has to be done only under general anaesthesia.

Regional anaesthesia of the head of animals was first studied in America by Bemis in 1917. Since then various workers have described various Nerve Blocks as the Infraorbital, Mental, Mandibular and Supra-orbital blocks. However, no one appears to have yet recorded a Nerve Block of the eye. This article records a new type of anaesthesia for the eye which the author believes is partially due to Nerve Block and partially due to infiltration anaesthesia.

Anatomy.—The foramen orbito rotundum gives exit to the nerves supplying the eyelids and the eyeball in the ox. In the horse and dog, these nerves gain exit through the foramen lacerum orbitale.

The following are the nerves of the eyes and its appendages which pass through these foramina.

1. The ophthalmic nerve, a branch of the fifth cranial nerve, supplies the lower eyelid.

2. The zygomatic branch of the superior maxillary nerve, also a branch of fifth cranial nerve, supplies the lower eyelid.

3. The 3rd, 4th and 6th cranial nerves supply the muscles of the eye of which there are seven.

4. The infra-trochlear division of the ophthalmic branch of the fifth Cranial nerve supplies the membrana nictitans.

Dissections and measurements revealed that the foramina rotundum is situated about 5" away from the lateral canthus of the eye in the adult ox. In the pony the foramina orbitale is 3" away from the lateral canthus of the eye. In the dog it is 2" from the supra-orbital process.

Technique and Site.—To get at these nerves in the adult Indian ox, a hypodermic needle 5" long is inserted in the angle between the frontal and temporal branch of the malar bone in a medial direction till it comes in contact with the bone. This site is roughly 1" from the outer canthus of the eye and in line with it.

In the pony the same sized needle is passed in the space between the space between the malar bone and the alveolar border of the mandible in a medial and upward direction. This site is about $\frac{1}{2}$ " below the lateral canthus and 1" behind it.

In the dog a needle 3" long is inserted from behind the supra-orbital process corresponding to a site $\frac{1}{2}$ " above the inner canthus in a postero-internal direction.

The syringe is then fitted on and a 4% solution of Novocaine injected.

Figures 1, 2 and 3 show the needle in position for injection in the Horse, Ox and Dog.

Symptoms of Anaesthesia

The first symptom is dilatation of the pupil. This is soon followed by fixation of the eyeball and immobility of the lower eyelid.

The following is the average of results obtained with a 4% solution of Novocaine injected into more than 60 experimental animals.

Species of animals	Quantity injected.	Time Hrs.	Time of dilatation of pupil after injection. Hrs.	Time of immobility of eye ball after injection. Hrs.	Period of anaesthesia. Hrs.	Ill effects, if any.
Horses	10 c.c.	0.00	0.05	0.07	5.00	Nil
Cattle	10 c.c.	do.	0.03	0.08	1.45	Nil
Dogs	2 c.c.	do.	0.02	0.05	0.45	Nil

Indication for use.—This anaesthesia has been found very useful by the writer for extirpation of the eyeball, for removal of membrana nictitans and dermoid cysts and also for performing 'worm in the eye' operation.

It is considered that it may also useful for cataract and ectropion operations.

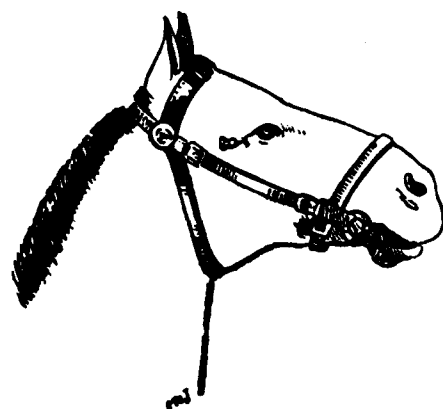


FIG. 1.



FIG. 2.

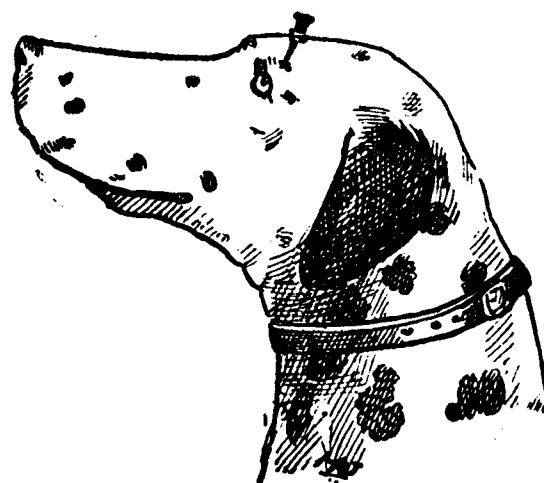


FIG. 3.

Summary

1. A new technique for regional anaesthesia of the eye in Equines, Bovines and Canines is described.
2. This anaesthesia is partly a nerve block and partly an infiltration anaesthesia.
3. This new technique is cheaper, safer and more convenient than general anaesthesia.
4. The technique can be utilised for all major operations of the eye and its appendages, except the upper eyelid.

Acknowledgments

I wish to thank the Principal, Dr. I. M. Azizuddin, B.A., G.M.V.C., B.V.Sc., Ph.D. (Edin.) and Dr. D. Mariappa, Lecturer in Anatomy, for their valuable suggestions.

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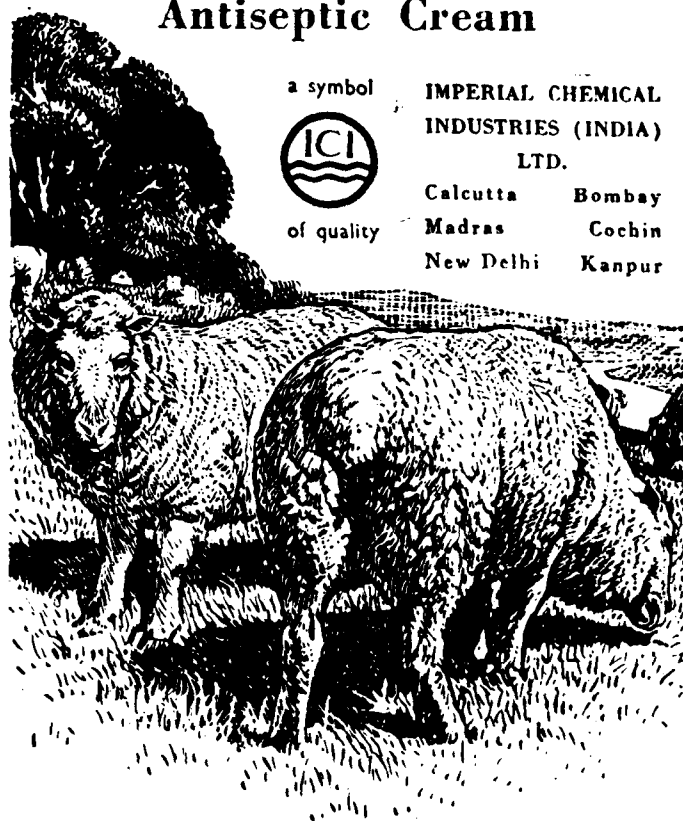
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Editorial

REPRESENTATION IN THE LEGISLATURES

One of the important resolutions passed at the joint session of the Eleventh Conference of the All-India Veterinary Association and the Twenty-Ninth Conference of the Bombay Veterinary Medical Association held at Bombay on the 26th December 1951 under the presidency of Dr. S. Datta, Director of the Indian Veterinary Research Institute, Mukteswar, was the following :—

" Resolved that this Conference reiterates Resolution No. 7 passed at the last year's Conference which runs as follows :—

This Conference is of opinion that, on account of the importance of livestock development in India, it is imperative that Veterinarians should be nominated to the Legislature of the Centre and States. And, therefore, it humbly requests the President of the Indian Union and the Governors, Rajapramukhs of the States to be pleased to appoint atleast one Veterinarian to the Council of State and to the Legislative Councils in the States, wherever they are, in consultation with the All-India Veterinary Association".

This is a very timely resolution. It has come not a day too soon and, we do hope, it will commend itself to the Government of India and the State Governments. The representation of the Veterinary Profession in the Legislatures has become a vital necessity in the general interest of the country in the new set-up of things. The Veterinary Profession in India has not so far received the recognition that is due to it as the custodian of the cattle-wealth of the land and also of the

important role it plays in the rural economy of this great agricultural country. Questions relating to livestock and Animal Husbandry have been considered by our administrators and by the general public with a very regrettable amount of apathy and indifference and consequently the Veterinary Profession has remained neglected all along. To the extent to which the Veterinary Profession was neglected, to that extent the livestock of the country deteriorated; to the extent to which the livestock deteriorated, to that extent food production went down and with it the prosperity of the ryots also went down. This is a logical sequence of events which any one can easily perceive. In a predominantly agricultural country like ours where agriculture is closely linked with the prosperity of livestock and where efficient cultivation depends largely on the capacity and the power of the plough cattle, it is superfluous to stress the importance of livestock for the welfare of the country. As the Hon'ble President Babu Rajendra Prasad himself once said "Cattle wealth constitutes a very important element in the prosperity and well-being of every country and particularly of an agricultural country". Our ancestors had recognised this fact from time immemorial and had, therefore, deified the cow for the worship of the people. Latterly, however, conditions became greatly altered; agricultural economy got dangerously upset and the close association and the intimate relationship between soil, plant and animals on which the entire fabric of the farm depended became disintegrated—all as a result of the neglect of the cow and the livestock. Mahatmaji, as long as he was alive, was never tired of drawing our attention to this fact and constantly stressed the fact that our downfall started from the day we neglected our Go-mata and that our salvation lies entirely only in the rehabilitation of the cow in her pristine glory. At the same time, he did not hesitate to say that the preservation and development of the cattle-wealth of India and the proper treatment of the cow and her progeny was a far more difficult task than the winning of the freedom. It is evidently from a realisation of this fact that the development of Animal Husbandry has been included in the Directive Principles of State Policy in our Constitution. Article-48 runs as follows :—

"The State shall endeavour to organise Agriculture and Animal Husbandry on modern and scientific lines and shall in particular take steps for preserving and improving the breeds and prohibiting the slaughter of cows and calves and other milch and draught cattle".

This is a highly important and wise Directive Principle. For effective fulfilment of this Principle, it is necessary that the Governments, both of the State and of the Centre, are assured of the expert advice of persons who have got special knowledge and practical experience of Veterinary Science in all its aspects. The members of the Veterinary Profession are the proper persons to advise the Governments on this subject but on account of their numerically poor strength in the country they will not be in a position to enter the Legislature by the process of election. Further, practically all the members of the Veterinary Profession are servants of the Government and there are only a few persons who could be called members of an Independent Veterinary Profession. As such, it is the duty of the Government to see that they make provision for proper expert representatives in the Legislatures of the land for voicing the requirements of the dumb creatures and for constantly keeping before the Government the importance of the livestock and the problems connected with them in the interests of the welfare of the country. Fortunately, there is provision for this in our Constitution. Article-80, Clause-A and (3) gives powers to the Hon'ble President to nominate to the Council of State persons having special knowledge or practical experience in respect of such matters as the following :—*viz.* Literature, Science, Art and Social Service. Similarly under Article-171, Clause (3) (e) and (5), the Governors in Part A States can nominate persons for representing Literature, Science, Art, Co-operative Movement and Social Service. So also in Part B States, the Rajapramukhs have got powers to nominate persons to the Councils of States wherever they are. It should, therefore, be easily possible for the Governments of the States and of the Centre to give a representation to the Veterinary Science by nominating suitable Veterinarians in consultation with the representative body of the Veterinary Profession and we earnestly appeal to them to do so.

Notes and News

PERSONAL

Sri Gopichand Taneja, B.V.Sc., Research Assistant at the Animal Nutrition Section, Indian Veterinary Research Institute, Izatnagar, has been selected by the Government of India for the award of an Australian Government Scholarship tenable for two years for higher studies in Animal Husbandry—Sheep Genetics—in Australia under the Commonwealth Technical Co-operation plan. Mr. Taneja has been admitted to the University of Technology in Sydney for Ph. D., degree course in Genetics.

Dr. S. L. Manjrekar, G.B.V.C., Ph. D. (Poona). We are very glad to learn that Dr. S. L. Manjrekar, Assistant Disease Investigation Officer, (Sheep and Goats) Bombay State, has obtained his Ph. D., Degree from the University of Poona. He is the first veterinarian to get this Doctorate Degree from an Indian University.

Dr. S. L. Manjrekar graduated from the Bombay Veterinary College in 1937 and joined the Civil Veterinary Department the same year. In 1943-44 he joined the Indian Dairy Research Institute, Bangalore, and got his Associateship by writing a thesis on "Effects of feeding ghee residue to milch cattle and growing heifers". On his return from Bangalore, he was appointed as Assistant Disease Investigation Officer, (Sheep and goats), Bombay State, and is on that assignment since then. In addition to his investigation work he utilised the facilities offered to him by the Indian Council of Agricultural Research and submitted his thesis on 'Rickettsiosis in sheep and goats in the State of Bombay' for a higher degree. He has successfully isolated a new species of Rickettsia which he has designated as *R. belgaumii*.

We wish Dr. Manjrekar a prosperous career and still higher distinctions.

The British Veterinary Association.—With effect from January 1, 1952, the National Veterinary Medical Association of Great Britain and Ireland has assumed the title of British Veterinary Association, a change which, according to the British Veterinary Journal, no doubt, will be welcomed as being less cumbersome than the old one. 'The "National," as it was always called, was founded in 1883, and is in all respects the veterinary counterpart of the British Medical Association'.

ANGORA GOATS AND MERINO SHEEP ARRIVE IN INDIA FROM U. S.

A batch of 28 Angora goats with a heavy fleece and the golden-footed Merino sheep were landed from the "City of Sydney" in Bombay on 4-2-52.

Imported from the United States of America, these animals are to be utilised in the research schemes undertaken by the Indian Council of Agricultural



Gopichand Taneja, B.V.Sc.,
who has gone to Australia for higher studies in
Animal Husbandry—Sheep Genetics.



Dr. S. L. Manjrekar, G.B.V.C., Ph.D. (Poona)
The first Veterinarian to take the Ph.D., degree from
the University of Poona.



K. B. Yadu, G.B.V.C., M.Sc. (Michigan),
a State Scholar from Madhya Pradesh
who died under tragic circumstances in U.S.A. on 4-1-1952.

Research in the States of Bombay and Uttar Pradesh. Most of them will be kept at a Research Station in Upper Garhwals of Uttar Pradesh where the long belt of Himalayan region affords excellent facilities for animal husbandry, particularly sheep breeding.

Out of the lot obtained in this consignment, two Ramboulet sheep will be taken to the Sheep Breeding Research Station at Poona which has pioneered the work of evolving fine-woolled sheep in India. The technique of sheep breeding followed at this Station will be applied in the sheep breeding areas of Uttar Pradesh and other States of the Himalayan region.

It is understood that the Ramboulet sheep, which is much hardier and yields better lambs than the Merino, might also be utilised in trials being undertaken by the Bombay State Research officer in the districts of Sholapur and Belgaum.

A consignment of Angora goats which had been imported by the Bombay State sometime ago is said to have given very encouraging results in rural areas. Three breeding centres are being established in the State.

Evening News of India of 4-2-52.

* * *

A NEW FARM AT ANAND

Mr. Dinkarrao Desai, Civil Supplies Minister, Bombay Government, inaugurated at Anand on 1st Feb. '52 a key-farm for livestock improvement sponsored jointly by the Indian Council of Agricultural Research and the Government of Bombay. About 14,000 buffaloes are found in a compact area of a group of villages round the Institute. These animals will be artificially impregnated with semen from selected bulls of good stock. It is expected that within the next four to five generations the entire stock of animals will have been upgraded and the bulls from this area will be available for livestock improvement in other villages also.

Dr. Jivraj Mehta, Public Works Minister, Bombay Government, inaugurated on the same day in Anand a scheme for establishing a regional sub-station in animal nutrition. The Institute of Agriculture, Anand, aims to become a centre for bio-chemical and nutrition research in Gujarat. This is essential because conditions differ from region to region. Because of the shortage of animal feeds, the science of nutrition has to find out the most economical use of available feeds, discover new ones, or new sources of feeds and scientific processing of poor feeds to improve feeding quality.

Times of India 2-2-'52.

* * *

EXPORT OF ANIMALS

India exported monkeys and other animals worth Rs. 850,000 during the first three quarters of 1951. The exports included birds, reptiles, rhinos and sheep.

In 1949-50, India exported 21,748 monkeys and between 1945 and 1950, 67,585 monkeys.—PTI.

National Standard 9-1-'52.

* * *

TIGER, A RARITY IN DARJEELING

Wild life in the forest of Darjeeling is reported to be rapidly dying due to illegal hunting and wide-spread disease.

It is said the tiger is now a rare animal in Darjeeling forests.

A spokesman of the Darjeeling Shooting Club said that "poachers are daily shooting prohibited animals, such as buffaloes and deer, while elephants, bisons and buffaloes are dying of anthrax and foot and mouth disease, which have assumed an epidemic form."—PTI.

National Standard 9-1-'52.

* * *

ONE MORE SLOGAN BY MUNSHI

The Union Food and Agriculture Minister, Mr. K. M. Munshi has coined yet another slogan, says the Sunday Standard of 13th Jan. 1952. Addressing an audience of 500 at Amreli last week, Mr. Munshi appealed to the audience to "rear more stud bulls" as India stood in sore need of a million stud bulls.

* * *

PLANS TO STAMP OUT DOPING IN BRITAIN

The Sporting Times, Bombay, says that a £50,000-a-year plan to establish a permanent staff of veterinary surgeons and laboratories for every racecourse in Britain to end doping was suggested to the Racecourse Owners' Association in Britain recently by Mr. William Satinoff, Manchester business director and racehorse owner.

* * *

DOGS'S NAME FOUND ON VOTERS' LIST

The name of a dog has been included in the voters' list in Kalyan West constituency. Canvassers who went to give election cards to 'Champabai' found that it was the name of a dog. According to the National Standard of 1st Jan. '52, the names of the voters in Kalyan were compiled from ration cards. The dogs's master had a card for Champi which has thus come to have a say in framing laws.

OBITUARY

K. B. Yadu, G.B.V.C., M.Sc. We regret to record the sudden and premature death of Mr. K. B. Yadu, G.B.V.C., M.Sc. (Mich.), under tragic circumstances.

Mr. Yadu had gone to visit some Indian friends at the University of Illinois during Christmas vacation and was involved in a car accident on January 4, 1952, between Champaign, Illinois and Chicago, Illinois, while he was driving his own new car on his way back to Minnesota. He died before arriving at a near hospital in an ambulance.

Born in July 1916, Mr. Yadu had his early education in Nagpur and passed out of the Bombay Veterinary College in April 1939. After varied service in M. P., and Rewa State, he went to U.S.A., as a Government of India Scholar and took the M.Sc. degree from Michigan University. In October 1950, he joined the University of Minnesota (U.S.A.) and was studying for the degree of Ph.D., in Physiology when the tragedy occurred. Full of wit and humour, very hard-working, keen and intelligent in his work, and a great sportsman, he will be mourned by one and all who knew him in India and U.S.A.

The late Mr. Yadu leaves behind his wife, Mrs. Kamala Yadu, a daughter and an younger brother Dr. B. S. Yadu, M.B.B.S., of Raipur M. P., to whom we extend our heartfelt sympathies.

Clinical Articles

ACUTE THEILERIASIS IN A CALF

BY

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and

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Subject.—Calf, female, grey, Hissar breed, 10 days old.

History.—The mother of this calf was purchased on the 17th June, '51 with the calf at foot and the owner found that the calf was constipated, dull and depressed and would not suckle milk normally. The case was brought to the Civil Veterinary Hospital, Hissar, for necessary treatment on the 18th June, 1951.

Symptoms.—The calf kept the head hanging down, was dull and depressed with watery discharge from the eyes; was disinclined to suckle;

respiration and pulse accelerated; buccal mucosa congested; gums slightly swollen; prescapular and parotid lymph glands slightly enlarged; morning temperature 104.4°F and evening temperature 105°F.

Symptomatic treatment was adopted.

19-9-1951. The calf continued to show depression, dullness and inappetence. An electuary containing Sulphanilamide 1 drachm, Soda bicarb $\frac{1}{2}$ drachm, Glycerin Q. S. was given thrice a day.

20-9-1951. Conjunctiva slightly anaemic. Examination of urine revealed presence of bile. Blood smears on microscopical examination revealed *Theileria* parasites in the red blood cells closely resembling *Theileria annulata*.

21-6-1951. The calf was found lying down constantly; parotid and prescapular lymph glands markedly enlarged; precrural lymph glands slightly swollen; mild gingivitis; conjunctiva pale and anaemic.

Numbers of ticks were seen attached inside the ear flaps of the calf and were identified to be *Hyalomma aegyptium*. The material collected by puncturing the lymph gland showed rare Koch's blue bodies.

4 c.c. of Pamoquine of Imperial Chemical (Pharmaceutical) Ltd. (each c.c. containing the equivalent of 10 mg. of Dihydrochloride of Pamoquine base) was given intramuscularly.

22-6-1951. Diarrhoea with yellow coloured faeces, liquid in consistency; lymph glands markedly enlarged; conjunctiva pale and anaemic. No parasitic egg or oocyst could be detected on the examination of the faeces. Blood smears revealed a large number of *Theileria* parasites in the red blood cells.

Atebrin tablets (Bayer) of 0.1 gm. administered, two in the morning and two in the evening.

23-6-1951. The calf a bit better; faeces diarrhoeic and liquid in consistency and yellow coloured; conjunctivae anaemic; suckled milk occasionally. Two Atebrin tablets given twice a day.

24-6-1951. General condition better; swelling of the lymph glands slightly reduced; faeces semi-solid. Treatment with Atebrin was continued, two tablets morning and evening.

25-6-1951. The calf a bit better and Atebrin treatment continued as above.

26-6-1951. The calf is brighter and suckles well. The *Theileria* parasites continued to be present in the blood.

The animal showed progressive recovery under the treatment of Atebrin and no parasite could be seen in the blood on 4-7-51. During the course of the entire treatment 40 tables of Atebrin were administered.

The following table shows the daily record of temperature and percentage of red blood corpuscles infected.

S. No.	Date	Daily temperature	Percentage of R. B. C. Infected	Remarks
1.	20-6-51	Morning 104.8°F Evening 105.2°F	17%	
2.	21-6-51	Morning 104.6°F Evening 104.6°F	30%	
3.	22-6-51	Morning 103.2°F Evening 104.2°F	70%	
4.	23-6-51	Morning 102.2°F Evening 103.2°F	23%	
5.	24-6-51	Morning 102.0°F Evening 103.8°F	13%	
6.	25-6-51	Morning 102.0°F Evening 103.4°F	9%	
7.	26-6-51	Morning 102.0°F Evening 103.4°F	6.5%	
8.	27-6-51	Morning 103.2°F Evening 103.6°F	7%	
9.	28-6-51	Morning 103.0°F Evening Not recorded	6%	
10.	29-6-51	102.6°F	4.8%	
11.	30-6-51	102.2°F	1.2%	
12.	1-7-51	103.0°F	1.9%	
13.	2-7-51	102.6°F	1%	
14.	3-7-51	103.0°F	Quite rare	
15.	4-7-51	102.4°F	Not detectable	

The calf appeared quite normal and has recovered from the attack of the disease.

Blood of the cow was examined off and on and no *Theileria* parasites could be detected.

From the review of the literature, it appears that Edwards (1930) found for the first time in India that *T. mutans* infection was of wide-spread occurrence in the blood of cattle. Sen and Srinivasan² (1937) carried out 44 sub-passages of theileriasis in adult cattle without undergoing any attenuation or exaltation in virulence.

Twenty drugs were tried and the best results (57.8%) were obtained by them by the use of Atebrin. Bayer 205 and Gonacrine ranked second in the list. MacHattie³ (1935) described an outbreak of Theileriasis in Baghdad causing 50% mortality in dairy calves due to *Theileria annulata*. Raghavachari, Abbas Ail and Ray⁴ (1940) observed an outbreak of Theileriasis in calves on a farm in Multan disirict and the causal parasite was provisionally identified as *Theileria annulata*. The prominent clinical symptoms mentioned were rise of temperature, diarrhoea, ulcerated gums, pale and anaemic mucous membranes and enlargement of superficial lymph glands.

Discussion

duToit⁵ (1930) cited by Sen and Srinivasan (1937) says that the incubation period with *T. annulata* infection is more than 20 days and with *T. dispar* it

is about 21 days. Hutyra, Marek and Manninger* (1938) mention atleast 20 days' incubation period in *T. annulata* and 20 to 30 days in *T. dispar*. Purchase¹ records a case of Piroplasmosis at birth through intra-uterine infection from the dam.

The clinical symptoms were observed in this calf on the 10th day from birth at the time of purchase and the incubation period has been either unusually short or there is a possibility of intra-uterine infection as observed by Purchase in a case of Piroplasmosis in an one-day old foal. The history previous to this regarding the condition of the calf could not be had. It is probable that symptoms might have been shown by the calf even earlier.

The symptoms observed in this case are almost similar to those seen in cases of acute Theileriasis recorded by Raghavachari, Abbas Ali and Ray (1940).

About 80% of the parasites seen in the red blood cells were round or slightly oval in shape giving the appearance of signet rings and about 20% were rod shaped. The morphological characters of the parasite and the persistent enlargement of the lymph glands are suggestive of *Theileria annulata* infection.

The treatment with Atebrin has been found effective in this case.

Summary

1. A case of Theileriasis in a 10 days' old calf is recorded. Either the incubation period is unusually short or intra-uterine infection with *Theileria* is suggestive.
2. The morphological characters of the *Theileria* closely resemble *T. annulata*.
3. Treatment with Atebrin has been found quite effective.

Acknowledgments

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FRACTURE OF THE LOWER JAW IN A CAMEL

By

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A camel, aged 8 years, was admitted into the Civil Veterinary Hospital, Bassi, on 3-5-51 at 1 P.M. with the history that it had a fight with another camel at 10 A.M. and that, since then, there was profuse bleeding from the mouth.

On examination, it was found that the lower jaw had fractured transversely just in front of the wolf tooth and in consequence the lower lip was hanging down. The haemorrhage was from the rupture of the inferior alveolar artery.

Treatment.—The camel was well secured and the haemorrhage was stopped by securing the artery and twisting it off. The fracture was reduced and the broken ends brought into exact apposition with the incisors touching the dental pad. It was then retained in position by an iron-sheet splint running the whole length of the lower jaw with slight curves on its either side and supported by elastic bands over the fore-head and nasal region of the animal. This was further re-inforced by a surgical bandage tied tightly round the tooth behind the fracture and the one in front of it.

The wound in the mouth was dressed antiseptically.

Diet.—The camel was kept fasting for that day i.e. on 3-5-51, and from 4-5-51 to 25-5-51 the following liquid diet was given.—

- i. 5 Seers of boiled milk with one seer *gur* at 8 A.M.
- ii. 2 Seers crushed gram in 5 seers water in the noon.
- iii. 2 Seers crushed gram in 5 seers water in the evening at 6 clock.

On alternate days tonic powder was given as a drench.

For the first one week, 4 ounces of Calcium Gluconate was given in two pints of water daily. On the second week lime water, one gallon, was given daily.

From 25-5-51 to 31-5-51, the camel was hand-fed with forage like leaves and grass, not exceeding 5 seers a day besides the liquid diet tabulated above.

From 1-6-51 to 5-6-51, the camel fed by himself without assistance on *bhusa* and grain and also drank perfectly well. The forage and grain rations were gradually increased.

Precautions during treatment.—Daily attention to the correct position of the jaw and the maintenance of it by proper adjustment of the splint.

No grazing allowed for the first three weeks.

After each feed the mouth was washed with Condy's lotion.

The surgical bandages changed after every third day and tied tightly to maintain proper position of the lower jaw.

On 4-6-51, the splints were removed and the mandible examined. The union of the bones was complete, with a callus formation at the fractured parts. The owner was given instructions to feed the camel on succulent forages for a time.

Result.—On 5-6-51, the camel was discharged from the hospital as cured.

FRACTURE OF THE LOWER JAW IN A CALF

By

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An Ongole cow, No. 6, served on 18-5-49, showed signs of parturition on 10-3-50 after a gestation period of 297 days. Labour was protracted as the calf was too large for the mother; it started an hour before mid-day and went up to two hours after mid-night. It was only by cautious perseverance that delivery was effected with safety to the dam. However, during the efforts at delivery, the calf sustained a simple fracture of the inferior maxilla at the symphysis and presented a very sorry appearance with a dropped jaw. It was quite unable to suckle the dam unless some one held up the hanging jaw. A contrivance was devised in the following manner to keep the jaw in position.

A 1/10 inch thick India rubber band, about 2" in diameter, cut out from an old motor car tube, was passed round the region of the bridge of the nose and secured loosely by stitching the ends. It was adjusted in such a manner as to permit the passage of the dam's teat between the tongue and the upper jaw; the lower half of the rubber band held up the jaw to facilitate the suckling process. The rubber band was secured in place by two cheek straps secured behind the ears. (Vide photo). By this judicious strapping, reduction of the fracture was automatic and effective for satisfactory union.

With this contrivance, the calf thrived well and grew splendidly. By the end of the third week, union of the fracture was complete and the rubber band support was entirely discarded one week later when the calf commenced nibbling at grass. During this period, at least four changes of the rubber band had to be effected owing to increase in size from developmental growth.

At the seat where the rubber band was playing on the muzzle, some pressure wounds resulted that yielded promptly to routine antiseptic treatment.

The writer is grateful to Sri. Francis Joseph, Lecturer in Animal Hygiene, Agricultural College, Coimbatore, for permission granted to publish this case report.

BENZENE HEXACHLORIDE POISONING IN CATTLE

By

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D.D.T. and Gammexane are extensively used nowadays by the agriculturists in the control of pests. Of late, even laymen use Gammexane in the form of powder and lotions for the eradication of ectoparasites as ticks and lice on cattle. It is reported that ryots use Gammexane powder for the dressing of ulcers in the interdigital space in cases of Foot and Mouth disease with very good results and no untoward results occur in them.

'Lindane', a compound of pure Gamma Isomer of Benzene Hexachloride contains 99 per cent pure Gamma Isomer and is available as wettable powder, dust, and emulsion, containing the active ingredient in various proportions. It is a German preparation and is reported to be considerably more effective than the BHC and DDT. It is said to have been extensively used as an insecticide by pest control operators, agriculturists and dairy farmers, for agricultural crops and for ectoparasites in animals in Egypt and other countries with successful results.

On the 5th October, 1951, a local cattle-owner obtained a 4-ounce packet of 'Lindane' wettable powder containing 20 per cent of the active ingredient. It was made into a thick emulsion. Two thirds of the emulsion was applied to the body of an aged Ongole cow and the remaining to the body of its heifer calf aged about 1½ years, as both of them were infested with ticks. The application was done by the hand with a fair amount of friction at about 2 P.M. and soon afterwards both the cow and the calf were let out for grazing. The animals did not return till about 7 P.M., when a search was started for them. At about 7-30 P. M. the calf was found outside the town in a prostrate condition, kicking and struggling but unable to get up from the ground. On examination, the temperature of the animal was 102.4°F; there was excessive salivation; jaws tightly closed; eyes protruding wide and staring with the pupils fully dilated; muscular twitchings especially at the neck; hyper-excitability; inability to stand; great pain and suffering present. The calf was made to sit in the recumbent position which it was able to maintain for about 15 minutes. Before any medical aid could be given, the calf fell prostrate on the ground, struggled very violently, bellowed very loudly and died. Soon after death there developed a slight bloating of the abdomen. Microscopical examination of the blood obtained after death revealed no organisms. No postmortem examination could be conducted.

At about 9 P.M. the cow was found about a mile away from the owner's house lying prostrate on the ground, struggling and kicking. She was found wandering in that locality since 5 P. M. i.e., 3 hours after the application. She

was reported to be wandering in an aimless manner, shaking and licking the body. She would run for a while, stagger and fall down on the ground, again to repeat the same process. This sort of wandering, staggering and falling down on the ground was repeated a number of times from 5 to 9 P.M.

When we saw the cow at 9 P.M. she was in a prostrate condition on the ground. She was sweating profusely; there was excessive salivation; inability to get up: no appreciable rise in temperature and pulse; respiration quick; muscular tremors throughout the body but more prominent on the limbs; and eyes protruding, wide and staring with the pupils fully dilated.

The cow was lifted up and made to stand. She was extremely weak on all the four limbs and unable to stand of her own accord. She had to be helped to keep standing with the support of men.

Immediately the whole body was thoroughly washed with cold water and the animal was given cold water to drink, which she drank. After about half an hour she could stand without any support but remained standing in one place; very much dull and depressed, more or less in stupor. After about an hour she slowly started moving. Immediate treatment consisted in a pound of Archis oil as a drench. Next day Mag. Sulph., Sod. Chloride., and Pulv. Zingiber., were given as a drench. Throughout the day she continued to be dull but taking a little green grass now and then. Ultimately, she recovered in about four days' time.

Remarks:—BHC preparations when used as dust, in lotions or emulsions in high dilutions as from 0.1 to 5 per cent, produce good results. But, if used in high concentration and applied over a large surface on the body with friction, the absorption of the drug is quicker and causes toxic symptoms.

MILK FEVER IN A BUFFALO

BY

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Subject.—A Murrah buffalo, aged about five years, purchased by her owner from the Government of Orissa, about two years ago.

History and symptoms.—On 7-12-51, the buffalo gave birth to a healthy female calf, the parturition being quite easy. This was her second calving. After her first calving, which was about 18 months ago, she gave an average of 14 seers of milk per day and was maintaining good condition. On 8-4-51, at about 6 P.M., nearly 36 hours after calving, the animal took ill quite suddenly. She was completely prostrated and was in a state of semi-consciousness. The body was cold to the touch and the temperature

was 99.8°F. The pulse was 25 to 29 per minute while the respirations were shallow. The pupils were dilated and there was an aqueous discharge from the eyes. The udder was flabby and there was no milk secretion. Rumen was slightly tympanic.

Diagnosis.—Milk fever (Parturient Apoplexy)

Treatment.—Injected intravenously 300 c.c. of a 10 per-cent-solution of Calcium Gluconate, at body temperature, with the help of an ordinary 20 c.c. Record syringe for want of any better equipment. Adrenalin, 10 c.c., was given intramuscularly. Next morning i.e., on 9-12-51, the animal was much improved. She was standing and chewing grass. Early morning she had passed nearly four pints of urine and a good quantity of dung. Temperature was 100.4° F; respiration 10 to 12 and pulse 35 to 37 per minute. Again, 200 c.c. of a 10 per-cent. Calcium Gluconate solution was given intravenously. On 10-12-51 the animal was perfectly alright and went out for grazing. The lactation started on the fifth day and the patient was declared cured. The owner was advised to feed the animal with laxative and nutritive feeds.

Remarks.—Though milk fever in milch cattle is common in all parts of the world where high-yielding milch cattle are reared, and is also sometimes observed in milch goats and ewes after lambing, cases among buffaloes are rare and hence the interest in this case.

My thanks are due to Dr. R. M. Patnaik, Private Practitioner of Soro, for all help rendered.

Abstracts and Extracts

Zoonoses

Following many requests by member nations to WHO and FAO for assistance in the field of zoonoses, a WHO/FAO Group on Zoonoses was organised and convened in Geneva, 11-16 December 1950, to formulate recommendations on zoonoses for the guidance of WHO and FAO. The report of this Committee has been published by the World Health Organisation and it contains very valuable information.

Zoonoses are those diseases which are naturally transmitted between vertebrate animals and man. A list of zoonoses, comprising more than 80 diseases, is contained in Appendix 1.1. The field of zoonoses is one of the major branches of veterinary public health and includes the etiology, pathogenesis, diagnosis, transmission and control of these diseases.

Veterinary public health is all community efforts influencing and influenced by the veterinary, medical arts and sciences applied to the prevention of disease, protection of life and promotion of the well-being and efficiency of man.

Traditionally, veterinary medicine is responsible for the protection of human life against those hazards which results from contact with diseased animals, consumption of the tissues or products of diseased animals, and animal products contaminated during the processing and delivery of such foods to the consumer. These functions are of basic importance in the public health programme. The practice of veterinary public health forms an important consideration in the attainment of health as defined by the WHO: "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity."

The term veterinary public health* is relatively new in the English language, but it has already gained wide acceptance. The group feels that the term describes well the modern concepts of the responsibility of veterinary medicine to the health of the public.

The public health veterinarian is responsible for a variety of duties which include the following :

- (a) Promotion of activities to eradicate animal diseases transmissible to man.
- (b) Supervision of inspection and hygiene of all foods of animal origin.
- (c) Consultation and liaison with voluntary or official agencies, such as farm organisations, professional groups, and health and agriculture departments.
- (d) Development of special statistical service with reference to zoonoses.
- (e) Research activities in public health sciences.

The above activities are veterinary public health functions regardless of the institution or agency which assumes or is charged with the responsibility for their performance. It is not necessary that they invariably be performed under the direction of a public health agency. The group feels, however, that these functions can be most effectively pursued by specific administrative units within governmental public health organizations, whether in economically advanced or lesser developed countries.

Effective performance of veterinary public health services depends upon the employment of properly qualified personnel trained to work as an integral part of public health organization. For this reason advance public health

* Some translations recommended by the group are: French—hygiène publique vétérinaire; Spanish—salud pública veterinaria; Italian—sanità pubblica veterinaria; Portuguese—saúde pública veterinária.

training is a highly desirable part of the educational background for veterinarians engaged in these activities. Suggested educational qualifications for public health veterinarians will be found in Appendix 7.

The diseases dealt with in the report are the control of Tuberculosis in cattle, Q fever, the control of Anthrax in agriculture and industry, Psittacosis (Ornithosis) and Hydatidosis. The other two major zoonoses, rabies and brucellosis, have been considered in reports published separately.

The recommendations on Bovine Tuberculosis are interesting and they are as follows:—

The seriousness of bovine type infection in man acquired from milk and other animal products is emphasised. Air-borne infection to attendants in infected barns is also a serious task. Heat treatment of food products greatly reduces the risk, but the eradication of bovine tuberculosis is the only means of eliminating the danger of air-borne infection.

The tuberculin testing of all cattle and the separation of the reactors from the non-reactors is the only method of controlling and virtually eradicating tuberculosis that has proved successful on a large scale.

All reacting animals may be slaughtered, but this is not necessary in the early stages of a control scheme. Whatever method of segregation is used the efficiency of the work depends on the performance and interpretation of the tuberculin test.

Tuberculosis-free herds have been heavily infected from attendants with "open" tuberculosis caused by the bovine type of organisms. Attendants infected with the human type of organism may sensitize cattle to tuberculin, and for this and other reasons, the group recommends that there should be supervision of the health of milkers and attendants.

It is unlikely that any one method of tuberculin testing will be universally adopted but it is recommended that standard mammalian and avian P.P.D. tuberculins should be developed. Standard strains of tubercle bacilli, methods of producing tuberculin and standard tuberculin should be made available.

It is possible that vaccination may assist the progress of eradication under certain conditions in heavily infected herds, but the group recommends that straight forward eradication should be carried out wherever possible.

This report contains recommendations for international action indicated for the study and control of the major zoonoses, international sanitary and quarantine measures for zoonoses and for correlating work on the standardization of biological products for both human and veterinary use.

Brucellosis

Early in 1950, the FAO and WHO, upon request of their member countries, undertook a joint programme for combating brucellosis. A FAO/WHO Expert Panel on Brucellosis was formed, and 12 FAO/WHO Brucellosis Centres were designated in various countries to forward work in this field.

The Third Inter-American Congress on Brucellosis was held in Washington in November 1950. In view of the presence of many members of the FAO/WHO Expert Panel on Brucellosis at the Congress, meetings of the panel were convened from 7-13 November, during and after the Congress.

The report of this joint FAO/WHO Expert Panel on Brucellosis has been published by the World Health Organization and the following information contained in that report gives a brief resume of the position in regard to Brucellosis.

Brucellosis has proved to be one of the most difficult disease problems. A great amount of research still needs to be done for a better understanding and solution of some phases of the disease. It is felt by the panel, however, that there is now sufficient knowledge and practical experience to undertake satisfactory programmes of diagnosis, control and eradication in the various areas of the world.

The important aspect of Brucellosis as a world problem are essentially two-fold:

- (1) the public health significance; and
- (2) the economic loss to animal industry.

The public health significance of Brucellosis includes not only the direct or indirect transmission of the disease from infected animals to man, and the consequent illness, physical incapacity and loss of manpower, but also the serious diminution of needed foodstuffs, especially animal protein, which are essential to human health and well-being. Since brucellosis is not generally transmitted from person to person, the prevention of human infection is dependent upon the control and elimination of this disease in animals.

In many areas of the world Brucellosis contributes largely to a low standard of living. The economic losses attributable to Brucellosis in animals are caused by abortion or premature birth, decreased milk flow, and temporary or permanent infertility in infected livestock. Where a vigorous campaign against Brucellosis in animals has been carried out, great savings to the national economy have resulted. In the United States, for example, it is reliably estimated that the reduction of the incidence of bovine brucellosis by one half has resulted in a saving of 50 million dollars annually to the livestock industry. In Norway, where Brucellosis of cattle has been almost completely eradicated,

the cost of the entire programme was less than the estimated annual loss formerly caused by this disease.

Although *Br. abortus* commonly infects cattle, *Br. suis*, swine, and *Br. melitensis*, goats, infections with any of the three species of *Brucella* may occur in all domestic animals and man.

The reporting of animal and human Brucellosis is of major importance as a basis for the control of the disease. Accurate reporting and statistics enable proper evaluation of the disease problem, which will provide the justifications for necessary research and control procedures. Statistics also enable Governments to measure the progress of their control efforts. In order to develop a good reporting system based on statistical methods, properly trained personnel are necessary for the collection and interpretation of data. Education of the public and medical and veterinary professions, and legislation, are necessary to inaugurate such a system. The panel recommends, therefore, the enactment by all governments of legislation to make brucellosis a reportable disease in man and animals. Governments collecting data on brucellosis should exchange information on reported brucellosis with FAO, OIE (Office International des Epizooties) and WHO, and should distribute this information to the interested agencies within their countries.

Breeders plan for animal improvement in tropics.—F.A.O. BULLETIN, Vol. V, No. 2, July 1950.

One of the most difficult problems facing agricultural leaders of tropical and sub-tropical countries is that of livestock improvement. Tropical and sub-tropical environments place many limitations on efficient livestock production. A type of cow that has high milk production records in a temperate region may not even be able to survive in a tropical climate. On the other hand, the animal native to the tropics withstands the climate, but may be a poor worker, or a poor producer of milk or meat.

Tropical countries, like other countries, view livestock improvement works fundamental to the improvement of agriculture, to ensure both proper balance in the diets of the people and adequate humus for the soil.

The foremost government workers in animal husbandry from 13 countries with tropical or subtropical climates came together at Lucknow, India, February 13-22, to study their mutual problems in the field of livestock breeding. The meeting was convened by FAO.

The delegates agreed upon a list of conclusions and recommendations but, more important, they exchanged information with each other as to the work their countries have been doing in improving livestock breeds. They found some obstacles that impeded the work of all countries, and their recommendations were aimed at smoothing the way for further

research and development. For example, reports from most countries indicated the need for better yardsticks for measuring performance in livestock. It was recommended that governments consider developing, as far as possible, suitable performance measurements that would be uniform among countries.

In connection with the meeting, many of the delegates visited places in India where the various techniques and progress discussed might actually be seen.

The report of the meeting is being issued as a report for limited distribution to government technicians under the title "Improving Livestock under Tropical and Subtropical Conditions."

International center on foot and mouth disease proposed.—F.A.O. BULLETIN, Vol. V, No. 2, July 1950.

An international center to study, classify, and maintain strains of the virus which causes foot and mouth disease was proposed by Veterinarians and other representatives from 32 countries at a meeting in Paris May 13-20. The meeting was sponsored jointly by the Office International des epizooties and FAO.

The international center envisaged would be a center of reference and for storing and maintaining the various strains of the virus which causes this extremely contagious disease of cattle, sheep, goats, swine, and other cloven-hoofed animals. After an attack of the disease an animal becomes immune but only to the particular strain which caused the attack. Similarly, vaccines will protect an animal only against the particular strain of the disease from which the vaccine is manufactured. Thus veterinarians have generally agreed that one of the first problems in controlling the disease is to identify these virus strains. Since some countries in which the disease is prevalent do not have adequate facilities at the present for such work, the international center was proposed, and it was agreed that funds to maintain the center should come from an international source.

Dr. I. A. Galloway of the United Kingdom announced to the meeting that his Government is prepared to offer the facilities of the Research Institute of the British Foot and Mouth Disease Research Committee at Pirbright, if international funds are available to expand existing facilities and take care of increased maintenance costs. The meeting recommended that this offer be accepted, and that international funds be sought. The recommendations from the meeting will be reported to the FAO conference at its next session.

Delegates were optimistic on the control of foot and mouth disease, noting in an official declaration that "with existing means and through the implementation of all appropriate and proved measures, it is possible: (a) to protect countries free from infection: (b) to control and eradicate sporadic outbreaks.....; and (c) to reduce losses, and even eradicate the disease in countries where it exists in an endemic state."

A regional approach in developing a concerted attack on this disease was urged. The meeting asked that FAO, in co-operation with OIE, call regional meetings to set up regional committees, particularly in enzootic areas (where many animals are affected at the same time) and where such regional committees do not already exist.

The meeting expressed satisfaction with offers of various governments to provide training facilities for specialists of other countries, and urged that governments, on request, make their veterinary experts available to other governments to advise on foot and mouth disease research or vaccine production.

The importance of co-ordinated system for reporting the course of the disease in various countries and outbreaks was discussed. The President of the Office international des epizooties, Sir Daniel Cabot, said that the Office would be very willing to receive reports of outbreaks and the disease position and to circulate the information immediately to all countries.

While vaccines in use now are effective, the meeting emphasized that research must be continued in order to improve their effectiveness and methods of application. It recommended that every effort be made in an attempt to make vaccines available at a lower cost, and that international funds should be found to help countries not in a position to produce vaccines.

Hybrid rice breeding program launched.—F. A. O. BULLETIN, Vol. V, July 1950.

A hybridization project aimed at improving the rice crop of South-east Asia and other rice-producing areas has been launched by FAO in co-operation with interested countries. The project is one part of a comprehensive rice breeding program for South-east Asia initiated a year ago by the International Rice Commission.

The hybridization project will involve crossing varieties of the Indica and Japonica groups of rice to secure varieties which will combine the best qualities of each group. The crossing of these varieties will be done at the Central Rice Research Institute of India, Cuttack, India, 180 miles southwest of

Calcutta. Dr. K. Ramiah, Director of the Institute and chairman of the Rice Breeders' Working Party of the Rice Commission, will be responsible for immediate supervision of the work. After the seed from the crosses is harvested it will be sent to the countries from which parent stock were received for testing.

Already, many of the rice-growing countries have sent seed of their most important varieties of India groups and Japan has sent selected Japonica varieties to Cuttack where they are being planted as the basic material from which the crosses will be made.

One of the great advantages of a hybridization program is that through selection and crossing a variety may be produced which meets the particular needs of a certain region. Thus in crossing for new varieties of rice, parents will be chosen to fit the specific requirements of each participating country. For example, blast (*Piricularia*) is a serious rice disease in India and Japan, but it does not greatly limit rice yields in Burma, Ceylon, Indonesia, and Thailand. For these countries it may be more important to develop a variety which resists the rice stem borer, one which stands up better in the field, or one which does not shatter.

The primary aim of rice breeding in Asia and the Far East is increased yield. FAO plant industry technicians believe that the rice farmers of Southeast Asia, for example, could increase their production 50 percent by using good seed varieties. Apart from the poor fertility conditions under which rice is grown, low yields are almost always due to limitations of the varieties themselves. Rice breeders consider that susceptibility to plant diseases and to attack by insects is the most serious limiting factor, but there are many others.

In some areas, for instance, if an early maturing variety were available it would be possible to grow two crops each season instead of one. Early varieties require less water. They tend to be shorter strawed and produce less vegetative growth, making them better adapted to mechanized farming. And in Japan, where rice improvement work is well advanced, it has been demonstrated that some of the earlier maturing varieties are among the heavier yielders.

In addition to producing the first generation hybrids, the Institute at Cuttack will distribute seed of the second generation to the other rice-breeding stations participating in the project. Rice breeders from Burma, Ceylon, India, Indo-china, Indonesia, Japan, Malaya, Thailand and the United States of America attended the meeting of the Rice Breeders' Working party in February at which the hybridization project was recommended. Egypt and the Philippines are also represented in the Working Party.

Observations on the Cytoplasmic drop and Cytoplasmic cap in Sperm development in domestic sheep, domestic goats and wild barbary sheep (*Ammotragus Lervia*). BY C. K. RAO, B.V.Sc., M.S. (Calif) and R. O. BERRY, *Ind. J. Vet. Sci.* Vol. XX, Part 1. (Author's summary).

In the ram, goat and Barbary sheep, the cytoplasmic drop is present at various levels on the sperm, depending on the region from which they are collected and on their stage of development. The cytoplasmic drop may be found in any of the following locations on the sperm.

1. Surrounding the posterior half of the head.
2. Surrounding the neck of the sperm and continuous with the base of the head.
3. At the anterior end of the connecting piece.
4. On the connecting piece at various levels between the two extremes.
5. At the posterior end of the connecting piece.

The first two types are restricted to the testis, the third is found in the head of the epididymis and the fourth type in the body of the epididymis and are most abundant in the central part or middle third of the body. The fifth type of sperm is found in large numbers in the lower third of the body of the epididymis, some in the tail of the epididymis. The descent of the drop is controlled by internal factors and not by the secretions of the epididymis. The cytoplasmic drop is associated with the development of the sperm and probably performs a nutritive function. Its function appears to be complete when it reaches the posterior end of the connecting piece; their extrusion is brought about by active movement of the sperm. Sperm with posterior drops should therefore be considered as physiologically mature and normal.

Sperm with filiform connecting piece and those with a tortuous connecting piece presumably represent early and successive stages in sperm maturation.

The cytoplasmic cap is a constant feature on the sperm from all levels of the reproductive tract in these animals and is found both on morphologically normal and abnormal sperm. It is always most pronounced in the sperm from the deeper regions, but can be readily observed on most of the ejaculated sperm.

The sperm of these species are in maximal motion in the tail of the epididymis probably owing to the lowered viscosity and reduced sperm concentration. While the necessary secretions serve the dual purpose of adding bulk and stimulating sperm motility they are not essential for the initiation of sperm movement.

Studies on a Serological Test for the Diagnosis of Tuberculosis in Cattle.—BY S. FISHER, M.B., B.S., B.Sc, T. S. GREGORY, B.V.S.C., Dip. Bact., The Australian Veterinary Journal, February 1951.

In countries where plans for the control and eradication of Bovine Tuberculosis are being implemented accuracy in the diagnosis of that disease is of paramount importance. It has been generally recognised in recent years that despite its high order of reliability as a biological test, the intradermal tuberculin test when applied on a large scale is neither sufficiently specific nor sufficiently accurate. The authors have therefore conducted studies on a Serological test as an aid to the diagnosis of Tuberculosis in cattle and these are described in this article. The test, as given in the Author's summary of the article, is based on the haemolysis of sheep erythrocytes, coated with an extract of the human type of tubercle bacillus, which occurs if appropriate antibodies and guineapig complement are present.

Examination of sera from cattle experimentally inoculated with heat killed mycobacteria showed that antibodies causing haemolysis in this test were produced not only by inoculation of mammalian types of tubercle bacilli but also by inoculation of the avian type of *Mycobacterium johnei*.

By examination of sera from 224 adult cattle presumed, on good evidence, to be free of natural infection with these mycobacteria a range of titres was obtained which was accepted as being indicative of the range for normal antibodies.

When the sera from 40 tuberculous adult cattle selected from several herds were tested, 85 per cent gave a positive reaction. Among the 15 per cent. which gave a negative reaction was serum from a cow with extensive lesions of tuberculosis and probably a "spreader" of the disease. Sera from 9 out of 10 calves with active lesions of tuberculosis failed to give a positive reaction.

Despite its lack of specificity in respect of sera from cattle infected with organisms within the mycobacterial group and its failure to detect a higher percentage of tuberculous cattle, the test appears to be less likely to give "false positive" reactions with sera from tuberculosis-free herds than is the case with other serological tests.

It is suggested, therefore, that the haemolytic test might find a useful application in a preliminary survey of herds likely to be brought under control or eradication measures associated with tuberculin testing. It should give a reliable indication of the herds or districts most seriously affected with bovine tuberculosis.

It is also probable that the test would prove a useful means of detecting individual animals infected with *Mycobacterium johnei* in a herd known to be affected with Johne's disease.

Give Racing A Fair Deal

In the world of racing, quite a few thrive on the diet of darkness, doubt and dispute. But the darkness cast over racing in India in general, and Western India in particular, is of an entirely different nature. It is due to the cloudy thinking of the authorities. They argue that racing is an evil because there is gambling attached to it and as such whatever money derived from it is "tainted money". That is exactly where they are wrong.

Let us examine the two sides of the question, even if it means a little repetition of what I have already said in these columns in the past. According to some of our over-zealous Ministers, on the debit side of racing is the ruin brought to many families by gambling.

But by abolishing racing, are the authorities certain that they will also eradicate gambling? What is there to stop people from indulging in illegal gambling in other channels? It is human nature. The more you are ordered to do a thing, the more you resent it and the more you want to do it. That is why the sooner some of the Ministers stop treating the public as so many school children the better for the State which they are said to govern.

Expert's Views.—I am sure that even the most puritanical will agree that gambling as such is not bad. There is nothing wrong if you have a flutter or two within your means. After all, life itself is a gamble. And who could be more qualified to express an opinion on this subject than Lord Goddard, the Lord Chief Justice of England, who, in his evidence before the Royal Commission on Betting stated:

"I have never seen any reason, moral or otherwise, why a man should not make a bet if he so wishes. So long as he confines his bets or the playing of games of chance to stakes within his means, I have never understood the objection.

"If he bets or games to excess, it is the excess which must be deprecated since it may lead to crime; but this is true of very many things. It is exactly like drink. I am neither injuring myself nor any other person if I spend something that I can afford on a bottle of wine or spirits. If I drink to excess that is quite another matter, which may lead to all sorts of untoward results; and this is also true of gambling in whichever form it takes, whether on the racecourse, stock exchange or elsewhere."

Here are the views of an eminent legal authority, known throughout the Commonwealth of Nations and in other democratic countries for his sagacity, integrity and high principles. Surely, he would not like to see his own countrymen embracing the path of evil?

So much for the debit side. Now let us examine the credit side of racing in which gambling is merely one cog in a huge wheel of national importance. Racing, including the breeding side of it,

- (1) Provides employment to thousands of people like trainers, jockeys, riding boys, syces, saddlers, forage suppliers, grass-cutters, dealers in hay, vets, labourers, clerks, etc.
- (2) It provides recreation for some, thrills for many and entertainment for all who flock to the course every meet.
- (3) The State benefits to the tune of about Rs. 2 crores every year.
- (4) Hospitals and other charities are able to carry on from the large sums received from the Turf Club every season.
- (5) The National Sports Fund owes its existence to racing.
- (6) The Indian Thoroughbred made tremendous progress in the forties through the foresight of Mr. K. M. Munshi. It is now threatened with extinction. Was there an Indian at Mahalaxmi who was not proud to witness the glorious triumphs of great Indian horses like Bucephalus, Her Majesty, Philanthropist, Balam, Prince of Ramgarh, Gold Street, Maharaj Pramukh and many others? Our studs were and are capable of producing still better animals, but they have been denied the opportunity.
- (7) Even today the Army urgently needs good horses and India has to spend large sums of badly needed money on importing them. Only the other day, we were told that efforts were being made to train wild donkeys from the jungles of Saurashtra.

Almost four years ago, among the many to sound a note of warning was Sir Sultan Chinoy who, without mincing words, pointed out the disaster which then threatened the National Horse Breeding Industry through the short-sighted policy of the Government. But, so far, all that seems to have fallen on deaf ears.

Almost every notable Congressman appears to be in favour of the continuance of racing. Some time ago, Dr. P. Subbaroyan, the then Indian Ambassador to Indonesia and former President of the Board of Control for Cricket in India, took up the cudgels on behalf of the racing fraternity. Rajaji has always actively supported race meets by even donating trophies. Pandit Nehru is all for the horse. The present Finance Minister, Mr. Deshmukh, fully realises the importance of racing to the country and its exchequer.

Mr. Munshi's Outburst.—Many others have cried aloud at the mess that is likely to be made if racing is discontinued from 1953. Only the other day, Mr. K. M. Munshi, the Minister for Food and Agriculture, almost wept a tear or two and said:

"I feel sad, very sad indeed, that the country has neglected the horse in the scheme of national well-being... With the birth of freedom, we entered into an age of transition when the line between moral wrong and legal wrong tends to be blurred. At such times, schemes of swift redemption of human weakness by the seemingly easy method of legislative coercion find favour with zealous temperaments, and racing sometimes becomes an easy prey. It was, therefore, not possible for me, as one in charge of animal husbandry, to make any organised attempt at horse breeding. This is one of the great mistakes of my ministerial career... But my sadness is relieved by my certain knowledge that the attempt—enforcing sinlessness by legislative coercion—is sure to run out, as it had always done in the past. The horse will surely come into his own; the racecourse will flourish unafraid."

Let us in all sincerity humbly hope that with the formation of the new Ministry in Bombay, the authorities will take a saner view of the tremendous issues involved.

"Illustrated Weekly of India"
January 20, 1952.

Pioneer Of Indian Horse Breeding Industry

The Indian Derby which will be run at Mahaluxmi on Sunday, (20-1-'52) should attract thousands of sportsmen, who are thrilled by the spectacle of choice thoroughbreds vying for supremacy. This year's blue riband will be the tenth of the series. For very long the Indian horse was considered inferior to the imported variety and given little opportunity to vindicate itself.

Some busybodies are now taking the credit for the remarkable development of the home-bred product. In our lengthy association with racing on this side of the country we can modestly claim to have advocated the cause of the Indian-bred. Years ago one invited ridicule if any plea was made on behalf of country-breds.

Our horses were given this appellation with malice afore-thought. It was believed that in common with anything produced in India the horse was also inferior and unworthy of serious consideration.

The true champion of the Indian horse was the late Major J. D. Vanrenen who fought single handed to remove the prejudice against country-breds. From his famous stud at Renala he offered to match the home-bred against foreign horses. The Turf Clubs in this country which were controlled by the British military caste at the time were unmoved by his pleas. The die-hards naturally stood up for the foreign thoroughbred which provided a lucrative market for their countrymen.

We had occasion to meet Major Vanrenen and were convinced by his bold advocacy of the Indian horse. He was a pioneer in the true

sense of the word. Later when a campaign was launched to kill the prejudice against Indian breeds, we were instrumental in sending the great Irish stallion, Owen Roe, to the Renala stud. The son of Battleaxe sired horses like Cartoon, Redress and many other brilliant performers who beat imported animals.

These feats opened the eyes of the prejudiced and a few races were provided for Indian horses by the R.W.I.T.C. Within twenty-five years remarkable changes have taken place and now the bloodstock industry has a stake in the national economy. While credit must be given to Mr. K. M. Munshi for realising the possibilities of the Indian horse, the spade work was done by a few disinterested persons connected with the press.

To Major Vanrenen and these forgotten champions of the Indian horse we owe the classics which are now a joy to all lovers of horses. Races have been named in honour of nonentities as far as the sport is concerned. It is not too late for the R.W.I.T.C. to pay a suitable tribute to the late Major Vanrenen, a real pioneer of the Indian bloodstock industry.

— "Sporting Times" 18-1-52.

Priority to Fodder

Two schemes concerned with the improvement of livestock have been introduced at Anand in Bombay State simultaneously with the inauguration there of the first of twenty multipurpose rural development projects. One aims at upgrading the breed of cattle in the area by means of artificial insemination, thereby also making available pedigree bulls for livestock breeding in other villages. The other scheme is for a research station which will deal with different problems concerning cattle feeds. Both the schemes should be fruitful in an area where a flourishing dairy industry has grown up in the past few years following the Bombay Government's scheme to obtain milk supplies from Anand. The few artificial insemination centres which are working in this country have evoked an encouraging response from the villagers and the Anand milk producer who has already realised the benefits of increasing milk yields, will undoubtedly co-operate in a scheme designed to increase his income by improving the breed of his cattle. Scientific feeding is even more important than breeding for increasing milk production, and the cattle feeds research station is assured of a willing adoption by the villagers of the improved feeding methods that it may evolve. But while the two schemes will benefit the local villagers, their results will have a limited application in the surrounding villages so long as the basic cause responsible for the extremely poor condition of the nation's cattle wealth is not removed.

The Royal Commission on Agriculture which reported in 1928 found that there was a chronic famine of fodder during the hot weather months

and even in the remaining months of the year the cattle subsisted on a highly inadequate ration. Conditions since then have grown worse. The increasing pressure of human population on land has meant almost the virtual disappearance of grazing lands, and the villager has still to be taught the importance of growing leguminous plants both as cattle fodder and as suppliers of necessary nutrients to the soil. The cattle are thus forced to roam about in search of food causing in the process much damage to forest lands. The Royal Commission had observed: "The two important factors in cattle improvement are feeding and breeding. We place feeding first because no outstanding improvement in the way of breeding is possible till cattle can be better fed". During the past years this dictum has acquired a greater and more urgent degree of validity. Well-bred livestock will be no better than ill-bred cattle if they are not to be fed properly. The Planning Commission too has recognised the urgency of the problem which is closely inter-connected with agricultural practices and the raising and care of forests. The implications of this integrated issue do not, however, seem to have been widely recognised, and so long as they are not, the country's agriculture, forests and livestock will continue to deteriorate. Some awareness of this eventuality was shown by the Union Food Minister in March last when he promised early introduction of a Bill for livestock improvement on an integrated pattern for application in the centrally administered areas. That promise has still to be fulfilled.

— Times of India, 4-2-52.

Association News

MADRAS VETERINARY ASSOCIATION

Proceedings of the Annual General Body Meeting of the
Madras Veterinary Association held on 16-12-1951
at the Madras Veterinary College.

Members present:

- | | |
|--|------------------------------|
| 1. Swaminathan, R. Rao Bahadur
(President of the Association) | 17. Pangal Srinivasa Rao |
| 2. Alwar, V. S. | 18. Ramachandran, A. |
| 3. Azizuddin, I. M. | 19. Rama Rao, P. |
| 4. Babu, E. V. | 20. Ranganathan, M. |
| 5. Bertie A. D'Souza | 21. Ravi Varma Hedge, V. |
| 6. Bharadwajan | 22. Sastri, M. S. |
| 7. Chandrasekharan, K. P. | 23. Satchidanandam, V. |
| 8. Ganapathy, M. S. | 24. Satyendra Rao, P. |
| 9. John, C. I. | 25. Soundararajulu, P. |
| 10. Krishnappa, K. S. | 26. Veeramony Iyer, R. |
| 11. Krishnaswamy, K. S. | 27. Velayudhan Nair, C. K. |
| 12. Krishna Rao, M. V. | 28. Venkatarathnam, G. |
| 13. Lakshminarasimhan, A. | 29. Venkataswamy, V. |
| 14. Mantramurti, I. D. | 30. Venkatesulu Naidu, P. G. |
| 15. Muthugopal, M. | 31. Venkateswara Rao, C. |
| 16. Osman Khan, G. | 32. Umamaheswaran, V. |
| | 33. Wilson, F. D. |

As he happens to be the Secretary of the All-India Veterinary Association, the President assured that that body was gaining more and more strength and as such the Madras Veterinary Association would do well to keep up the link with the All-India Veterinary Association. The President further regretted about the poor bank balance held by the Madras Veterinary Association and requested all the members to pay up the arrears of and also enlist as many new members as there are Veterinary Surgeons in this State.

There being no further discussion, the proposition for the adoption of the report was carried unanimously.

Dr. M. S. Sastry, the founder of the Association, spoke about the link between the State Association and the All-India Veterinary Association and requested as many members as possible to attend the coming meeting of the All-India Veterinary Association.

The General Body then elected the following members to represent the Association in the All-India Veterinary Association meeting at Bombay:

1. Dr. R. Swaminathan.
2. Dr. M. S. Sastry.
3. Rao Sahib Sri T. Vinayaka Mudaliar.
4. The Editor of the Indian Veterinary Journal.

The General Body then considered certain amendments to the Rules and bye laws of the Association and passed the same.

The following resolutions were passed:

1. Resolved to appeal to the Profession for generous contribution towards Panikkar Memorial Fund as well as for the Kailasamier Memorial Fund to enable the Association to institute medals to be awarded by the University of Madras.—vide appeal enclosed.

2. Resolved to request the Government to expedite the formation of the Madras Veterinary Council and the registration of Veterinary Practitioners in this State.

Explanatory note.—This resolution is a reiteration of resolution No. 8 of 1944. This envisages the formation of a Veterinary Council which will regulate the Code and Ethics of all the members of the profession. Such a Council will also be a liaison between the State and the Central Veterinary Council proposed to be formed on an All India basis. Further, to enable the formation of such a Council, the first requisite is the registration of all practitioners in this State as is done in the sister medical profession.

3. Resolved to reiterate the resolution passed in the previous general body meeting on the subject of gazetting all the Veterinary Assistant Surgeons in the service of this State as has been done in the sister Medical

and Public Health departments, and request the Government to take early steps in the matter.

Explanatory note.—The only qualification now available under Veterinary Education in this province is the degree of B.V.Sc. and the course is a fairly difficult one comparable to the degree of M.B., B.S. Hence, to attract the right type of personnel both to the College and the department, it is very necessary that these degree holders also are given a status and position in the department. In recent years many Veterinary Assistant Surgeon have taken up posts outside the province on attractive scales. Hence the need to Gazette the Veterinary Assistant Surgeons also.

4. Resolved to reiterate the following resolution which had been passed already in a previous Provincial Veterinary Conference and request the Director of Animal Husbandry to take necessary steps in the matter:

That this Conference notes with regret that in spite of repeated representation that Vety. Asst. Surgeons are the most competent persons for the inspection of meat, slaughter houses, hackney horses and ponies, their services are not still fully utilised for this purpose and requests the Government to make it obligatory on the authorities concerned to utilise the services of these officers for the abovementioned purposes.

This resolution is self-explanatory.

The election of the President and the Managing Committee took place.

Rao Bahadur R. Swaminathan was re-elected as President unanimously.

The following members were elected to the Managing Committee.

Messrs. Dr. I. M. Azizuddin.	Messrs. C. I. John.
" Bertie A. D' Souza.	" K. S. Krishnappa.
" Pangal Srinivasa Rao.	" Muthugopal.
" I. D. Mantramurti.	" Satyendra Rao, P.
" C. K. Velayudhan Nair.	" Krishna Rao, M. V.
" V. S. Alwar.	" K. P. Chandrasekharan.
" G. Venkataratnam.	" M. S. Ganapathy.

The Managing Committee then elected Sri M. S. Ganapathy as the Secretary and Sri K. P. Chandrasekhan as the Treasurer.

With a vote of thanks from Dr. Azizuddin to the Chair and the members present, the meeting terminated.

M. S. GANAPATHY,
Secretary.

PANIKKAR MEMORIAL FUND**APPEAL TO THE PROFESSION**

In an earlier appeal the profession was requested through the columns of the Indian Veterinary Journal for its generous contribution towards the above Fund. Since the abolition of the Diploma course at the Madras Veterinary College, the medal has now to be awarded to the best outgoing B.V.Sc. Degree holder. For this purpose, a sum of Rs. 2,000/- at least has to be deposited with the University so as to enable it to present the award of the medal during the Convocation. At present we have on hand only a sum of Rs. 1,133/-. We request the profession again to contribute liberally towards the Fund so that the target may be reached as quickly as possible at least by next Convocation, in August 1952.

KYLASAMIER MEMORIAL FUND

We have appealed to the profession earlier through the columns of the Indian Veterinary Journal for generous contribution towards the above Fund. Sufficient amount has not yet been realised to institute a prize in the name of late Kylasamier. So we request once again all the members of the profession, particularly the students of late Kylasamier, to contribute liberally towards the Fund.

In this connection, the following resolution was passed by the General Body of the Madras Veterinary Association at its meeting held on 16-12-1951 at the Madras Veterinary College:

"Resolved to appeal to the Profession for generous contribution towards Panikkar Memorial Fund as well as for Kailasmier Memorial Fund to enable the Association to institute medals to be awarded by the University of Madras".

In furtherance of the above resolution, a sum of Rs. 160/- (list appended separately) was subscribed on the spot by the members present at the General Body meeting held on 16-12-1951.

All contributions may please be sent to the Secretary, Madras Veterinary Association.

M. S. GANAPATHY,
Secretary.

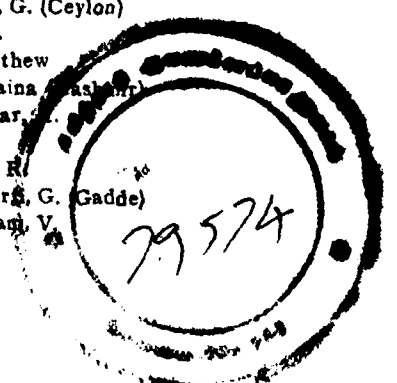
List of Subscribers

	Rs.		Rs.
1. Dr. Azizuddin.	20	13. C. Bharadwajan.	5
2. M. S. Ganapathy.	10	14. P. Srinivasa Rao.	5
3. M. Muthugopal.	5	15. M. S. Sastry.	5
4. V. S. Alwar.	5	16. K. S. Krishnappa.	5
5. G. Venkataratnam.	5	17. M. V. Krishna Rao	10
6. V. Umamaheswaran.	5	18. K. P. Chandrasekharan.	10
7. A. Lakshminarasimhan	5	19. G. Osman Khan	10
8. V. Satchidanandam.	5	20. F. D. Wilson.	5
9. V. Venkataswami.	5	21. C. Venkateswara Rao.	5
10. A. Ramachandran.	5	22. C. K. Velayudhan Nair.	10
11. P. Satyendra Rao,	10	23. M. Ranganathan.	5
12. C. I. John.	5		

College News**Madras Veterinary College Examination Results.**

Of the 51 candidates, who took the recent B.V.Sc. Degree Final (N. R.) Supplementary Examinations, December 1951, 46 have passed and they are as shown below:—

- | | |
|-----------------------------------|------------------------------------|
| 1. Abdul Khuddus, C. (Mysore). | 24. Nagarajan, V. V. |
| 2. Achyutan, H. N. | 25. Narayanamurti, G. V. |
| 3. Amiya Krishna Patnaik (Orissa) | 26. Narayanan, S. |
| 4. Ayyalmswami, P. | 27. Palaniswamy, S. |
| 5. Bapanayya, M. | 28. Pararajasingham, G. (Ceylon) |
| 6. Bhaskaran, N. V. | 29. Parthasaradhi, E. |
| 7. Bhaskaran, R. | 30. Paul Arimpur Mathew |
| 8. Dhandapani, S. M. | 31. Radha Kishen Raina (Mysore) |
| 9. Dhandapani, K. | 32. Ramakrishna Ayyar, |
| 10. Fredrick Salvanayagam | 33. Rangaraj, S. |
| 11. Ganapati, C. N. (Coorg). | 34. Santanakrishnan, R. |
| 12. Gopalakrishnan, C. A. | 35. Satyanarayanamurti, G. (Gadde) |
| 13. Govindaraghavan, M. | 36. Shammugasundaram, V. |
| 14. Gurudatta Rao, K. | 37. Srikrishnan, V. |
| 15. Janakirama Rao, P. | 38. Srinivasan, R. |
| 16. Kannamani, G. | 39. Srinivasan, V. V. |
| 17. Krishnamurti, V. | 40. Subba Rao, V. |
| 18. Krishnan Unni, N. | 41. Thurley, T. M. |
| 19. Lakshminarayana Sarma, P. | 42. Veluchami, R. |
| 20. Madhusudan, P. | 43. Venkatesan, E. S. |
| 21. Muhammad Sheriff Ahamad | 44. Venkateswara Rao, V. |
| 22. Naganathan, N. | 45. Venugopalan, A. |
| 23. Nagarajan, R. | 46. Viswanatha Rao, K. |



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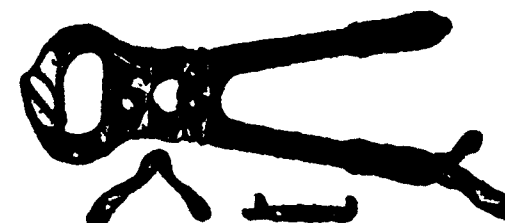
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