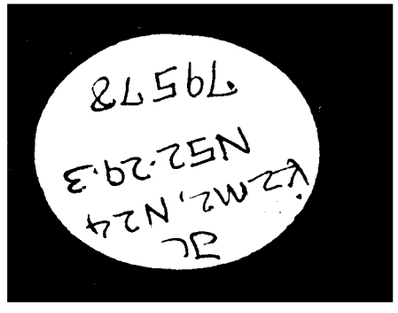
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A BI-MONTHLY RECORD OF VETERINARY SCIENCE.

DEVOTED TO THE CAUSE OF THE VETERINARY PROFESSION

(ESTD. 1924)

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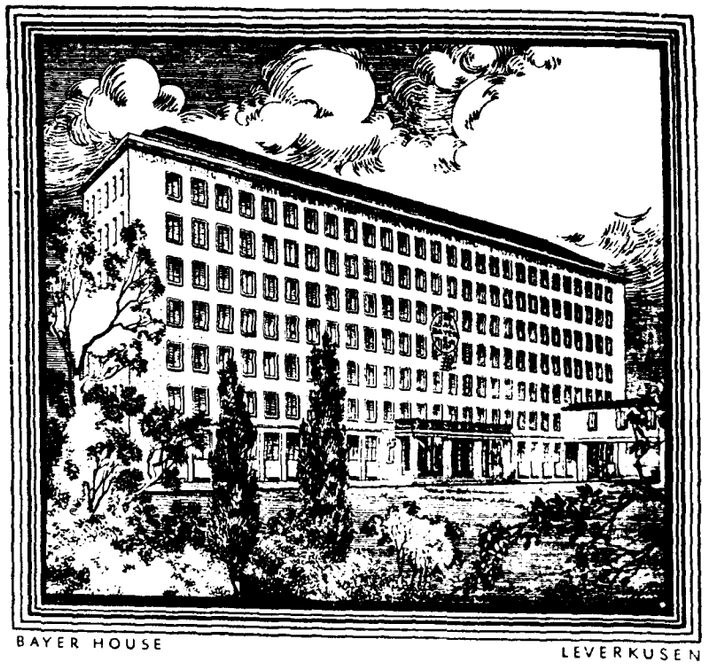

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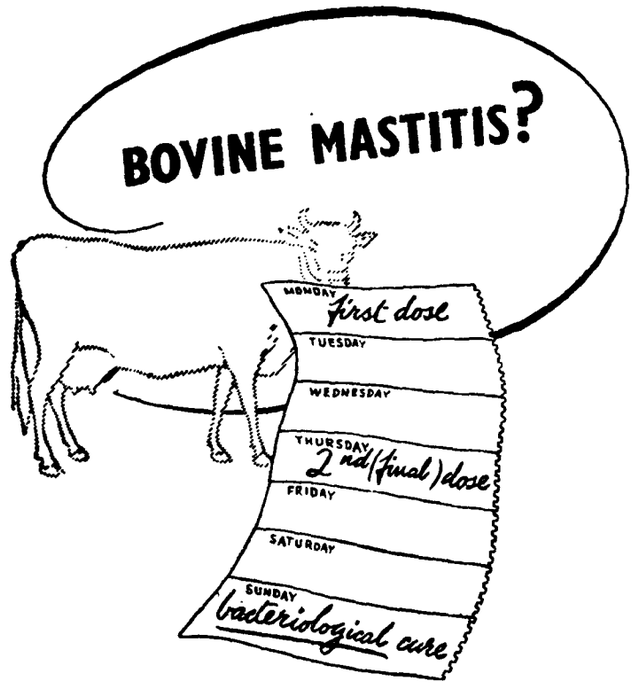

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The Indian Veterinary Journal

(The Journal of The All-India Veterinary Association)

Vol. XXIX NOVEMBER 1952 No. 3

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THE

Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. XXIX NOVEMBER, 1952 No. 3

General Articles

TECHNICAL ASSISTANCE TO INDIA IN THE SPHERE OF ANIMAL PRODUCTION UNDER THE EXPANDED TECHNICAL ASSISTANCE PROGRAMME OF F.A.O.

BY

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F.A.O. Mission to India.

The assistance that the Food and Agriculture Organization of the United Nations has agreed to extend to India in the sphere of Animal Production is specifically defined in a series of Supplemental Agreements that have been made between the Government of India and the Organization. Each of these Supplemental Agreements has been made in response to a request or requests for specific assistance in a carefully defined field of activity, and such requests may have originated either with the Central or State Governments.

Supplemental Agreement Number 3 of the 4th June, 1951 covers the provision of technical assistance to the State Government of Uttar Pradesh. Included in the personnel that are to visit the State to render technical assistance are:

(i) A specialist on the dehydration of milk.

(ii) A specialist for the instruction and training of personnel in the tanning of hides and skins as a village industry.

(iii) A biologics manufacturing specialist for training personnel in the production of sera and vaccines, and organizing the Biologics Laboratory with essential equipment.

The specialists are to be engaged for a year, and the tannery specialist and the specialist in biologics manufacturing are already in the country. Essential equipment for the preparation of veterinary biological products is already in operation.

Supplemental Agreement No. 4 of 16th August, 1951, deals with Technical Assistance to the State of Madras, and includes the provision of one expert in veterinary biologics manufacture, including vaccine

production and the use of freeze-drying equipment. The expert is also expected to advise and assist in the production of effective vaccines for field work, to train personnel in the field, and to advise and assist in the organization of field programmes using such vaccines. This expert and his equipment have arrived and he is working at Ranipet. Under both this arrangement and the preceding one, the organization undertakes to provide free of cost a certain amount of equipment.

Supplemental Agreement No. 5 of 16th August, 1951, makes provision for technical assistance to the Government of India. It covers the provision of the following personnel:

(i) An expert, who shall be fully conversant with the use of freeze-drying equipment, to advise on the large-scale manufacture of rinderpest vaccines, with particular reference to the production of dry vaccines for field use, for a period of one year.

(ii) One expert to advise and assist in the organization of field campaigns for the eradication of rinderpest, for one year.

(iii) One expert to advise on the establishment of a foot-and-mouth disease vaccine preparation laboratory for a period of 3 months. After receipt of this expert's report, a further expert may be provided to advise and assist on the manufacture of foot-and-mouth disease vaccine for a period of 1 year.

The specialists on freeze-drying and rinderpest eradication (1 and 2 above) arrived in February and March 1951, and are at Izatnagar.

The Organization also agreed to provide a certain amount of equipment not procurable in the country. Some of this equipment has just arrived, and some is still on order.

Under Supplemental Agreement No. 5 the Organization also agrees to award eight fellowships, each for a period not to exceed twelve months, to persons nominated by the Government and approved by the Organization, to study and train abroad in certain fields of activity. These fellowships are to be awarded to persons who are taking or will take an active part in projects upon which the Organization is providing advisory assistance as set out in the Agreement, and who require further training outside the country to carry out satisfactorily their assignments on these projects. The various fields of activity are:—

(i) Manufacture of biological products, with particular reference to lyophilisation.

(ii) Rinderpest control, mass-production of vaccine, and equipment required therefor, and large scale application of eradication programmes.

(iii) Typing of foot-and-mouth disease virus, mass-production of foot-and-mouth disease vaccines.

(iv) Research, and control of virus diseases, including titration and propagation of virus.

(v) Artificial Insemination.

At the time of writing no recommendations for fellowships had been received from the Government.

Supplemental Agreement No. 5 A of 29th November, 1951 covers the provision of 3 additional specialists to assist the Central Government, mainly in connection with the scheme to eradicate rinderpest from India by means of a mass-immunization campaign. One is to be fully conversant with freeze-drying and to advise on the large scale manufacture of rinderpest vaccines, and two are to advise and assist in the organization of field campaigns for the eradication of rinderpest. All are to be engaged for periods not exceeding one year. The equipment which the organization may provide is not to exceed $ 30,000 in value.

Supplemental Agreement No. 7 of 28th September provides for technical assistance to the State Government of West Bengal, in the form of two experts, one of whom is to advise and assist on the development of the Bengal Veterinary College and the veterinary research work to be carried out at that College, and in the production of vaccines required for field programmes; and the other who will advise and assist in the development of veterinary field services in that State, and in programmes for the control of eradication of animal diseases. The specialist to advise on the development of the Bengal Veterinary College arrived in January 1952, and essential equipment provided by F.A.O. has just been received. The Organization has been advised that the Government is not yet ready to make use of the other specialist in field work.

In Supplementary Agreement No. 11 of 29th November, 1951 with the Central Government, the Organization agrees to provide four experts, each for a period not exceeding twelve months. One is to be an artificial insemination specialist to advise and assist the Government on the technical aspects, organization, and operation of artificial insemination centres in Key Villages, and the preservation of semen for field use. The two others are also artificial insemination experts to assist in organizing the Key Village Centres and to advise these centres on technical aspects of the artificial insemination work to be carried out. These three specialists have been engaged, and are due to arrive on October, 1952. Equipment not to exceed 7,000 dollars in value has been ordered and is now beginning to arrive in the country. The fourth expert is to be a specialist in livestock feeding to advise and assist the Government on problems relating to animal nutrition, especially in improving range and forage production.

General.—It will be evident that the assistance to be provided in the sphere of animal production covers a considerable range of activities, extending from tanning and dehydration of milk in the field of commercial exploitation to the manufacture of lyophilized vaccines and the planning of mass-immunization campaigns in the field of veterinary science proper. The production of freeze-dried living virus vaccines against rinderpest is one of the projects with high priority. Small preliminary laboratory trials of goat-adapted virus (Line W), of the goat-reactor lapinized virus, and of avianized strains from Egypt have already been made at Mukteswar. Experimental freeze dried goat virus vaccines of the Cairo and Mukteswar strains have already been produced at Ranipet, and Lucknow will shortly be going into production on similar lines. Spin-freeze driers of the Edwards Model 3PS. supplied by F. A. O. are already in use at Madras and Lucknow, and similar plants for Bengal and the Indian Veterinary Research Institute at Izatnagar have already arrived in the country, and delivery may be expected in the near future.

A field survey, covering the rinderpest position during the last three years, methods of immunization and control, legislation and the organization of state veterinary services, including facilities for the manufacture of rinderpest vaccines, has already been carried out in 9 States, which represent a fair cross-section of the country. Certain recommendations regarding field trials, based on the experimental work and the survey have been submitted to Government, and are now under considaration. It is, therefore, fair to say that useful developments may be expected to occur in the near future.

Rinderpest control remains in the forefront of the Government and F. A. O. programmes; but other problems, particularly in relation to the production of living virus vaccines will also receive attention. A preliminary examination of the position indicates that considerable improvement is possible in the techniques by which such vaccines as Newcastle disease vaccine (i.e., Raniket disease vaccine), Sheep-pox vaccine and fowl-pox vaccine, are at present prepared. These are all living virus vaccines, depending for their efficacy and safety upon the strains of virus employed, the titre of virus in the vaccine, its viability under conditions of storage and transport in India, and the freedom of the vaccine from contaminating micro-organisms that might prove pathogenic to the inoculated animals. Lyophilization or freeze-drying can be regarded as an essential part of the manufacturing process if a satisfactory titre is to be secured and maintained until the vaccines are used, and lyophilization alone will prevent the multiplication of air-borne-contaminating micro-organisms. In the choice of strains of such vaccines as sheep-pox, fowl-pox and Newcastle disease it is well to have available a number of strains of virus that have been used in preparing such vaccines in other countries, and to be able

to assess the comparative value of such strains by means of trails performed on Indian livestock. Foreign strains have, therefore, been imported in the freeze-dried state and comparative trials have already been started.

Of all the issues the most important is the choice of the type or types of rinderpest vaccine to be used in the proposed mass-immunization of Indian cattle and buffaloes. Possibly more than one type of vaccine will be needed, a more potent type like the desiccated goat virus vaccine for the more resistant plains cattle of India, and a milder type such as the avianized vaccine for the more susceptible cattle and buffaloes. Both types are available, and as soon as the necessary laboratory facilities are provided sufficient vaccine of both types will be prepared, so that extensive field trials can be carried out in three or four different States under careful observation. In any mass-immunization campaign that may be contemplated it is essential that workers in the field should have complete confidence in the safety and efficacy of the vaccines they are using; and it may be taken as certain that rinderpest vaccines will not be released for mass-immunization purposes untill every one concerned is satisfied that the vaccines chosen reach the necessary standard in both these respects.

LABORATORY EXPERIMENTS AND FIELD TRIALS WITH VACCINES FROM STERNE'S AVIRULENT ANTHRAX STRAINS

By

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Indian Veterinary Research Institute, Mukteswar.

(Received for publication on 23-9-52.)

Attempts were made to manufacture a suitable anthrax vaccine for this country at this Institute. In the first few years, work was concentrated on the feasibility of introducing a saponin vaccine as advocated by Hruska (1931, 1932). Work with a few experimental brews showed that this vaccine, even if it turned out to be safe, would not gain popularity in the country on account of the alarming proportions of swelling and systematic disturbances following its use. An alternative had to be sought and it seemed this was provided by the glycerinated spore vaccine so extensively used by Viljoen, Curson and Fourie (1928) in South Africa. This type of vaccine made by Mitchell (1930) from a strain obtained from Viljoen was becoming rapidly popular in the neighbouring State of Burma. It was therefore decided to give this type of vaccine an extensive trial in india.

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1. Now the Director of Animal Husbandry, Government of Madras.
2. Now in Pakistan.

A bovine vaccine strain was obtained from Pfaff, who, in turn, had obtained it from Onderstepoort. Vaccine was made according to the technique of Viljoen, Curson and Fourie (1928). Brews of this vaccine repeatedly passed all the laboratory tests. They were safe and efficient for use on cattle, buffaloes and sheep, but was found to be very dangerous for use in goats. The vaccine stored at the room temperature was found to retain potency up to 13 months but not at 18 months. Vaccinated animals when tested at intervals were found to remain immune up to 14 months after vaccination. Animals were not tested after longer intervals. The vaccine thus seemed to satisfy all practical requirements. A small brew of 2,000 doses was issued to Bengal for a preliminary field trial, where it was being used at five to ten times the recommended dosage. According to Balwant Singh (1940) there was no mortality among 361 cattle, 2 buffaloes and 2 sheep vaccinated with this product. Ten of the cattle showed high thermal reaction and two of them developed oedematous swelling. The result seemed to justify more extended trial in the field. The Institute therefore undertook the supply of this spore vaccine on demand to selected areas in the Provinces.

In all six brews were made between the years 1937 and 1941 and 2,06,000 doses were issued for vaccination of cattle and sheep. With this extended usage, severe reactions and occasional deaths were reported. For instance, in the Central Provinces, of 7,845 vaccinated animals four died of anthrax. About five to ten *per cent* of animals developed extensive swelling. The most damaging report came from the Province of Madras where Viswanathan (1941) used the vaccine on sheep. Although the use of the vaccine was forbidden for goats, at the specific request and risk of the owners, he also vaccinated some goats. Of 2,472 vaccinated sheep and lambs 95 or 3·8 per cent died; and of 88 goats, 33 or 37·5 per cent died; and of the animals that survived many developed extensive swellings. There was a high proportion of abortions among the pregnant ewes. Finally, one of the last brews of vaccine to be prepared proved to be dangerous even in laboratory tests.

We were attempting to further attenuate the vaccine strain by the Pasteurian technique, when some very interesting observations reported by Sterne (1937a, 1937b) came to notice. He showed that colonies of virulent anthrax bacilli which are rough, when grown in air, are mucoid and capsulated when grown on 50 per cent serum agar in an atmosphere of Carbon-dioxide but soon threw out rough peripheral outgrowth composed of non-capsulated bacilli. The optimum concentration of Carbon-dioxide for obtaining avirulent roughs quickly appeared to be between 10 and 30 per cent (Sterne 1937c) Subcultures of the rough variant grew rough whether in air or Co_2. But the growth from the smooth mucoid centre when subcultured always grew rough in air and smooth mucoid in Co_2

throwing out rough peripheral outgrowths. The change from the smooth mucoid to the rough was abrupt and irreversible. This was analogous to the phenomenon of smooth-rough variation first reported by Arkwright (1921) and was accompanied by loss of capsule and complete loss of virulence. Contrary to what one would expect, the rough variant happened to retain, in large measure, its immunising properties. Sterne (1937a, 1937b) and Sterne and Robinson (1939) have shown that potent vaccines can be made from such avirulent variants. The object of this paper is to record the results of the use of such vaccine in India.

Preparation of the vaccine

All the work reported here were done with two strains, one obtained from Sterne and the other adapted at Mukteswar according to Sterne's technique. The technique of isolating a suitable avirulent immunising strain has been discussed by Sterne (1937b). Briefly, it consists in growing several virulent epidemic strains of *B. anthracis* on 50 *per cent* horse serum agar plates in an atmosphere of 10 to 30 per cent Co_2. The colonies which at first are smooth and mucoid consisting of capsulated rods soon develop rough peripheral outgrowths consisting of non-capsulated rods. The rough peripheral outgrowth is carefully selected avoiding picking any smooth culture. The purity of the rough variant could be assured by again plating the rough variant, incubating in Co_2, when only rough colonies should develop. The rough variants so isolated from several strains are tested on guinea-pigs for protective power and only those which afford solid protection in guinea-pigs are further examined for utility in the manufacture of spore vaccine. It appeared the protective power of the variant is dependant upon the virulence of the parent strain from which it was derived. Spores of the selected strain are preserved in 50 per cent glycerine saline for use as and when required.

For the manufacture of anthrax vaccine, a loopful of the glycerine spore suspension of the selected strain is streaked on an agar plate and a single colony is transferred to an agar tube. After 24 hours incubation the growth is washed and seeded into a Roux flask. After 24 hours' incubation the growth is washed off with some saline and sown into Roux flasks containing 3 per cent nutrient bufferred agar at pH 7·4. Before inoculation the water of condensation from the flasks is carefully removed and the flasks incubated for 2 days for the excess of moisture to evaporate. After inoculating, the flasks are incubated for 3 days at 37°C. The growth in the flasks is examined for purity. A few flasks selected at random are examined microscopically and if they are found to contain about 80 per cent of spores, as they generally do, the flasks are then removed from the incubator for further treatment. They are kept at room temperature overnight as this helps to complete the spore formation. The following day the growth is washed off with saline at the rate of about 20 to 30 c.c.

per flask. The operation is facilitated by rolling the flasks from side to side with some sterile glass beads within. The washing is pipetted off into a big flask the weight of which has been previously determined. The spore emulsion was at first being preserved by the addition of an equal part by weight of pure sterile glycerine. As this did not prevent the growth of moulds, it was later increased to 50 per cent by volume. This constitutes the stock vaccine. This is left for about 3 weeks at room temperature for the spore count to stabilise before tests are undertaken to ascertain its safety and potency.

Tests for safety and potency

The safety test was done on 2 bulls and 2 sheep at 20 c.c. and 2 goats at 10 c.c. of the undiluted stock suspension, but the bulls were dropped in later tests. At the same time, 4 sheep and 4 goats were being injected with 1 c.c. of a dilution representing 0·1 c.c. and a similar number with a dilution representing 0·01 c.c. of the stock suspension but in later tests this was relinquished in favour of a single dilution representing 1·0 million spores per animal. Two ponies were included in testing the first 2 brews and they received each 10 c.c. of the stock suspension. The vaccinated animals are tested for immunity usually after an interval of 21 days. The test dose for sheep and goats varied from 300 to 500 lethal doses, as titrated in the sheep, of virulent spores but as control bulls and sometimes ponies were resistant to this dose of spores, the test dose for these class of animals was later changed to 0·2 to 0·5 c.c. of a young broth culture of a virulent anthrax strain. So far ten brews of vaccine made from the Onderstepoort strain and fourteen brews made from a local strain have been tested and released for use in the field and the result of test of the first seven brews is tabulated (Table I). The other brews also gave similar results. In no instance did animals die of the vaccine at the top dose of 20 and 10 c.c. of stock suspension.

Eleven ponies, 34 bulls, 144 sheep and 144 goats were subjected to vaccination and none died from vaccination due to anthrax. Of these, 5 ponies, 12 bulls, 48 sheep and 48 goats had received from 10 to 20 c.c. of the stock suspension amounting to 500 to 2000 field doses, and none of these died from anthrax. The vaccine is therefore safe for use on bulls, sheep, goats and ponies. It had also conferred a marked degree of protection against 300 to 500 lethal doses.

On account of the higher susceptibility of mules to anthrax, vaccination of this class of animals was always a risky procedure. Through the courtesy of the army officers six mules were made available. The vaccine was made from the Onderstepoort strain. One mule was injected with 10 c.c. of stock suspension equivalent to 500 field doses. The others were vaccinated with 2 field doses contained in 1 c.c. All of them developed, at the seat of inoculation, slight but painful swelling which

TABLE I

Laboratory tests for safety and potency of anthrax vaccine.

Vaccine strain	Interval between vaccination and challenge dose	HORSE			CATTLE			SHEEP			GOATS		
		After vaccination	After challenge dose	Controls	After vaccination	After challenge dose	Controls	After vaccination	After challenge dose	Controls	After vaccination	After challenge dose	Controls
Onderstepoort	25 days	0/6	0/6	0/1	0/2	0/2	0/0	*1/22	*4/21	6/6	*3/22	*2/19	2/4
,,	19 days	0/2	0/2	0/1	0/2	0/2	0/1	0/10	*1+/18	2/2	0/2	0/2	0/2
,,	22 days	—	—	—	0/8	0/8	1/2	*1/6	0/5	2/2	*/18	0/7	2/2
Mukteswar	24 days	—	—	—	0/6	0/6	1/1	*1/6	*1/5	1/1	0/4	*1/4	1/1
,,	30 days	—	—	—	0/2	0/2	0/1	0/6	0/5	4/4	*3/6	*0/3	4/4
,,	19 days	0/3	0/3	0/1	0/6	0/6	0/1	0/6	0/6	2/2	*1/6	*1/5	2/2
,,	21 days	—	—	—	0/10	0/10	1/1	0/10	0/10	1/1	*5/10	*1/5	0/1
TOTAL		0/11	0/11	0/3	0/36	0/36	3/7	*3/66	*6+1/60	18/18	*13/38	*5/45	13/16

Denominator = Number used
Numerator = Number died
* Died of causes other than anthrax.

[17 other brews where tested on sheep and goats with similar results as regards safety and potency.]

lasted from 3 to 10 days, but there was no recognisable thermal reaction. On re-test with virulent culture after intervals of about 3 to 7 months they were all found to be resistant (Table II). The test dose was 0·2 c.c. of an 18 hour broth culture of a virulent strain of *B. anthracis*. One control inoculated with the same dose died of anthrax in 5 days.

TABLE II

Safety and potency tests on mules.

Dose of vaccine	Mule No.	Reaction after vaccination	Reaction after test	Interval between vaccination and test	Fate
2 doses contained in 1 c.c.	952	slight swelling for 10 days	slight swelling	3 months and 7 days	Lived
	2688	slight swelling for 4 days	do.	do.	do.
	195	slight swelling for 6 days	do.	do.	do.
	3257	slight swelling for 3 days	do.	7 months and 3 days	do.
10 c.c. stock suspension = 2500 field doses	261	slight swelling for 11 days	do.	do.	do.
Control	199	—	Marked swelling and acute fever	—	Died in 5 days

Optimum concentration of saponin

It was desirable to ascertain if saponin was an indispensable constituent of anthrax vaccine and if so the concentration at which it was safe and effective. Hruska (1931, 1932) and Mazzucchi (1931) used ten to one per cent and ten per cent saponin respectively and they maintained that the function of saponin was to reduce the virulence of the strain to be safe as a vaccine. Homutov (1936) assumed that saponin penetrated into the capsule of the anthrax bacilli thus delaying multiplication and allowing antibody production to take the lead. Sterne, Robinson and Nicol (1939) who have also critically reviewed the literature on saponin anthrax vaccine, however, showed that the presence of saponin in a vaccine did not

so much reduce the virulence of the strain as it increased the immunising property of relatively low immunising strains. But saponin, even when used alone, produced a marked local reaction. As the farmers in India look with disfavour on products which lead to even temporary inconvenience it was desirable to reduce the concentration of saponin to the minimum or even eliminate it altogether. The results of tests of vaccines with different concentrations of saponin is tabulated in Table III.

TABLE III

Effect of different concentration of saponin on local reaction and resulting immunity.

Saponin (per cent) in 50 per cent glycerine in saline	Species	Dose of spores (millions)	Volume (c.c.)	Abscess formation	Death after vaccination	*Death after challenge dose
0.5	Ponies	1000 1	10 1	2/2 0/1	0/2 0/1	0/2 0/1
	Bulls	2000	10	2/2	0/2	0/2
	Sheep	2000 10 1 1000	20 1 1 10	2/2 2/4 5/12 0/2	0/2 0/4 0/12 0/2	0/2 0/4 1/12 0/2
0.4	Ponies	1	1	0/1	0/1	0/1
	Sheep	1	1	2/2	0/2	0/2
0.3	Pony	1	1	0/1	0/1	0/1
	Sheep	1	1	0/2	1/2	0/1
0.2	Sheep	1	1	0/2	0/2	0/2
0.1	Pony	1	1	0/1	0/1	0/1
	Sheep	1	1	1/8	0/8	0/8
No saponin	Sheep Goats	1 1	1 1	0/102 0/102	0/102 0/102	0/102 0/102
Control	Sheep Goats	Not vaccinated Do				48/48 48/48

Denominator = Number used.
Numerator = Number died or developed abscesses, as the case may be.
*Interval between vaccination and test was 21 days. The challenge dose was 500 lethal doses.

The animals were tested for immunity 21 days later. In the hope that differences in the degree of immunity between vaccines with and without saponin may be distinctly brought out, in a second experiment, vaccinated animals were challenged at two levels of test doses (Table IV).

TABLE IV

Effect of vaccine with and without saponin on resulting immunity.

Kinds of vaccine	Number of sheep vaccinated	Formation of abscess or nodule	Death after vaccination	Death after challenge dose	
				100 lethal doses	500 lethal doses
No saponin	6	0/6	0/6	0/3	0/3
0.1 per cent saponin	6	1/6	0/6	0/3	0/3
0.5 per cent saponin	6	1/6	0/6	0/3	0/3
Unvaccinated control				3/3	3/3

Denominator = Number used.
Numerator = Number died or developed abscess.

Although the numbers involved in our experiments is admittedly small, it is reasonable to conclude that in larger animals when a relatively concentrated vaccine (1·0 million spores per dose) is used the degree of immunity produced is not appreciably inferior to that resulting from a vaccine containing saponin. As the proportion of animals which develop abscess from vaccines containing 0·4 or 0·5 per cent saponin is sufficiently large, for Indian conditions it is preferable to use a vaccine with no saponin, relying on adequate concentration of spores to give good immunity.

Germany. Details of the geological and chemical nature of the soil, the water supply and botanical flora of the farms were studied. The chemical and physiological characters of the blood and urine, the clinical and *post-mortem* features associated with the disease have been studied. Records of the observations upon the various aspects have been interpreted in the light of the existing knowledge upon the mineral metabolism, role of vitamins, blood constituents, the physiological mechanism of the clotting of blood in normal cattle and its retardation. The author attempts an explanation of the causation on these lines, and believes that a haematogenous toxin, derived from local plants, is the cause.

Gottardi (1935) studied chronic haematuria in milch cattle, and states that the water of affected farms was rich in acids, due to soil being deficient in lime. He ascribed the disease to a diminution in the calcium and phosphorus content of the blood.

Bankier's (1936) investigations consist chiefly of field observations regarding the conditions under which the disease occurs, as well as of cattle feeding experiments on a notorious haematuria farm at Milner, B. C., which was specially leased for investigational purposes. Attempts were made to determine if the forms of insect life present in the surface water had any relation to the disease. Bankier reports the finding of quite large cells in urine samples, but is uncertain about their identity and significance. He goes on to state that, of the reports of scientific workers on the disease in other parts of the world, the most interesting one appears to be by Datta, who claims that the disease in India is caused by a parasite. No definite proof has, however, been secured yet of the disease in British Columbia being caused by such a parasite.

Pommeret (1937) records the results of his studies upon samples of haematuria urine and bladder, collected at the abottoir at La Villete. He states that on examination of the urine of twenty cows and of twelve specimens of diseased bladders, he succeeded in two cases in discovering the bodies described by Datta as Entamoeba. He asks the question: " Le bacille de Pasteur et Thillier donne le rouget au porc, le bacille de Nicolaier et Kitasato donne le tetanus, mais quel est l'agent de l'hematurie essentielle, nous l'ignorons. Cependant, n'y a-t-il pas lieu de fonder queleque espoir sur la theorie toute recente qui nous vient des Indes sous la plume du Capitaine Datta ? " [*Tr. The baccilli of Pasteur and Thillier gives a red colour to the pox. The baccilli of Nicolaier and Kitasato gives tetanus but we are ignorant of what the real agent of haematuria is, However, is there not some hope in the recent therapy which comes from the Indies written by Captain Datta.* ? *Ed. I. V. J.*]

In Yugoslavia, Butozan (1938) has worked out the percentage land area in each county and circle which is affected. He describes how the

The animals were tested for immunity 21 days later. In the hope that differences in the degree of immunity between vaccines with and without saponin may be distinctly brought out, in a second experiment, vaccinated animals were challenged at two levels of test doses (Table IV).

TABLE IV

Effect of vaccine with and without saponin on resulting immunity.

Kinds of vaccine	Number of sheep vaccinated	Formation of abscess or nodule	Death after vaccination	Death after challenge dose	
				100 lethal doses	500 lethal doses
No saponin	6	0/6	0/6	0/3	0/3
0.1 per cent saponin	6	1/6	0/6	0/3	0/3
0.5 per cent saponin	6	1/6	0/6	0/3	0/3
Unvaccinated control				3/3	3/3

Denominator = Number used.
Numerator = Number died or developed abscess.

Although the numbers involved in our experiments is admittedly small, it is reasonable to conclude that in larger animals when a relatively concentrated vaccine (1·0 million spores per dose) is used the degree of immunity produced is not appreciably inferior to that resulting from a vaccine containing saponin. As the proportion of animals which develop abscess from vaccines containing 0·4 or 0·5 per cent saponin is sufficiently large, for Indian conditions it is preferable to use a vaccine with no saponin, relying on adequate concentration of spores to give good immunity.

Number of spores required to confer immunity

A viable count was made of the stock suspension of one of the brews of vaccine which was then diluted with 50 per cent glycerine saline to yield the required concentration of spores, ranging from 30 spores to 2 million spores per c.c. for the vaccination of sheep. The animals vaccinated with the different doses were tested for immunity 21 days later with 500 lethal doses of virulent culture (Table V).

A dose of 1500 spores conferred some immunity. A dose of 30,000 produced a good grade of immunity in most animals and that of 1 million or more conferred very solid immunity in all animals.

TABLE V

Number of spores required to confer immunity.

Number of spores	Death from anthrax following challenge dose
2 millions	0/5
1 million	0/8
300,000	1/7
150,000	0/4
75,000	0/4
30,000	1/7
3,000	2/7
1,500	1/4
300	3/7
30	3/3
Controls	7/8

Denominator = Number used.
Numerator = Number died.

Interval between vaccination and establishment of immunity

Twentyfour sheep were vaccinated with dose of vaccine approximating 1·0 million spores. Batches were tested for immunity at intervals of a day up to 7 days with a test dose equal to 500 lethal doses from the same stock of a suspension of virulent spores. (Table VI). The challenge dose was controlled on 4 sheep, two of which were injected at the zero hour and 2 on the 7th day.

TABLE VI

Interval between vaccination and establishment of immunity in sheep.

INTERVAL (DAYS)	SURVIVED TEST
0	0/2
1	0/2
2	0/4
3	3/4
4	2/4
5	3/4
6	4/4
7	4/4
Control	0/4

Denominator = Number used.
Numerator = Number survived.

Under the conditions of the experiment the vaccine immunised a large proportion of sheep in 3 days and all in 6 days.

Keeping quality of the vaccine

A stock spore suspension of the vaccine was divided into four equal lots of 50 c.c. each contained in 100 c.c. flasks. They were left at 0°C., 10°C., 20°C. and 30°C. respectively. Viable counts were made of the lots at the time of preparation and then at intervals of 15, 30, 45 and 90 days and thereafter up to twentyfour months at intervals of 3 months (Fig. I). From the third month onward the lot maintained at 30°C. was also simultaneously tested for its immunising property at a standard dose of 1·0 million spores. At the conclusion of the experiment, after twentyfour months, all the lots were tested for their immunising property at 1 million spores.

There was a steep fall in viable count during the first few days following the preparation of the vaccine so that the number of viable spores of all the lots was found reduced to fifty per cent of the original strength when plated on 15th day. It remained constant at that level for about three months in all cases and up to six months in the case of the lots maintained at 0°C. and 10°C. At 15 months the lot maintained at 0°C. contained about one-third of the original strength of spores while the others had dropped to about one-eighth.

In the routine preparation of the vaccine, the initial count for the standardization of the vaccine is done 3 weeks after its preparation i.e. after the vaccine had stabilised at about 50 per cent of the original viable count. Therefore, after standardization, the strength of a brew should remain constant for about 6 months when maintained below 10°C. Maintained at 0°C. it would still contain, at the end of 15 months, two-thirds the number of viable spores compared to the strengh at the time of standardization. As the vaccine is standardized to contain not less than 1½ million spores per dose, vaccine made from a stock suspension maintained at 0°C. for a period of 15 months would still contain more than 1 million spores per c.c., a dose sufficient to confer very solid immunity.

It was also desirable to test how long the strain in the stored vaccine would retain its immunising quality. Small quantities of the vaccine were removed at intervals of 3 months and diluted in glycerine saline to contain 1 million spores per dose of c.c. for test on 2 sheep on each occasion. It was assumed that if the strain, on storage at 30°C., was found to retain its quality, the strain in vaccines stored at lower temperatures would also have maintained its quality. Therefore only the lot maintained at 30°C. was put to periodic test. The vaccinated sheep were tested for immunity 3 weeks later along with two controls. At the conclusion of the experiment at 24 months, the lots maintained at all the four temperatures were put to a similar test (Table VII). None of the vaccinated sheep died

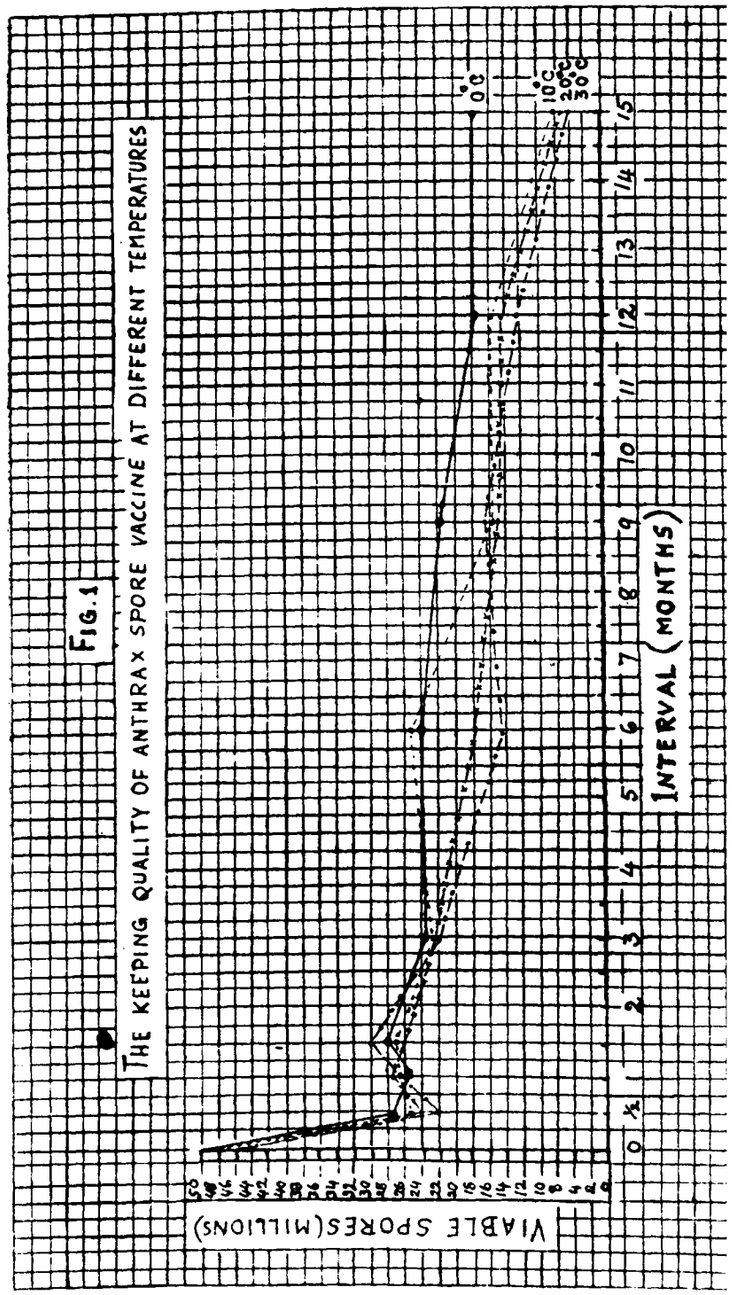

FIG. 1 THE KEEPING QUALITY OF ANTHRAX SPORE VACCINE AT DIFFERENT TEMPERATURES

on retest. The immunising quality of the strain in the vaccine was not impaired up to 2 years at least, irrespective of the temperature of storage ranging from 0-30°C., provided a dose containing 1 million spores was used for vaccination.

TABLE VII

Immunisation of sheep with anthrax spore vaccine stored at different temperatures.

Storage temperature	Interval in months							
	3	6	9	12	15	18	21	24
0°C.	—	—	—	—	—	—	—	0/2
10°C.	—	—	—	—	—	—	—	0/2
20°C.	—	—	—	—	—	—	—	0/2
30°C.	0/2	0/2	0/2	0/2	0/2	0/4	0/2	0/2
Controls	2/2	2/2	2/2	2/2	2/2	1/2	1/2	2/2

0—2 etc. = None out of 2 animals vaccinated with 1 million spores died on retest with 500 lethal doses of virulent spores.

[The vaccine was preserved as concentrated stock suspensions and diluted to contain 1 million spores per dose of 1 c.c. at the time of test].

The duration of immunity following vaccination

Twenty sheep were vaccinated each which one c.c. doses of vaccine containing 1 million spores per c.c. Batches of four sheep were assigned for testing for immunity at intervals of 3 weeks and 3, 6, 9 and 12 months respectively. On each occasion 2 sheep were used as controls. The test dose was 300 lethal doses. All the ten control sheep used in the five tests died of anthrax. Immunity was solid up to 3 months and of a high order up to 1 year (Table VIII).

Three of the animals died of other causes during the interval leaving only three animals for retest in some of the batches.

TABLE VIII

Interval between vaccination and test.					
3 weeks	3 months	6 months	9 months	1 year	*controls
3/3	3/3	2/4	3/4	3/3	0/10

Denominator = Number of animals available for test.
Numerator = Number of animals that survived.
Test dose 300 lethal doses.
* 2 sheep controls were used at each test (i.e. 10 in all) and all died of anthrax.

FIELD TRIALS

Tests on sheep and goats

The first field trial was conducted in the Nellore District, Madras Province, through the courtesy of Mr. G. R. Viswanathan. One hundred and thirty-two sheep and fourteen goats were inoculated. All the inoculated animals had fever. There was a local swelling which usually appeared on the fourth day, increased up to the sixth day and then gradually subsided. The swelling was hot, slightly hard and painful. In goats, the swelling was generally larger and had a tendency to persist for a longer time. In odd goats, the swelling extended to dependant parts. In no animal was abscess formation noticed. There was no mortality among the vaccinated sheep and goats.

Immediately after inoculation most vaccinated goats and some sheep jumped violently many times and fell down, probably as a reaction to the smarting sensation caused by the inoculated glycerine. Some ran away turning the head towards the side of inoculation, then fell down and rolled on the ground, sometimes kicking the legs violently. Some rubbed their neck especially the seat of inoculation against the ground. After two or three minutes they calmed down and started grazing.

The second field trial was conducted at Vedicherla, an endemic area in the Nellore district. Over the previous 15 years, 100 to 200 deaths from anthrax had been reported yearly. Out of 599 sheep, 2 sheep died on the fifth and tenth day respectively after vaccination. No post-mortem examination or smear examination was made and the deaths could not be confirmed as due to vaccination.

The third trial was conducted in two endemic areas in the Nellore district and Tinnevelly district respectively. The vaccine was diluted with 3 c.c., of half per cent serum saline before injection. In this manner the reaction of goats and sheep to the smarting sensation was eliminated. A total of 1086 animals comprising of 129 goats, 20 kids, 893 sheep and 44 lambs were vaccinated. There was no mortality. The local reaction was milder following the use of the diluted vaccine.

An attempt was made to test some of the sheep and goats for immunity after vaccination under field conditions. The result was inconclusive as the vaccinator had failed to mark the vaccinated animals.

In the United Provinces, Chowdhury (1943) vaccinated 67 adult goats including 9 she-goats in milk. Forty four of them had a mild temperature reaction lasting 1 to 2 days. Eleven goats developed swellings of oedematous nature 8 days after vaccination and in some of them the swelling infiltrated into the dependent parts and took 17 days to subside. The milk yield dropped by 25 to 30 per cent but gradually returned to normal. There was no mortality.

(ii) *Test on elephants.*—As there had been deaths from anthrax among elephants on the Malabar and Nilgiri hills, a request was received for exploring the possibility of protecting elephants with anthrax spore vaccine.

Four elephants Mothima, Godavari, Janaki and Ranjitham were vaccinated with one c.c. of the vaccine followed by three c.c. after an interval of one month.

There was a slight local oedematous reaction about 2 inches in diameter following the primary vaccination and two of them had a slight rise in temperature on the third and fourth days. There was no rise in temperature following the secondary dose, but the local oedema was as large as 4 to 5 inches in diameter. About 21 days after the administration of the secondary dose, Mothima was tested with about 20 sheep lethal doses of virulent anthrax culture. The elephant withstood this dose of culture.

Within the following year (1943), 83 elephants had been vaccinated without any untoward result. It is now the practice to vaccinate all Government elephants yearly in the Nilgiri area.

(iii) *Other animals.*—At the request of the Army authorities, the vaccine was issued on an experimental basis for the vaccination of one hundred camels, and several hundred of horses, mules, cattle, sheep and goats. As the vaccine was found to be quite safe it came into routine use for the protection of Army animals during the war in India and the Far East.

During 1943-44, in Assam and Arakan alone, 2000 cattle, 500 camels and 25, 161 horses and mules were vaccinated. Death due to vaccination was nil. With the adoption of vaccination every six months, there has been no death from anthrax in these areas among army animals.

There was, however, one outbreak of anthrax among vaccinated sheep and goats in the Tuticorin area. As this is of some interest it is described in some detail. Among this batch of sheep and goats a few deaths from anthrax was noticed, the first death being noticed about the fourth day after vaccination. A batch of this vaccine was recalled and inoculated into guinea-pigs, sheep and goats at Mukteswar and it was found to be safe. Growth on 50 per cent serum agar under Co, yielded rough colonies as should be the case with the vaccine strain. Virulent strains on the other hand yield mucoid colonies under the same conditions. It has been our experience that the vaccine strain could be recovered from the spleen of animals destroyed within a few days after vaccination as also from animals which die of concommitant diseases within a few days after vaccination. In all these instances the strain had been found to remain true to its original characters as regards rough growth under Co, and inability to form capsules and has never shown any tendency to reversion. Swabs

from dead animals at Tuticorin, however, yielded mucoid colonies when cultured under partial pressure of Co, showing that the strain was not the true vaccine strain but a virulent epidemic strain. It was also lethal to goats and sheep. The interpretation, therefore, is that the animals at Tuticorin were vaccinated at the scene of an outbreak and the vaccine was unable to protect these few animals which were already incubating the disease. The same batch of vaccine had been issued to other places and no adverse reports were received.

FIG. 2.

The vaccine is under routine issue since 1941 and so far 24 brews consisting of over three million doses have been issued to the field. (Fig. 2). There have been no other unfavourable reports so far. Some Provinces have started manufacturing this vaccine for local use from strains supplied from Mukteswar and this shows there is a great demand from the field for this product.

Summary

1. It has been possible to isolate avirulent immunising variants from virulent anthrax strains by growing the strains on 50 per cent horse serum agar in 20 per cent Co, according to Sterne's technique.

2. Vaccines made from one such locally isolated variant and from the strain obtained from Dr. Sterne have been found to be safe for use in India on cattle, sheep, goats, elephants, camels, horses and mules.

3. When a relatively concentrated vaccine is used, the degree of immunity produced is not appreciably inferior to that resulting from a vaccine containing saponin. As the proportion of animals which develop abscesses from vaccines containing 0·4 to 0·5 per cent saponin is large for Indian conditions it is preferable to use a vaccine with no saponin.

4. Using sheep and goats, a dose of 1500 spores was found to confer some immunity, of 30,000 spores a good grade of immunity and of 1 million a very solid immunity.

5. The vaccine immunizes a large proportion of large animals in 3 days and all animals in 6 days.

6. The viable count of spores in the spore vaccine falls steeply within the first few days after preparation but becomes stabilised by about the 10th day. Maintained at a temperature below 10°C. the vaccine thereafter retains strength and immunising property up to six months. Vaccine kept at 0°C. contained sufficient viable spores after an interval of 15 months as to confer full protection at the dosage recommended.

7. Vaccinated animals were found to have retained a good grade of immunity up to one year.

8. It is preferable to give the dose of vaccine diluted in over 3 times its bulk of half per cent serum-saline as this eliminates smarting in inoculated animals and reduces the local reaction.

Acknowledgment

The author is indebted to Dr. Sterne for the supply of one of his strains of avirulent variant of *B. anthraeis*.

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CHRONIC BOVINE HAEMATURIA*

BY

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1. History of the Disease

Although a large volume of literature on the disease has accumulated in different languages, a considerable number of workers appear to have paid little attention to publications from outside their immediate jurisdiction Consequently, there have been too many unnecessary repetitions and comparatively little attempt to correlate investigations or to break new ground, As far as the English veterinary literature is concerned, and this, according to the writer's studies, applies to that in other languages, Thomas Topham, in 1787, would appear to be the first to publish a general, though quite a lengthy, discourse on haematuria of cattle. Credit has been given in some continental literature to Pichon and Sinoir for being the first to introduce the name haematuria, in 1863 and 1864 respectively. It appears that a part of the credit should legitimately go to Topham. Again, contrary to the impression existing among certain authorities that the history of the literature on bovine haematuria starts with 1863 or 1878, it may be mentioned that the available evidence clearly shows that the disease has been recognised in more than one country in Europe for at least a century.

Chronic bovine haematuria or, better still, enzootic haematuria of cattle, presents a clear-cut and precise syndrome, and truly the term haematuria has acquired a special significance in veterinary literature. Haematuria has been a serious scourge in cattle farms in many countries, and its diagnosis as a separate disease entity does not appear to have presented much difficulty. The earliest recorded cases traced so far relate to several European countries. Topham's discourse is dated 1787, but it is not possible to find out from his descriptions where he obtained all his sixty year's experience of the disease. Haematuria cases were diagnosed in the forties of the last century (Drouard, 1838; Anderson, 1842; Hubner, 1842; Vaes, 1843; Vigney, 1845; Raconnat, 1847). Outside of Europe, the earliest report would appear to be from Australia, made some fifty years ago (M'Caffrey, 1892), and the first report from Canada is dated 1907. As far as other countries are concerned, the disease was reported from Nulgaria in 1910, from Hawaii Islands in 1911, from East Africa in 1912, from Washington, U.S.A. in 1913, from Ireland in 1917, from England, Scotland and Wales certainly about 1924 (earlier reports from England probably exist), from India in 1921, from New Zealand in 1926, from Jamaica in 1932 and from Yugo-

*This formed a part of the Thesis for D.Sc. in Veterinary Pathology submitted to the University of Edinburgh in 1939.

slavia in 1935. Although it is not possible to form an opinion as to whether the disease was ever introduced from one country into another, it may be advisable to note the above dates, as they may turn out to be suggestive, if in the future the disease is found to occur in a new locality in an affected country, or in an altogether new country having little or no traffic in cattle from known enzootic areas.

2. Various names

The different names under which the disease has been described from time to time, in different countries, provide a good impression of what form the most outstanding general features of the malady. It will be of interest therefore to recount them below :—

Maladie de bois Holzkrankheit Moor III	...	(Law, 1901)
Blutharnen	...	(Hubner, 1842)
Stallroth Weidroth	...	(Hink, 1886)
Haematurie essentielle	...	(Detroye, (1891)
Ematuris enzootice	...	(De Filippis, 1891)
Cystite hemorragique	...	(Galtier, 1893)
Hematurie des bovides	...	(Boudeaud, 1894)
Hematurie chronique	...	(Delcroix, 1905; Lienaux, 1905).
Cystite verrucosa	...	(Goetz, 1906; Klobouk, 1931)
Haematuria vescicalis bovis rodopensis	...	(Angeloff, 1910)
Red Water	...	Case, 1911; Kalkus, (1913)
Endemic Haematuria Illawater Redwater	...	(Creland, 1911)
Bovine Haematuria	...	(Hadwen, 1912)
Cystite chronique hemorragique	...	(Cadeac, 1913)
Endemische Hematurie mit Blasentumor	...	(Ichikawa, 1921)
Urocystitis haemorrhagica	...	(Miyamoto, 1927)
Enzootic Haematuria	...	(Dickinson & Bull, 1929)
Cystirrhagie		
Queensland Malady		
Cistite cronica emorragica vegante	...	(Giovine, 1933)

3. Distribution

It will be shown below that the disease occurs throughout the world and the particular areas where it occurs are restricted and widely separated from each other. A comprehensive list of the enzootic area, or a complete account of the geographical distribution, is not to be found anywhere in literature. It is proposed, therefore, to set together as much of the information as can be collected from original sources, and to prepare maps showing

the world distribution. In the future, other countries or areas may have to be added to the list, and it is hoped that with proper preventive methods being devised, areas may be rendered disease-free. According to the available information, the following countries are reported to have the disease within their boundaries :—

Austria	...	(Reisinger, 1924)
Australia	...	(M'Caffrey, 1892; Williams, 1894; Cleland, 1911)
Belgium	...	(Lienaux, 1919, Lahaye & Rulot, 1926)
British Columbia	...	(Bowhill, 1907; Rutherford, 1911 Hadwen, 1912)
Bulgaria	...	(Angeloff, 1910; Popow, 1936)
Czekoslovakia	...	(Klobouk, 1931)
England, Scotland and Wales	...	(Craig & Kehoe, 1925, Imp. Bur. Ani. Health, 1931)
Formosa, Japan	...	(Ichikawa, 1921; Miyamoto, 1927)
France	...	(Avril, 1929; Pommeret, 1937)
Germany	...	(Rose, 1879; Arnold, 1890; Achlegel, 1934)
Hawaii and other Pacific Islands	...	(Case, 1911)
Hungary	...	(Hutyra & Marek, 1938)
India	...	(Rangaswamy, 1922; Datta, 1934)
Ireland	...	Craig & Kehoe, 1923)
Italy	...	(Cavalazzi, 1889; Adami 1917: Gottardi, 1935)
Jamaica	...	(Lockett, 1932)
Kenya Colony	...	(Kearney, 1918)
New Zealand	...	(Kerrigan, 1926)
Oregon	...	
Republic of Columbia	...	(Giovine, 1933)
South Africa	...	(Alexander, 1938)
Switzerland	...	(Goetz, 1906)
Washington	...	(Kalkus. 1913)
Yugoslavia	...	(Butozan, 1935 and 1938)

Regarding the actual localities where haematuria occurs in the above mentioned countries, exact information has not been recorded from one and every country. In the Commonwealth of Australia, the disease occurs practically throughout the south-east, including the high lands of Victoria, Tasmania, New South Wales and Southern Queensland. In New Zealand, the disease occurs in the west coast district of South Island, particularly in Murchison and Inanguhua. In North America, the disease occurs on the Pacific slope of the Cascade and Coast Ranges, extending from the Fraser

Valley in British Columbia to Washington and Oregon in the United States of America. Considerable details regarding the affected areas in British Columbia are available. It occurs principally in Fraser Valley district, consisting of uplands bordering on the north and south sides of the Fraser River, encompassed on the west by Vancouver and by Hatzic on the east, and in the north by the river and in the south-east as far as Rosedale, and in the south extending into the United States but not including the delta islands. The disease is recorded from the Municipalities of Surrey, Langley, Matsqui Chilliwack, Maple Ridge and the Lilloet district, which are all in the above mentioned area, and within a distance of approximately seventy miles inland from the Pacific Coast. The disease has also been reported as occuring on Bowen, Galiano, Salt Springs and Vancouver Islands, which are all adjacent to the mainland of British Columbia. Definite evidence has been secured recently that it also occurs on the Terrace and East Kootenay districts, both of which are widely separated and considerable distances from the Fraser Valley. The possibility that the environment responsible for the malady covers an even wider area in British Columbia has been suggested (Bankier, 1936).

In the Pacific Islands, most cases have been reported from the Island of Hawaii, the principal infected districts being Kona and Hamakua. Some cases occur in the Island of Maui.

In Jamaica, most reports have come from Southern Manchester. Less frequently cases have occured around Christiana, Lacovia and a limited areas of the coast region of St. Ann.

In East Africa, the disease appears to be confined to the Limuru district.

In France, the disease occurs in the west and in the vast territory enclosing the central plateau. The disease is particularly common in low-lying areas and scarcely seen above a height of 2,400 ft. It occurs in the Mayenne, the Sarthe, and spreads into the Main et Loire and the Indre. It inflicts great losses in the Creuse, Allier, Vendee, Haut-Vienne, Cantal, Haut-Morvan, Saverdun (Ariege), the Correze and Haute-Loire districts. In Belgium, the disease occurs mainly in the Ardennes Mountains, but occasionally in Brabant, Beauvechain, Hemmemille and Weed-Saint Georges. In Germany, cases occur in the south in the Black Forest, among stall-confined cattle during and after a dry summer, and in cattle which are turned out on high-lying wooded pastures. The disease occurs in the Elbe region.

In Yugoslavia, the disease is found in all the countries (Banats), especially in the hilly and mountainous regions which are wooded. The disease affects animals in 95 out of 350 circles, the average for the whole country being 27.5 per cent. The percentage of land area affected in each

circle has been worked out with the following results: Banat of Danube, 1.9 per cent; Banat of Morava, 5 per cent: Kustenland Banat, 18.1 per cent; Zeta Banat, 18.9 per cent; Vardar Banat, 44.9 per cent; Drava Banat, 48 percent; Drina Banat, 62.4 per cent; and Vrbas Banat, 68–76 per cent.

In Switzerland, Goetz (1906) says that stallrot is known to occur somewhat commonly in certain regions. He studied the disease at Zurich, and some of his cases came from Benken, Burghalden, Baretswil and Willison.

The disease occurs in some other countries in Europe, e.g. in Hungary, in the central provinces of Italy, in Czekoslovakia. Regarding the incidence in the British Isles, Wallis Hoare stated, in 1914, that as far as he was aware it had not been noted. The disease occurs in Cornwall and Shropshire in England (Downham, 1938), in Carnarvonshire and Merionethshire in Wales (Roberts, 1930) and in the north of Scotland. In Ireland, it occurs in the Suek Valley in Co. Ros-common. The exact extent of the disease in these areas is not known, but it is believed that it may be widely distributed in Ireland. Upland farms are usually affected. According to some private information obtained from Mr. H. G. Lamont of the Veterinary Research Division of Northern Ireland, the disease exists in Belfast, and along the Antrim seacoast, and also in the countries of Down Londonderry and Tyrone.

In some countries, the actual localities where the disease occurs have yet to be surveyed and clearly defined.

4. The environment of haematuria farms and localities

It has been observed already that geographical distribution and enzooticity are two of the most striking features of the disease. Why is the disease so particular in occuring in special places and intending to remain localised there, without any obvious spread to the neighbouring areas? This question has been asked from the earliest times, and most workers have set out to ascertain the nature of the inherent factors which appear to govern the phenomenon of distribution in such a marked way. Are the environmental factors merely chance associations, or have they some significance? Some workers have gone so far as to believe that the environment itself produces the discase, and stray observations supporting this belief have been recorded from time to time. Attempts have been made to define the localities accurately, and to determine by careful observations and scrutiny which of the factors are really the indispensable features. The general experience of workers, from the early date when the disease first forced itself on human attention, has been that haematuria localities provide conditions confirming more or less closely to an invariable pattern. By the process of elimination, repeated attempts have been made to determine the

minimum optimum conditions that would allow the disease to appear in a farm or in an area. Comparisons have been made from different angles between infected and non-infected areas, but though an increasing amount of appreciation of the localities has no doubt resulted, the main question still remains to be answered.

It has been the general experience that the habitats of the disease are chiefly upland areas, which are wooded and situated on both high and low mountains. Field observations have been recorded from both Mounts Gambier and Schank, in Australia, to the effect that when paddocks which had not been ploughed for years (described as "stale and ferny") were leased cases of hamaturia started to appear in farms that had been free. After carefully weighing all the evidence obtained from farmers, Bull, Dickenson and Dann (1932) came to the following conclusions :—(i) That certain farms are definitely more likely to give rise to the disease. (ii) That a regular stream of cases does not always develop on any farm, but that after the disease has become manifest in several animals, a period of years may elapse before more cases develop. (iii) That within the haematuria area some farms never show active cases of the disease. Law (1901) states that it is the disease of woods and waste lands, of damp undrained lands, of lands rich in vegetable humus or vegetable moulds. In the country most recently added to the list of haematuria countries, Butozon (1938) has also observed that the disease is a malady of wooded hills or mountains.

Apparently contradictory reports have, however, been made to the effect that the disease occurs in the low-lying areas of France, and that the bench lands of Canada, where haematuria is found, are only a few feet above the sea level. In Australia, Cleland (1911) noticed that the disease was confined to high lands, and Case (1911) observed the same thing about the incidence in Hawaii Islands. Detailed investigations of other features like the character of the soil, water and vegetation of the areas, have been made. While the disease is normally a disease of pasture animals, it occurs in both stall-confined and grazing cattle in Germany. Moussu states that in all countries, bovine haematuria is a disease of certain poor regions of which the soil and flora present special characters. The idea of the influence of the soil, flora and action of certain plants, has been sustained everywhere.

Hadwen (1917) stated that the disease in Canada was associated with poor farm lands, woodland, newly cleared farms, or farms that were either neglected or falling out of cultivation. The disease has therefore been called " a poor man's disease." He added that the disease is due to a class of vegetation rather than individual or special plants. It is usually stated that with improved management, cultivation or top dressing of the land, the disease gradually disappears, but it is not clear what modification of the

flora, or other transformation in the land conditions, bring about the disappearance of the disease. Other factors associated with its occurrence are high rainfall, an open or light soil, and the presence of bracken fern. In the earliest reports from Australia, M'Caffrey states that in New South Wales the disease is more prevalent after a dry season where there has been a great rush of soft grass.

Certain field observations recorded by Lienaux (1911) to emphasise the enzooticity of the disease, are worthy of note. For instance :—

(i) One farmer, who had always suffered from the existence of the disease in his large farm, disposed of the part that was wet and water-logged, and thus restricted his own cattle rearing operations to the better part left for himself. He noticed that the disease altogether disappeared from his own farm, while much illness was exhibited in the other part taken over by a new farmer.

(ii) A farmer purchased a farm where the disease existed. He disinfected it and started out with a fresh batch of good animals, but he obtained fodder from the same source as the previous farm holder. The disease appeared again in the farm.

(iii) One farmer, who was always troubled with the disease, started obtaining the food supply of his cattle from an area that was known to be free. After this, there was no disease among his cattle for one winter, but the following year the disease again manifested itself. Whether this was due to accidentally contaminated food, or due to the animals having had access to old food of the locality, was not clear.

(iv) Another farmer used to obtain food for cattle from an area outside his locality but could not get rid of the trouble from his herd.

The author went further to record that when affected animals were transferred from the Ardennes, the disease was " cured ".

Contrary to the existing hypothesis incriminating either the vegetation or the soil type, Bankier (1936) asserts that these have no direct relationship to the disease whatsoever. His experience, however, confirms that the majority of haematuria farms have a limited amount of land under cultivation, the balance being bush or rough pasture. He observes that the disease appears to be confined to certain farms rather than any particular area. From the crucial experimentation under field conditions now in progress at Milner B. C., highly interesting results are promised. The positive evidence already collected, which need not be gone into here,

tends to establish a definite relationship between pasture conditions and the development of the disease. Literature shows how very difficult it has been to establish any correlation between environmental factors and the disease. The difficulties of controlled work under conditions existing in the field have been great, but there is no doubt that the possibilities have been greatly narrowed down.

1. *Vegetation.*—The toxic effects of plants have long been suspected, and many individual plants, or groups of plants, have come into prominence and disrepute in this connection. Young shoots of the oak, ash, privet, hornbeam, hazel, dog-berry, coniferae (Law, 1901), ferns, sedges, rushes, hellebore (Galtier), and many others have been included in the list of plants from which animals have to be protected and kept away. Botanists have co-operated to a large extent in these investigations carried out in several countries. In Ireland, it is stated, the fields to which haematuria cases have access, contain grasses which are for the most part coarse, and that the herbage contains moss, gorse, bracken, arum, iris, and sedges. Plantage, Ranunculus, Rumex, Anemone, Cares, mosses and Colchicum were found growing in and around haematuria farms in Belgium, and the pastures contained *Hieracium, Auricula, Achillea, Hypericum tetrapterum, Hypochoeris radic.* and *Hypochoeris macul.* (Lahaye & Rulot, 1926). In British Columbia, the native and herbage growth consist principally of alder (*Alnus glutinosa*, Goertn.), fir (*Abies balsamea*, Mill.), birch (*Betula occidentalis*, Hook.), vine maple (*Acer circinatum*, Pursh), cedar (*Thuja occidentalis* L.), bracken (*Pteris aquilina* L.), willow (*Salix sp.*), hazel (*Corylus americana*, Walt.), broad-leaf maple (*Acer glabrum* T. & C.), hemlock (*Tsuga canadensis* L. var), and cotton seed (*Populus* deltoides, Marsh.). The prevailing cultivated pasture herbage consists of timothy (*Phleum pratense*), June grass or Canada blue grass (*Poa comprossa*), white clover (*Trifolium repens*), red clover (*Trifolium hybridum*), orchard grass (*Dactylis glomerata*), perennial rye grass (*Lolium perenne*), red top (*Agrostis alba*), meadow fescue (*Festuca elatior*) and Yorkshire fog or velvet grass (*Holcus lanatus*). The plant communities dominant in the affected areas are 'fire or burn indicators', such as would be expected to occur on logged or burnt off lands, whereas the 'plant indicators', among the pasture plants are those usually associated with overgrazing. It is also to be noted that the majority of herbage plants of the locality are acid-loving individuals. (Hill, King & Laird, 1933). Recent Australian workers have, however, failed to detect any difference in the herbage and grasses between affected and non-affected farms.

Of the plants growing in enzootic areas, Cleland (1911) in Australia became highly suspicious of *Homalanthus populifolius* (Euphorbiaceae), *Indigofera australis* and *Goodia latifolia* (both Papilionaceae), while Hadwen in Canada thought it necessary to experimentally test out the

local plants, bleeding heart (*Dicentra*, deer grass (*Achlys triphylla*), alder and bracken (*Pteris aquilina*). In New Zealand haematuria localities were covered with beech (*Nothofagus sp.*). The possibility of certain toxic plants causing haematuria has been tested by several workers, and reference to this work will be made later, in connection with the various attempts at experimental transmission of the disease.

One plant, however, more than any other requires to be considered here in some detail. The bracken fern (*Pteris aquilina*) has been prominently mentioned and observed as invariably associated with haematuria farms in all countries. For instance, Downham (1938) states that haematuria farms in Shropshire, in England, are mostly hill farms with bracken in the pasture. The converse, however, does not hold true. The symptoms of bracken poisoning are well known and do not include the syndrome of haematuria, and some years ago Stockman studied the subject in England. Bracken has been called the insidious foe of the farmer, and the great increase of this plant in recent times in Great Britain has been causing some concern among recent writers. Bracken is no doubt a most widely distributed plant in temperate and tropical regions alike, much more widely spread than haematuria. According to a recent report, the cultural requirements of bracken are being studied in hamaturia farms in Canada. This point has already been studied in England from the purely agricultural standpoint. Surveying the story of the bracken fern, Long & Fenton (1938) provide the following interesting details. It does not seem to flourish on calcareous soils or over limestone unless the carbonate has been washed out. It occurs in most rough grazings and in many old permanent pastures, in most open woodlands and on sites of formerly wooded area. Bracken is a typical part of the flora of rather open Pedunculate Oak woods or forests, and also appears with the Sessile Oak, and in many other plant associations. A series of wet seasons, that have probably been very favourable to the spread of the plant by spore growth, has been suggested as one of the causes of the recent increase of bracken in British pasture. It may be remarked in passing, that certain authorities have described the special features of haematuria localities in very similar terms.

Authorities have repeatedly stated that the disease is associated with upland farms where much of the land is badly cultivated or has gone out of cultivation. Such upland grazings are expected to become bracken infested. Similar other plant associations of hamaturia exist. Attempts have been made to ascertain the common factors underlying the plant associations of haematuria, but no data capable of providing a satisfactory explanation have yet been obtained. Some exact data with regard to the vegetation of haematuria localities have, however, been put forward by Hill, King & Laird (1933) who stated that it had been definitely established

that there was an inherent difference in the mineral and inorganic compositions of different species of plants. The leguminous plants usually contain a large excess of calcium over phosphorus, whereas there is generally an excess of phosphorus over calcium found in the graminous plants. Further, it has been found in Canada that the calcium content of feeding stuffs grown on haematuria farms is comparatively higher, with a wider range, than those produced on disease-free farms, and that the manganese content is distinctly lower in the majority of cases. The investigators think that the physiological effect of this slight deficiency may be of importance, as manganese is an essential element of plant growth which probably assists in animal nutrition. Similarly, Theiler (1929) emphasised that the remarkable coincidence of phosphorus and manganese deficiency in haematuria areas in Australia should not be lost sight of. The finding in Germany that the hay of haematuria localities is rich in crude fibre, but deficient in albumin and poor in mineral salts and vitamins (Schlegel, 1934), is perhaps not so interesting as the results obtained in Canada, but should not be altogether allowed to be lost sight of. Bankier (1936) says that the dry feed supplied to cattle in Milner B.C. does not appear to have any relationship to the production of the disease, nor is the bodily condition of animals a predisposing factor. In the opinion of Bull, Dickenson and Dann (1932), " it is possible that a deficiency of some dietary constituent is the essential cause of haematuria ", and from the result of urine analysis carried out by them, they add that " there appears to be some possibility of a low protein intake and possibly a low sulphate intake." Besides this idea of a chemical or nutritional deficiency, there is, of course, the other suggestion of Law (1901) that " some special poison in the pasture may be the unknown cause of the disease."

2. *Soils.*—Closely associated with vegetation is the question of the the soil of haematuria farms, because the character of the latter would naturally be reflected to a large extent in the former. The character of soil conditions determining the incidence of certain animal diseases of specific or nutritional origin, like Johne's disease or osteomalacia of cattle respectively, or to put it in another way, the influence of the soil upon the welfare of the animal body through the intervention of the herbage, is being increasingly realised in animal pathology.

Regarding haematuria, land reclamations (Pichon), thin arable soil poor in phosphorus acid, poor feeding (Cruzel) were suggested as associated factors about the middle of the last century. Landel and Stricker ascribed the disease to soil conditions, peat soil in particular. The leaching of open soils by excessive rains has been mentioned by several authorities as being present in the affected farms. In Belgium, most of the cultivators believe that the deficiency of lime and phosphoric acid content of the soil in the Ardennes is the cause. After prolonged

investigations, Schlegel states that the disease is related to calcium deficiency in the soil, produced by the washing away of this constituent through heavy rains. These soils are stated to be rich in potash and silica content. Similarly, Gottardi (1935) in Italy ascribes the disease to soil conditions producing deficiency in calcium and phosphorus in the blood of affected cases. In Canada, the probablity of a nutritional disturbance and of a mineral deficiency, hyperacidity, or an unknown factor in the soil and vegetation, has been suggested (Ottawa Report, 1930). Hill, King & Laird's (1933) analytic data relative to haematuria farm soils, show that the total insoluble matter, representing chiefly insoluble silicates and certain forms of organic matter, is comparatively high, also that the soluble silica in the form of soluble silicates is slightly higher in some instances than normally expected. Further, the statement by them that the lime content is not abnormally low, and its relation to magnesium content is within a safe range, is against the results of Schlegel.

The Canadian workers have made the further interesting, and it will be shown later, a possibly significant observation, that the hydrogen-ion concentration of the affected soils is *acidic*, and the ratios between the calcium, iron and aluminium would suggest that the cause of the acidity of these soils is probably the existence of iron and aluminium compounds which are held absorbed by the soil colloids and associated with the silicates. Analyses showed that the soluble silica, aluminium and iron are comparatively higher on affected farms and their range is wider. Recent Australian workers assert that there is no appreciable difference between the soils of haematuria farms and non-haematuria farms. Yet they quote Prescott and Piper to show that in haematuria areas " the soil is remarkable for its high fertility in terms of plant nutrients and its favourable fine sandy, loamy texture, tending to a degree of looseness, locally expressed by the term ***snuffiness***". They visualise the possibility that certain soil conditions lead to some abnormality in the herbage which is directly responsible for the production of the disease. In dilating on this point, they add that this abnormality may be due to the absence of some rare element of organic substance, or may be caused by the presence of an abnormal organic substance orginating from an abnormal metabolism of the plant.

3. *Altitude.*—It has been stated earlier that the habitats of the disease are provided by mountains or sub-mountainous regions, and in some cases by bench lands which may be only a few feet above the sea level. Some actual data exist in this connection, and these would appear to be worthy of note.

In Bulgaria, haematuria farms are situated on high-lying lands at an elevation of 2,500 ft. to 7,000 ft. In Germany, the enzootic areas lie at a height of between 550–600 metres. In France, the disease is said

to occur mainly in low-lying areas and scarcely above 2,400 ft. In Yugoslavia, which appears to be the only country where the disease is present in every county though to varying extents, one finds that the lowest area, the Banat of Danube, has the least percentage of land area affected, while the Vrbas Banat has the highest. In Jamaica, the disease occurs in the mountainous regions of Southern Manchester, while in the Pacific Islands it is seen at an elevation of 3,000 ft. to 4,000 ft. In the Republic of Columbia, the affected farms lie at an altitude of 1,000 to 3,000 metres. In British Columbia, the affected farms may be as low as 40 ft. to 350 ft. above sea level.

A consideration of the above cited specific data would seem to demarcate the maximum and minimum ranges which are capable of supporting, or producing, the conditions required for the existence of the disease. The fact that the disease may occur at an elevation of 40 ft. only in one country, as opposed to its occurence at 7000 ft. in another, can perhaps be explained on the relative elevation of the haematuria farm or district in relation to its immediate vicinity. The invariable association of elevated lands with the incidence of the disease has been observed in all countries, but the special conditions of Yugoslavia make the relation even more obvious. The significance of this would seem to lie in the amount of moisture conditions available, depending, of course, upon the rainfall, humidity, drainage, and the degree of diminished evaporation peculiar to wooded area. Besides, the nature of the vegetations and the cultural conditions provided by the geological and surface soil formations, would also appear to have some important bearing. The relative part played by each of the factors in constituting a natural enzootic area may only be discussed at a later stage. The statement of Fleming, Fowler & Clark (1930), that it is open to doubt whether haematuria occurs in places where potassium iodide is being administered for preventing goitre peculiar to high altitudes, is of unusual interest. Excessive rains may lead to serious leaching of elevated lands, but goitre and haematuria are not found associated together. While iodine deficiency by itself is not expected to set up haematuria, any diminished incidence or suppression of the disease as a result of iodine supplements, would require to be thoroughly investigated.

4. ***Climate and season.***—Lienaux (1919) points out that one cannot say in which part of the year the disease starts but the symptom of haematuria is often exhibited first in the winter. Atmospheric influences seemed to be without effect, since he observed that the exceptional dryness of 1911 did not reduce its incidence from that unusually seen in any moist or damp year. Bull, Dickenson & Dann (1932) remark that opinions regarding the disease being more common in one part of the year than in another are quite unreliable. The annual rainfall in their area is said to be between 30-35 inches. Moussu states that in France the disease is often observed in

the winter when the animals are housed, as well as in the other seasons when the cattle are at pasture. In Germany, more cases are stated to occur during and after a dry summer. In Canada, the disease is seen more frequently at the end of winter. Recent Canadian workers state that the disease requires a long cool season, colder habitats and higher altitudes. The haematuria area of Canada has a mild winter and a cool summer, with a yearly average rainfall of 53 inches, a mean monthly temperature of 49°F., and with 1627 hours of bright sunshine in a year. According to the workers there, the two important climatic factors which are undoubtedly involved in producing the soil conditions found in the affected farms are rainfall and temperature. Hill, King & Laird (1933) suggest that these may be the significant factors of the disease. They are convinced that the amount of rainfall must be the most important of all the factors in producing the changes in the composition of plants which their analyses revealed. The occurrence of heavy rains in the affected areas in Germany has been emphasised by Schlegel (1934).

5. *Water supply and Drainage.*—In Germany, the water supply in the affected areas is said to be poor in mineral salts. The spring water from notorious localities was tested experimentally on healthy animals, and from the negative results obtained, it was concluded that the water supply of enzootic areas did not contain any virus or bacteria which might produce the disease. Further, the statement from Germany that one can distinguish the water of these localities on account of its high percentage of nitric acid content is interesting. In Canada, Hill, King & Laird found that the water supply in none of the farms was highly mineralised or contained any elements in such quantities as might be deterimental to cattle. They analysed the silica content of the water supply (average 8.6 as SiO_2, the maximum 12.4 to 13.4) and considered the data suggestive, when taken in conjunction with that of the herbage produced on affected farms. They refer to the extensive metabolism of silica, which takes place in milch cattle, and to the retention of this element from rations being surprisingly large. While considerable amounts of this element were found in the urine by them, its presence in milk was not in weighable amounts.

In Canada, the water supply of the affected farms is obtained largely from seepage wells, 12 to 30 ft. deep, with some surface water and artesian well water (Mackenzie, 1930; Grauer, 1930). It is understood that the pastures there are more or less badly drained, and that as a result of heavy rainfalls and the impervious nature of the sub-soil in spots, considerable surface water accumulates which may stand for the greater part of the year. Cattle have access to the surface water in pasture fields or bush lands. Bankier (1936) asserts that the maintenance of cattle under such pasture or watering conditions is the only apparently common feature among the affected farms, and this is also the most striking difference

between the affected and non-affected areas. Further, it is noteworthy that the relation of the surface water to the incidence of the disease receives added support from the observation in Canada that the affected cattle recovered in many cases after the drinking water had been changed from the surface water, previously supplied, to artesian well water, (Jarvis), as well as from the other observation that, if not too seriously affected, some cattle make recoveries on being removed to disease-free areas (Lienaux, 1919; Grauer, 1930). When a comparative chemical analysis of surface and artesian well water was made, the most noteworthy difference revealed was the increased amount of salts (chloride, carbonate and sulphate of sodium, and bicarbonate of calcium), and the high iodine content (2,000 parts in 100 billion) of the artesian well water.

6. *Geology of Haematuria areas.*—Hill, King & Laird (1933) state that, geologically, the affected sections of the Fraser Valley area are composed principally of glacial drift, overlain in places by small thicknesses of marine deposits which were laid down during glacial retreats of the pleistocene time. According to Johnston, quoted by them, the glacial drift soils occurs on the uplands which were formerly, and still are, in large part, heavily timbered. They are mostly sandy or sandy loam soils. The upland areas are being gradually brought under cultivation in places where the valuable part of the forest has been removed in timber operations. The topography of the land is usually of a rolling nature, with occasional fairly level areas. The type of soil may be classed generally as coarse, sandy loam, varying from a light brown to a dark chocolate colour. It is usually acid in reaction. The texture is often open and readily leached, and drained naturally.

In Australia, the bedrock of the area consists of a series of marine tertiary limestones which extend over thousands of square miles to the north, west and east of Mount Gambier. The limestones include red and cream-coloured dolomites and a polyzoal limestone, and in places flints are abundant. The limestones decompose to a red clay, and the chief modifying feature of the surface soils is the peaty accumulations of the extensive swamp areas, and the sand of the ancient dune ridges. The most fertile areas are those where basaltic "ash" fragments have been deposited. Most of the haematuria farms are found within the area of ash deposit in Mount Gambier. The soil is much less acid than most other South Australian soils. Some of the soils are unusually well supplied with plant foods, the maximum amounts observed being 0·4% of nitrogen, 0·4% of P_2O_5, and 1·7% of K O.

Regarding the geology of haematuria farms in Germany, the affected farms contain granite, gneiss and coloured sandstone.

It may be remarked here that a consideration of the available geological data from the three countries given above does not seem to justify any clear generalisation being made.

5. Theories of Causation

Chronic bovine haematuria has received attention from many investigators. It occurs in many countries and has been known for the past century. The literature on the subject is, therefore, very extensive, widely spread, and written in several languages, some of which are not intelligible to any average English speaking student. In recent times articles on haematuria have been fairly frequent, and several Theses on the subject have been presented to Universities in Europe and America. Yet no attempt has been made to put either the old or the new literature together. In fact, a lack of co-ordination among the various writers on the subject seems to be a feature of the literature extant upon the disease. Investigations have been carried out along various lines and, though some quite lengthy articles have been written, records of definite data of significance are very few indeed. The failure to produce any significant data, in spite of prolonged investigations, has been commented upon from time to time by the investigators themselves.

Considerable time and labour have been devoted to the perusal of the existing articles. Without attempting a complete and detailed chronological account of all the literature, it is proposed to provide a bird's eye view, as it were, of the more important and noteworthy contributions, particularly those that are likely to be of value in elucidation, or in filling up the gaps in our knowledge. A number of these and foreign and old literature could not be secured for reference.

Writing in 1787 about the evacuation of blood in the urine, Topham says: "For I am well convinced by experience during a course of sixty years' practice that a sudden change of weather, seasons or climate is the most common and effectual cause of, not only this, but of almost all inflammatory diseases whatever". It is not clear if the writer implied an inflammatory process as the cause of haematuria, but, as the first reference, it is certainly of some interest. Anderson (1842) found in the urinary bladder of a cow a "fungus haematodes" in the form of five pedunculated blood sponges (fungus haematodes) which stood out of the vesical mucous membrane and "perspired" blood. Hubner, in the same year, observed an epizootic of haematuria of cattle at Meissen. He believed it to be due to Arnica, and buds and shoots of Coniferae, which cause an occasional haemorrhage and tearing of the vascular tissue. In an ox passing blood-stained urine, Vaes (1843) observed rupture of the urinary bladder and spongy growths on the thickened mucous membrane of the organ. The growths were differentiated from the surrounding mucous membrane due to their greyish

brown colour. Raconnat (1847) described cauliflower-like polypus in the bladder of a bovine as the cause of haematuria. Working in the province of Maine, Pichon (1863) ascribed the disease to changes in the cultivation, which had altered the general appearance of the country and the conditions of cattle breeding. The specific factors mentioned were land reclamations, the lime dressings applied to land, and the introduction of the Durham breed of cattle. In 1864, Sinoir considered that the crossing of the local cattle with the Durham breed had undermined their bodily resistance, and had increased precocity, making them highly predisposed to attacks of haematuria.

Both Pichon and Sinoir described changes in the kidneys and ureters, but did not attach any significance to these. They were inclined to consider haematuria as a blood disease, resulting from poor feeding. Reynal endorses this view and says that, as a result of increased fluidity of the blood, the blood corpuscles become smaller than normal and can therefore escape through the wall of the blood vessels more readily. Reynal affirms that plethora causes haematuria, since, under the prolonged influence of a very assimilable diet, the blood becomes more plastic, circulates with difficulty in the capillaries, and may even rupture them, with a resulting capillary renal haemorrhage and haematuria. In Reynal's experience, the disease occurred when the cattle were turned out to the very rich pastures characteristic of the spring and, similarly, he found the unusually rich pastures of Mormandy notorious for producing bloody urine. Roll and Lousienne encountered an epizootic of haematuria in the Austrian Alps and in the region of Aubal, but no vesical growths were found, and the cause was not determined. Landel and Stricker observed haematuria in England and Holland, and gave the causes as soil conditions (peat soil), certain plants of *Ranunculaceae* and *Euphorbiaceae*, and water containing lead. Ross, in 1878, described haematuria locality as containing abundant hay and straw of poor quality, with deficiency of green grass, and with pastures containing standing water. Pflug (1876) thought that the polypi were caused by constant irritation in the chronic cystitis, and bladder calculi could form anywhere on the bladder mucosa. Galtier and Boudeau (1886) concluded that haematuria was a local disease of the bladder, due to a toxic irritant substance and secondary microbes which were excreted through the urine. The organisms gaining a foothold in the bladder could produce great irritation, but when injected caused no haematuria. Cystitis haemorrhagica became necrotic and incrustaceous, and was a disease transmitted through fodder spoilt by "melioration" of the meadow. Semmer found bleeding was due to polypoid new growths in the bladder. Hink (1886) observed Stallrot (stable red), and Weidrot (Pasture red) in cattle in the Black Forest. He found the latter in young stock in the early part of the year, ascribes it to the cooling of the body surface in general and of the digestive tract. In the peculiar and chronic disease "Stallrot", blood comes out of the bladder. Hink called it haemorrhagic inflammation, caused

by obstructions in the way of the posterior vena cava, due to growths impinging upon it. Thus varicosity and engorgement of the capillary and venous blood system take place, eventually causing them to give way and form ulcers. Stockfleth, in 1889, writes of neoplasam of the bladder of a cow. The bladder had an uneven surface, and the papillae and mucous membrane had the appearance of a carcinoma. It simulated a polypoid fibroma, but was really a scirrhous carcinoma. In 1890 Arnold published observations on haemorrhagic verrucose growths of the urinary bladder, apparently caused by "gregarines" (coccidia) developing in the epithelium of the bladder mucous membrane. Hink and Lydtin had already considered this possibility.

Detroye (1891 and 1904) ascribed the disease to a microbic infection and considered it to be a readily transmissible condition. He thought that the specific cause was a micrococcus which appears in culture on serum, urine and boullion as a diplococcus or a streptococcus. The organism resists desiccation for months. According to him, the micrococcus grew naturally in the moisture of the pastures, and the infection was contracted through feed or water. Young growing animals are more susceptible to infection with the bacterium than older animals. Of the seventeen transmission experiments, ten were positive. Treatment is useless. Clearing of pastures and isolation of the sick animals are the measures of prophylaxis recommended.

Galtier (1892-3) ascribes chronic haemorrhagic cystitis to the ingestion of irritant plants by animals which are already parasitised by the liver flukes (distomiasis). When thus parasitised, the liver can no longer perform its functions and destroy toxins effectively. The toxic principles of *Ranunculaceae*, sedges, rushes, etc., are absorbed and without being previously destroyed, are eliminated through the kidneys. The toxic principles, having passed to the bladder, cause intense irritation and haemorrhagic cystitis, which is maintained subsequently by microbic organisms present in the bladder. Cruzel suggested that the disease was entirely due to poor feeding.

Against Cruzel's view, Moussu (1905), who has done much to remove misconceptions regarding the disease, points out that the theory of poor feeding and poor forage does not explain the causation of the disease. Debilitated animals, for instance, pass through all stages of wasting and profound cachexia, but never pass blood in the urine, while haematuria is exhibited quite frequently in animals of good bodily condition. In controverting Galtier's ingenious theory, Moussu recounts the two simple facts, that haematuria is known to occur among animals with no liver fluke infestation in them, and, secondly, that the disease does not occur in the lower regions of the "departments" of the Nord, the Pas de Calais and the Somme, where both of the factors incriminated by Galtier, viz. *Ranunculaceae*, and other irritant plants, and liver flukes, are common. Similarly, Detroye's micrococcal theory falls to the ground, since the culture he sent to Nocard was found to be incapable of setting up disease. Boudeau (1893)

supported Cruzel's view by stating that haematuria affected as many as one-tenth of the cattle population in the south of the canton of Indre and north of the Creuse, parts of which are characterised by thin arable soil, deficient in phosphates. He went further and suggested that the dressing of land with lime and phosphorus in the affected areas would prevent the occurrence of the disease, as, in his experience, the disease had disappeared under such conditions from previously notorious farms.

Gmelin (1897) divided blood-stained urine into *Weidrot* (pasture red), as an acute haemoglobinuria, and *Stallrot* (stable red), as chronic haematuria, following upon a productive cystitis associated with papillomata and bleeding neoplasms of the bladder.

Lienaux (1905) discountenances all the existing theories regarding causation and seeks the cause in the abdominal circulation of affected animals. He considers that inflammation of the bladder-wall results from the abnormal size of some of the organs of the posterior part of the body, and some times due to the defects in the lung function. In a later paper, Lienaux (1919) modifies his previous view and says that the disease is not seen in voracious eaters or as a complication of fattened animals, as would be expected to happen if his previous hypothesis were correct. He criticises Detroye and says that the latter did not distinguish between haematuria and haemoglobinuria.

In extension of Lienaux's previous hypothesis, Delcroix (1905) incriminates pressure stasis of the venous blood, particularly of the pelvic veins. Mossu (1905) discusses the existing theories of causation but avoids making any definite suggestions himself, though, when dealing with the subject of treatment, he makes the abrupt assertion that "the disease is beyond question of a parasitic character".

Goetz (1906) studied the pathology of "warty cystitis" in Switzerland. He described the presence of "water-clear, oval or round structures in the epithelial layer (of the bladder) with a granular content arranged in the form of clumps or rounded masses, and showing a more or less large nucleus-like body". He was definite that these peculiar bodies were different from the cells of the surrounding tissue. The size and shape of the bodies gave him the impression of "*Coccidium oviforme*", and reminded him of the previous findings by Arnold and others of similar structures. He was inclined to think that they were secretory products having a "drop-like" structure.

Case (1911) examined sections of bladder growths from haematuria cattle in the Hawaii Islands, and makes the statement: "the study of the peculiar cells found in such large numbers in the (bladder) submucosa leads to the conclusion that they are the etiological factor in this disease". The cells are described as circular in outline with a central nucleus, rich in chromatin and taking a deep haematoxylin stain. In another form, the

parasite exists as free nuclei. The nuclear forms become encysted in the epithelial cells, and he thinks the parasite should be classed as a *Coccidium*.

The above observation is certainly interesting but curiously this has never received any notice in literature.

In 1917, Hadwen complained that in Europe apparently very little work was being done upon this important disease of cattle. By his experiments, he tried to prove that injections of dilute oxalic acid solutions provoke great irritation, and a bladder disease indistinguishable from bovine haematuria. He postulated that calcium oxalate crystals are formed in the bladder (from the ingested fodder, suspected to be oxalic-acid-bearing), as soon as the acid comes in contact with urine and mucus. The crystals, being characterised by cutting edges, have a direct effect on the bladder wall, and it is probable that oxalic acid itself has a selective deleterious effect. After a time, contaminative bacteria play their part in aggravating and maintaining the lesions produced by oxalate crystals and oxalic acid. The blood drawn from one of the oxalic acid treated heifers coagulated in thirty-three minutes. Anderson (1918) and Cleemann (1918) reported on cases of "parturient" haematuria. While making microscopical examination of bladder growths, Roger (1912) found that the branching growths were composed of very large ovoid cells, with a large nucleus disposed in several layers round a peduncle in the manner of petals of a flower. In the epithelial layer of the bladder, he discovered the presence of transparent ovoid bodies without much structural differentiation. These did not resemble any known parasite, and he believed they were degenerated epithelial cells. In four cases of haematuria examined, Cleland (1911) found numerous larvae of *Pentastoma denticulatum* as infesting the mesenteric gland. He did not find any evidence of the presence of actual larvae in the lesions or in any part of the bladder. He expresses the opinion that the disease is not of bacterial origin, since cultural examination and smear examination of organs have been negative. Roger (1916) remarks that oxalaemia should have a place in veterinary pathology, and believes that this can play an important part in horses, as well as in cattle. In 1922, Ichikawa in Japan found adult *Schistosoma japonicum* worms in the bladder tumours of two bovines. In five other cases, he failed to detect any bilharzial worms. Mathis and Leblanc are said to have incriminated Schistosomes in 1897 and 1893 respectively. Craig and Kehoe (1923-25) stated that the causal agent is probably some chemical irritant in the grass or fodder from the land, which is excreted in the urine, but they are unable to identify any special plants with the production of the disease. They failed to find any chemical agent to account for the condition. While discussing the various theories, Lahaye and Rulot (1926) question Hadwen, and express the opinion that the disease is caused by an intoxication produced by a species of *Mercurialis*. In the experiments carried out by Kalkus and Sawyer, oxalic

acid and oxalates failed to produce haematuria. Miyamoto (1927) studied the disease in Formosa among cattle and buffaloes. He portrays the development of various types of neoplastic formation in regular sequence. He reports that cystitis and pyelonephritis occur due to secondary infections, and numerous streptococci in long chains may be present. Cocheril (1930) ascribes the disease to intoxication due to *Mercurialis*, similar to the view of Lahaye and Rulot noticed above. Allardyce, Fleming, Fowler and Clark (1930) were unable to detect any notable difference in the constituents of the blood of haematuria and normal cases. Cholesterol, sugar, non-protein nitrogen, urea nitrogen, creatinin, calcium, inorganic phosphates and chlorides were estimated. In Fleming, Fowler and Clark's experience (1930), two remedial measures were found to be beneficial: (1) A change of drinking water, from surface to artesion well water, (2) the administration of ground coral rock. Scharer (1930) says that the disease is not spontaneously cured, and describes the finding of "coccidia" in various developmental stages in the tissue cells of the tumour-like growths of haematuria. Durin and Unglas (1931) believe that the disease is a form of Colibacillosis, and attempt treatment in that belief. Bull, Dickenson and Dann (1932) state that a bacteriological examination of the bladder lesions in earlier cases has failed to reveal the presence of any micro-organisms. They add that one or more small and insignificant lesions may lead to severe, and even fatal haemorrhages, while large or more extensive lesions may bleed very little. Further, in their experience, the commonest lesions found, apart from the urinary system, are haemangiomata of the liver, hydatid cysts in the liver and lungs, pentastomiasis, and occasionally oesophagostomiasis. Lockett (1932) reports that in Jamaica mildly affected cases have been observed to recover permanently on a more or less complete change of food and water conditions. He failed to find any gross parasites in affected animals. He obtained temporary improvements with intravenous injections of tartar emetic. Mackenzie (1932) carried out an economic survey of the disease in Canada. Giovine (1933) ascribes the disease to the condition of the fodder, and states that the changing of the pasture reduces the incidence. Hill, King and Laird (1933) analysed soils, grass, and oat hays, and samples of water from haematuria farms, and also similar materials from definitely disease-free areas. Simonetti (1934) ascribes haematuria to *Babesia bovis*.

Commencing with Ross's work in 1878, Schlegel (1934) surveys the literature. The previous forty years' literature existing on the subject would appear to be unknown to the author. Schlegel wrote his first article in 1912. With the approval of the Reich authorities, a very comprehensive investigation was started in 1927, and all the work to date is recorded in an exhaustive series of documented articles. In collaboration with a geologist, a botanist and a chemist, he carried out a complete scientific survey of the haematuria localities, the so-called "hunger farms" of the Black Forest in

Germany. Details of the geological and chemical nature of the soil, the water supply and botanical flora of the farms were studied. The chemical and physiological characters of the blood and urine, the clinical and *post-mortem* features associated with the disease have been studied. Records of the observations upon the various aspects have been interpreted in the light of the existing knowledge upon the mineral metabolism, role of vitamins, blood constituents, the physiological mechanism of the clotting of blood in normal cattle and its retardation. The author attempts an explanation of the causation on these lines, and believes that a haematogenous toxin, derived from local plants, is the cause.

Gottardi (1935) studied chronic haematuria in milch cattle, and states that the water of affected farms was rich in acids, due to soil being deficient in lime. He ascribed the disease to a diminution in the calcium and phosphorus content of the blood.

Bankier's (1936) investigations consist chiefly of field observations regarding the conditions under which the disease occurs, as well as of cattle feeding experiments on a notorious haematuria farm at Milner, B. C., which was specially leased for investigational purposes. Attempts were made to determine if the forms of insect life present in the surface water had any relation to the disease. Bankier reports the finding of quite large cells in urine samples, but is uncertain about their identity and significance. He goes on to state that, of the reports of scientific workers on the disease in other parts of the world, the most interesting one appears to be by Datta, who claims that the disease in India is caused by a parasite. No definite proof has, however, been secured yet of the disease in British Columbia being caused by such a parasite.

Pommeret (1937) records the results of his studies upon samples of haematuria urine and bladder, collected at the abottoir at La Villete. He states that on examination of the urine of twenty cows and of twelve specimens of diseased bladders, he succeeded in two cases in discovering the bodies described by Datta as Entamoeba. He asks the question: "Le bacille de Pasteur et Thillier donne le rouget au porc, le bacille de Nicolaier et Kitasato donne le tetanus, mais quel est l'agent de l'hematurie essentielle, nous l'ignorons. Cependant, n'y a-t-il pas lieu de fonder queleque espoir sur la theorie toute recente qui nous vient des Indes sous la plume du Capitaine Datta?" [*Tr. The baccilli of Pasteur and Thillier gives a red colour to the pox. The baccilli of Nicolaier and Kitasato gives tetanus but we are ignorant of what the real agent of haematuria is, However, is there not some hope in the recent therapy which comes from the Indies written by Captain Datta.? Ed. I. V. J.*]

In Yugoslavia, Butozan (1938) has worked out the percentage land area in each county and circle which is affected. He describes how the

disease exists to varying extents in all the counties there (Banats), the least affected being the Banat of Danube (1.9 per cent), and the most widely affected being Frbas Banat (68-76 per cent). He has carried out chemical estimations of the inorganic constituents of the blood and urine, and has found no parasites in the blood smears from affected cattle. He records results of the observation for one complete year upon two cows and one bull.

In summarising the foregoing narrative, it may be recalled that no definite clues or indications have yet been given by the literature extant upon the disease, and the theories that have been propounded have been declared to be unacceptable by various workers (Hadwen, Kalkus, Grauer, Schlegel). Nevertheless, an analysis or examination of the basis of the theories so far put forward, may be worth our while.

Generally speaking, all the foregoing theories are based upon some individual observation or other relating to

(i) the tissue changes seen in affected animals (e.g. due to "fungus haematodes" Anderson; cauliflower-like polypus, Raconnat; chronic cystitis aggravated by constant irritation, Pflug; due to polypoid neoplasms, Semmer; round cell sarcoma, Hink; Scirrhous Carcinoma, Stockfleth; transitional neoplastic growths, Miyamoto; mechanical passive hyperaemia, internal sarcoids, pressure stasis);

(ii) microscopical findings of organised factors, bacteria and entozoa, in the diseased tissues (e.g. due to micrococci, Detroye; secondary bacteria, Galtier and Boudeau; colibacilli, Durin and Unglas; due to filaria, distomes, Lydtin, Hink, schistosomes, Leblanc, Mathis, Ichikawa; and pentastomes, Cleland; due to coccidia, Arnold, Goetz, Case, Roger and Scharer; and

(iii) clinical observations on environment (e.g. due to the influence of the local vegetation Pichon, Sinoir; soil and pasture conditions, Ross, Galtier, Boudeau; lack of cultivation and lime-dressings, plant poisons, mineral deficiency, oxalic-acid-bearing plants, chemical irritant in the grass or fodder, Craig, and Kehoe; haematogenous toxin derived from local plants, Schlegel; toxic irritant substance through fodder spoilt by "melioration" of the meadow, Galtier and Boudeau; faulty metabolism, amelioration or cure due to change of place and elimination of surface water.

Regarding the investigations which are now in progress in different countries, it may be noted that they are being approached from one of the two angles, *viz.* (i) the phenomenon of enzooticity—what inter-relations of factors govern the incidence of the disease-and (ii) direct observation of

factors operating in the lesions in animal tissues. Of these two angles, the former has been receiving a greater amount of attention, but, while no single environmental factor or specific plant or poison has been identified with the disease, it is generally agreed that the environment does play an important part. The observation that the disease is associated with farms where much of the land is weedy and out of cultivation, and that the disease disappears, or is reduced in incidence, after agricultural improvement, has been confirmed from most countries (France, Kenya, Columbia, New Zealand).

Turning to the organised factors said to have been seen in the affected tissue, it is necessary to remark that the association of any readily recognisable gross parasites is out of the question (Craig and Kehoe, Lockett Schlegel). Bodies somewhat similar to coccidia have been repeatedly seen (in Germany, Switzerland, Hawaii Islands, France, Antiquoa). While it is certain that the disease is not a form of coccidiosis, the findings of coccidia-like bodies have not yet been satisfactorily explained or convincingly interpreted. Is it possible that these bodies represent the essential factor in the weed environmental conditions, the specific poison, irritant or haematogenous toxin peculiar to the local vegetation, the oxalic-acid-bearing plant from which the crystals of oxalates are introduced into the urinary bladder? The deficiency of green grass, abundance of hay and straw of poor quality, acid conditions of the soil, are said to characterise the affected farms. Is it possible that the coccidia-like bodies are favoured by the above conditions? The disease is exhibited only after animals have lived and grazed in special pastures, yards and stables for prolonged periods. Does the time factor help the coccidia-like bodies to increase in number and reach a density of growth bearing a significant relation to the incidence of the disease?

EFFECTS OF SUMMER ON TEMPERATURES OF BUFFALO CALVES

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It is well known that buffalo stock in general is poorly equipped to dissipate its body heat to meet summer requirements. It is also well known that male buffaloes, when put to draft work, get easily tired and start panting in summer. Dairy buffaloes, too, when not provided with good shade and cool environments, exhibit some sort of inconvenience resulting in partial loss of appetite and drop in milk yield. More than the adult animals, buffalo calves under one year of age are the chief victims. They go off feed, show rise in body temperature and lose condition considerably. Under such conditions, they are often taken as seriously ill and brought to the clinics for treatment. These observations have led the author to study the normal temperature of buffalo calves and watch the effects of summer upon them. With this object in view, it was considered appropriate to begin the study by noting down the temperatures of the entire buffalo stock both in summer and winter. The stock was split up according to the age of the animals to determine the age-susceptibility to seasonal influences. As animals other than calves under one year did not show much summer variation from the standard normal temperature, the winter recording in those animals was dropped.

The observations thus made have been compiled in Tables I, II, III, IV, and V attached as appendices to this paper.

I. Observations

Table No. I records summer temperatures of 19 calves under one year of age from 25th May to 14th June. Morning temperature was taken at 7·0 hrs. and evening at 17·30 hrs.

Results are as under :—

(i) Overall mean for morning and evening temperature respectively was 101.57° and 102.4° F.

(ii) On dates when the maximum heat of the day ranged between 110°F to 114°F, the mean temperature of the animals for morning and evening went above 102°F and 103°F respectively.

(a) *Morning*

Date	Mean morning temp.	Maximum heat of the day.
10—6—51	102·58°F	110°F
11—6—51	102·3°F	114°F
12—6—51	102·02°F	112°F
13—6—51	102·06°F	113°F

(b) *Evening*

Date	Mean evening temp.	Maximum heat of the day.
10—6—51	103·10°F	110°F
11—6—51	103·37°F	114°F

(iii) Individually many calves on certain days showed morning and evening temperature above 102°F and 103°F respectively as given below :—

a) *Morning*

Date	Max. heat of the day.		No of calves showing temp. 102 or above.
25—5—51	105°F		4
27—5—51	107°F		1
2—6—51	109°F		2
3—6—51	97°F	(Rainfall 0·2")	1
6—6—51	102°F		4
7—6—51	107°F		1
8—6—51	112°F		8
9—6—51	112°F		11
10—6—51	110°F		18
11—6—51	114°F		14
12—6—51	112°F		11
13—6—51	113°F		13
14—6—51	109°F		10
		Total	98

In 98 cases the morning temperature recorded 102°F or above.

(b) *Evening*

Date	Max. heat of the day.		No of calves showing temp. above 103°F.
25—5—51	105°F		1
30—5—51	108°F		6
31—5—51	106°F		1
2—6—51	109°F		1
3—6—51	97°F	(Rainfall 0·2")	1
6—6—51	106°F		1
7—6—51	107°F		3
8—6—51	112°F		5
9—6—51	112°F		7
10—6—51	110°F		10
11—6—51	114°F		11
12—6—51	112°F		6
13—6—51	113°F		5
14—6—51	109°F		7
		Total	65

In 65 instances, evening temperature recorded 103°F or above. Out of these in 21 calves, it bad gone above 104°F and in 2 cases even touched 105°F.

Table No. II shows winter temperature recording in 22 calves under one year of age w.e.f. 31-1-51 to 13-2-51. The morning temperature was taken approximately at 9·0 hrs and evening at 16·00 hrs. The calves were kept in open sunny paddocks throughout the day.

(i) The overall mean temperatures for morning and evening respectively were 100·90°F and 101·80°F.

(ii) The morning mean temperature varied from 100·51° to 101·16°F. Only on 2 days viz. 5-2-51 and 11-2-51 it had risen above 101°F i.e. 101·16° and 101·13°F respectively.

(iii) The mean evening temperature fluctuated between 101·44° to 102·1°F. The mean evening temperature went above 102°F only on 2 days i.e. 102·04°F on 1-2-51 and 102·1°F on 12-2-51.

(iv) Individually—The morning temperature touched 102° only in two instances which can be neglected as being exceptional. Otherwise it remained under 101·6°F.

The evening temperature rose above 102°F in 45 instances. This is regarded as being due to the fact that the calves were kept in open sunny enclosures and the temperatures taken probably earlier than 16·00 hrs. The direct influence of the sun is thus obvious in the winter as well.

Table Nos. III, IV and V respectively record the summer temperatures of adult buffalo stock, young stock over 2 years and young stock between 1-2 years. Conclusions from the tables are as under :—

(i) *In adult buffaloes.*—The overall mean temp. was 100·7°F in the morning and 101·15°F in the evening. The mean morning temperature varied from 100·0° to 101·6°F and the mean evening varied from 100·4° to 102°F.

Individually—The morning temperature touched 101·6°F only once and the evening temperature touched 102°F twice. This is of little significance and may be attributed to other reasons.

(ii) *In young stock over 2 years.*—The overall mean temperatures for morning and evening were respectively 100·79°F and 101·35°F. The morning mean fluctuated between 100·2° to 101·6°F, while the evening between 100·8° to 102·6°F.

The individual readings yield no significant results and hence omitted.

(iii) *In young stock between 1-2 years.*—The overall means were 100·79° and 101·30°F respectively for morning and evening. The morning mean varied from 100·0° to 101·6°F and evening from 100·6° to 102°F.

The individual readings in this class also yield little significant results and hence considered not worth recording.

II. Regulation of body heat

A brief review of physiology dealing with regulation of body heat will not be out of place here.

Body heat is governed by factors causing heat production and heat loss. The chief source of heat production in the body is metabolism. The skeletal muscles build more than half of body's soft tissues and constitute the main seat of heat production brought about through contractions under C. N. S. (Central nervous system). Various glands, in their routine functions, also add to the body's heat.

However, in the very perfect adjustment of temperature which is evidenced in higher animals, the regulation of heat loss plays a greater part than heat production. The heat is lost by radiation and conduction going on from the body surface. This loss by radiation is diminished by the rise of humidity in the air since water is a bad conductor of heat. The loss of heat also depends upon the difference in temperature between the surface of the body and surrounding air. It will be largely affected by the temperature of skin and therefore by the amount of blood flowing through the skin, which, in turn, is controlled by C. N. S. through vaso-dilatation and vaso-constriction. Vaso-dilatation induces heat loss and vaso-constriction prevents heat loss.

Sweating is another chief source of heat loss and this is aided by atmospheric conditions favouring radiation and conduction. High atmospheric temperature, less moisture in the air and draughty conditions help in the early evaporation of sweat.

If this loss of heat is checked by placing an animal in an atmosphere already saturated with aqueous vapour, the temperature of the body runs up rapidly and death ensues from hyperpyrexia or heat stroke. Although an individual can stand exposure to a temperature of 200° or even 250°F for a considerable period provided the air is dry, a temperature of 89°F is rapidly fatal if air is saturated with moisture. The reason why one feels 'stuffy or close' often on sultry days in rainy season is therefore obvious.

It is also thought that a heat centre is present in the corpus striatum and that this is activated by the temperature of circulating blood. If the temperature is raised, the heat production and vaso-dilatation are accelerated. Cooling, on the other hand, results in vaso-constriction. This hypothesis has not yet been established though it is known that removal of cerebral hemisphere and thalamus in certain animals reduces them permanently to a cold-blooded condition. 'Panting' in cows after protracted illness from F & M is another instance, where inability to lose body heat is evident. This also points to the probable presence of a heat centre and the part played by it.

Latest researches seem to indicate that the nature of pigmentation of the skin has also a part to play in the control of the body heat. This factor when

established is likely to prove of considerable significance in the case of the buffalo, for apparent reasons.

III. Discussion

(i) From the observations, it is evident that calves under one year of age are the chief victims of seasonal variations. The buffalo stock above that age did not suffer bodily under ordinary conditions.

It is understood that calves may suffer most between July and mid-September (Rainy season) because of the humidity in the air. Under such conditions the body surface is denied of rapid loss of body heat as channels of loss through radiation and conduction are interfered with.

(ii) Sweating is another important means of body's heat loss. Unfortunately, histology of Buffaloes' skin has not been satisfactorily worked out so far. This is quite out of proportion with the importance the buffalo has gained for herself in the role of our livestock.

The work done so far on the subject reveals that the presence of sweat glands on the body surface in general is not established. The possibility of their presence at odd places like muzzle, groin and under arms etc. is not ruled out but that in itself can hardly be termed adequate.

This constitutes a serious handicap for the animal to adjust to summer requirements.

(iii) The trail of symptoms noticed in calves under one year of age viz. rise of temperature, loss of appetite and condition, are often mistaken for serious sickness. In this connection, the publication of an article entitled 'An unusual sickness in Buffalo calves' in the *I.V.J.* November '51 issue is very timely. The author therein has rightly given an opportunity for the profession at large to discuss and disseminate their views on the subject through the esteemed columns of the *I.V.J.*

The observations under study and the conclusions drawn in this paper are obvious. The age-susceptibility of affected calves and the period in which the so-called outbreaks have occured point to seasonal influence. The fact that no case occurred after 30th September (end of rainy season) strengthens this presumption. The main symptoms mentioned in that article were rise in temperature (103°-107°F) and swelling at fetlocks. Higher manifestation of temperature may be possible in cases bordering heat stroke conditions. During the course of observation recorded in this paper (Table No. I) a good number of calves (23) have shown temperatures between 104°-105° F.

The fetlocks in standing position bear the most of body weight. Vasodilatation attended by capillary infiltration under body weight may explain the swellings in the joints. The lack of desire to run or move about (through

lassitude) may aggravate the swelling at fetlocks and this may even prove a fruitful primary cause for such a swelling. The failure of microscopical, cultural, biological and histopathological examinations to reveal anything else, point to similar conclusions drawn in this paper.

IV. Conclusions

(i) The overall mean summer temperatures in various classes of Buffalo stock were as under :—

Class of animal	Morning overall mean temperature	Evening overall mean temperature
Buffalo adults	100·7°F	101·15°F
Buffalo young stock over 2 years	100·79°F	101·35°F
Buffalo young stock, one to two years	100·79°F	101·30°F
Calves under 1 year	101·57°F	102·40°F

The overall mean for calves in winter was 100·9° and 101·8°F for morning and evening respectively.

(ii) Individual variations during summer were also considerable in calves. The temperatures ranged from 102·0° to 102·4°F in the morning and 101·6° to 105°F in the evening.

(iii) The Buffalo stock in general lacks in the ability to lose its body heat freely, when summer requirements so demand. Calves under one year of age are particularly affected and suffer bodily inconvenience and malaise.

(iv) Provision of suitable cool environments, with good shade and wallow-tank facilities etc. are thus desirable in summer. Our domesticated animal has her origin from primitive 'Water Buffalo' and her requirements as such need little emphasis.

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TABLE I

Temp. chart of buffalo calves under 1 year.

Number and name of calves	Date of birth	25—5—51		25—5—51		27—5—51		28—5—51		29—5—51		30—5—51		31—5—51	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E
1. Guler	11—11—50	102.0	102.6	101.2	102.0	101.0	101.8	101.0	102.0	101.2	102.6	100.4	102.4	101.2	102.0
2. Hari	11—11—50	101.4	102.0	101.8	101.8	101.4	102.0	101.4	102.4	101.0	102.2	101.2	102.2	100.8	102.4
3. Catch	16—11—50	101.0	102.4	101.0	102.0	101.0	101.6	101.2	101.8	101.4	102.6	101.0	102.0	101.4	102.6
4. Jersey	28—11—50	101.6	102.2	101.4	101.6	101.4	102.0	101.0	102.2	101.6	102.8	101.4	103.0	101.0	102.0
5. Sajnee	6—12—50	101.8	102.6	101.6	102.0	101.8	102.4	101.4	101.8	101.0	102.0	100.4	102.0	100.6	102.8
6. Urmila	7—12—50	101.4	102.0	101.0	102.4	101.2	102.0	101.4	102 0	101.0	102.2	101.2	102.4	101.2	102.2
7. Gamber	8—12—50	101.4	102.0	101.4	101.8	101.0	101.6	101.2	102.6	101.6	102.0	101.4	102.6	101.6	102 4
8. Kaloo	15—12—50	101.6	101.8	101.6	102.2	101.2	102.0	101.6	102.0	101.4	102.8	101.0	104.2	101.0	102.8
9. Binashan	15—12—50	101.4	102.0	101.2	101.6	101.4	102.6	101.8	102.4	101.0	102.0	101.6	102 6	101.8	102.0
10. Kunroo	3—1—51	101.4	101.8	101.4	101.6	101.6	102.6	101.2	101.8	101.6	102.8	101.0	102.2	101 2	103.0
11. Kitty	10—1—51	101.4	101.6	101.6	102.0	101.8	102.6	101.2	101.6	101.2	102.6	101.0	102.4	101.4	103.2
12. Raja	15—1—51	101.6	102.8	101.6	102.4	101.0	102.0	101.0	102.0	101.4	102.6	101.0	102.6	101.6	102.0
13. Sita	24—1—51	101.0	101.6	101.0	101.6	101.2	101.8	101.4	102.4	101.0	102.4	101.2	104.0	101.2	102.4
14. Krishna	16—2—51	101.0	102.0	101.2	101.4	102.0	102.4	101.0	101.6	101.8	102.2	101.0	102 0	101.2	102 0
15. Ballo	1—3—51	102.6	102.8	101.4	101.6	101.0	101.6	101.2	102.0	101.0	101.8	100.8	103.0	100.8	102.2
16. Dara	3—3—51	101.0	101.6	101.4	102.0	101.4	102.0	100.0	101.6	101.4	102.0	101.0	102.4	100.8	102.0
17. Kit	1—4—51	101.6	102.0	101.8	102.6	101.2	102.0	102.0	102.0	101.4	102.6	101.2	102.6	101.4	102.4
18. Luna	19—4—51	102.0	102.6	101.4	102.0	101.6	102.4	101.0	102.6	101.0	102.2	101.6	103.0	101.6	102.2
19. Dipak	8—5—51	103.0	104.4	101.8	102.6	101.8	102.2	101 8	102.4	101.8	102.8	101.8	103.0	105.6	102.8
Mean Averages.		101.57	102.24	101.41	101.96	101.37	102.13	101.30	102.11	101.25	102.38	101.1	102.63	101.23	102.4
Atmospheric temperature		Max 105	Min 86	Max 105	Min 83	Max 107	Min 86	Max 108	Min 83	Max 108	Min 86	Max 108	Min 83	Max 106	Min 86

TABLE I—*contd.*

Temp. chart of buffalo calves under 1 year.

Number and name of calves	Date of Birth	1-6-51		2-6-51		3-6-51		4-6-51		5-6-51		6-6-51		7-6-51	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E
1. Guler	11-11-50	101.0	101.6	101.4	102.0	101.0	102.0	100.6	101.4	100.6	102.4	101.0	102.6	101.6	102 6
2. Hari	11-11-50	101.4	101.8	100.6	102.2	101.4	102.4	101.0	102.4	101.2	102.0	101.6	102.8	101.0	102.8
3. Catch	16-11-50	100.8	101.0	101.4	101.8	100.8	102.0	100.2	101.6	101.0	101.8	101.8	102.0	101.4	102.4
4. Jersey	28-11-50	101.0	102.0	101.2	101.6	100.6	101.6	100.8	102.0	100.6	102 0	101.4	102.4	101.2	102.6
5. Sajnee	6-12-50	101.2	102.4	101.2	102.0	101.4	102.0	101.0	102.2	101.2	102.4	102.0	102.6	101.0	102.2
6. Urmila	7-12-50	100.6	102.4	100.0	102.4	101.0	102.4	100.6	101.8	101.0	101.8	102.2	102.8	101.6	103.0
7. Gamber	8-12-50	101.2	102.8	100.2	102.0	101.4	101.8	100.2	101.6	101.6	102 6	101.2	102.2	101.2	102.0
8. Kaloo	15-12-50	100.4	102.2	101.0	102.0	101.2	102.6	100.8	102.0	100.6	102.4	101 0	102.4	101.2	102.6
9. Binashan	15-12-50	101.6	102.4	100.0	101.8	101.0	102.0	101.0	102.0	101.4	102.0	101.4	102.2	101.0	102.6
10. Kunroo	3- 1-51	100.4	102.0	100.4	101.6	104.4	102.6	101.2	102.4	101.6	102.6	101.6	102.6	101.2	102.8
11. Kitty	10- 1-51	101.0	102.4	101.2	101.4	101.6	102.8	101.0	102.2	100.8	101.6	101.2	102.8	100.8	102 0
12. Raja	15- 1-51	101.6	102.0	101.0	102.0	101.2	101.6	100.6	101.8	101.4	102.2	102.0	102.6	101.0	102.6
13. Sita	24- 1-51	101.2	102.2	100.2	101.4	100.8	102.0	101.0	102.0	101.2	102.4	101.0	102.4	101.4	103.2
14. Krishna	16- 2-51	100.8	102.4	100.6	101.6	101.2	102.6	101.2	102.0	100.8	102.0	100.8	102.4	101.6	102.4
15. Ballo	1- 3-51	100.4	101.8	100.0	101.6	101.0	101.6	100.8	102.4	101.2	101.8	101.0	102.6	101.2	102.6
16. Dara	3- 3-51	101.0	102.0	100.4	102.6	101.4	102.0	101.4	102.0	101.4	101.8	101.4	102.0	101.0	102.0
17. Kit	1- 4-51	101.8	102.6	103.0	104.8	102.6	103.0	101.2	102.6	101.8	102.4	102.6	103.0	102.0	103.0
18. Luna	19- 4-51	101.4	102.4	101.0	101.8	101.0	101.6	101.0	102.6	101.0	102.0	101.0	102.2	101.0	102.4
19. Dipak	8- 5-51	101.6	102.0	102.0	102.0	101.4	102.0	101.6	102.4	101.2	101.8	101.6	102.6	101.2	102.2
Mean averages		101.07	102.18	101.88	102.03	101.15	102.06	100.9	102.07	101·12	102.1	101.46	102.5	101.24	102.52
Atmospheric temperature		Max 109	Min 80	Max 106	Min 86	Max 97	Min 76	Max 98	Min 83	Max 98	Min 83	Max 102	Min 83	Max 107	Min 83

TABLE I—(*contd.*)

Temp. chart of buffalo calves under I year.

Number and name of calves	Date of Birth	8—6—51		9—6—51		10—6—51		11—6—51		12—6—52		13—6—51		14—6—51	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E
1. Guler	11—11—50	101.0	102.8	102.0	103.0	102.6	103.2	102.4	104.6	102.0	103.0	102.0	103.0	101.4	102.4
2. Hari	11—11—50	101.2	102.6	102.4	102.8	103.0	104.8	102.2	123.2	102.2	102.8	101.6	102.4	101.6	102.6
3. Catch	16—11—50	101.4	103.0	101.4	102.4	102.4	103.0	101.8	103.0	102.6	103.0	102.6	102.8	102.0	102.6
4. Jersey	28—11—50	102.0	103.2	101.2	102.2	102.6	102.6	102.0	105.0	101.8	102.6	102.4	103.2	102.4	102.4
5. Sajnee	6—12—50	102.2	102.0	102.4	103.0	103.2	102.4	101.6	102.8	102.0	102.8	102.0	102 6	102.2	102.6
6. Urmila	7—12—50	101.4	102.6	102.0	104.4	102.4	102.8	102.0	103.2	101.8	102.6	102.2	102.8	102.0	104.2
7. Gamber	8—12—50	101.6	102.8	101.0	102.4	102.6	102.6	102.8	103.2	101.6	102.4	101.6	102.4	102.4	103.4
8. Kaloo	15—12—50	101.4	102.2	101.8	102.6	101.8	102.4	103.4	105.0	102.4	102.8	102.4	103.2	101.6	103.2
9. Binashan	15—12—50	102.0	103.0	102.6	103.0	102.6	103.2	102.6	102.8	102.0	103.0	102.0	102.6	101.8	103.2
10. Kunroo	3— 1—51	102.4	102.8	102.4	104.2	102.8	103.0	102.2	102.6	101.6	102.6	102.2	102.4	101.6	102.0
11. Kitty	10— 1—51	101.4	102.6	101.2	102.2	102.2	104.6	101.8	102.6	101.6	102.4	101.8	102.6	102.4	104.0
12. Raja	15— 1—51	101.2	102.4	102.0	102.6	102.4	102.6	101.4	102.8	101.8	103.0	101.6	102.4	101.6	102.0
13. Sita	24— 1—51	102.4	102.0	102.4	104.0	103.2	103.4	102.0	102.6	102.6	102.6	102.0	104.0	102.4	102.0
14. Krishna	16— 2—51	102.2	104.0	101.6	102.0	102.2	102.4	101.6	103.0	102.2	104.4	102.8	102.2	102.2	102.0
15. Ballo	1— 3—51	102.0	102.6	101 8	102.6	102.4	103.0	102.4	103.2	101.6	102.4	101.4	102.4	101.8	103.0
16. Dara	3— 3—51	101.0	102.6	102.0	102.8	102.6	102.8	102.6	102.8	102.4	102.6	101.6	102.6	102.6	103.0
17. Kit	1— 4—51	101.4	104.2	102.2	102.6	102.0	102.4	103.4	104.8	101.8	102.8	102.2	104.2	102.0	103.0
18. Luna	19— 4—51	102.0	102.4	101.8	103.4	103.4	103.0	103.0	104.2	102.4	104.0	102.6	102.8	101.0	102.0
19. Dipak	8— 5—51	101.8	102.6	102.2	102.4	102.6	104.4	102.4	102.8	102.0	102.6	102.2	102.4	101.6	102.0
Mean averages.		101.7	102.75	101.9	102.87	102.58	103.1	102.3	103.37	102.02	102.86	102.06	102.79	101.94	102.7
Atmospheric temperature		Max 112	Min 86	Max 112	Min 88	Max 110	Min 91	Max 114	Min 89	Max 112	Min 90	Max 113	Min 90	Max 109	Min 91

Overall mean average. Morning. 101.57
Evening 102.4

TABLE II

Temp. chart of buffalo calves uuder 1 year of age

Number and name of calves	Date of birth	31—1—51		1—2—51		2—2—51		3—2—51		4—2—51		5—2—51		6—2—51	
		M	E	M	E	M	E	M	E	M	E	M	E	M	E
1. C 8 Omi	29—9—50	101.6	102.2	100.4	101.6	101.0	102.0	100.6	101.4	100.4	101.2	101.2	101.8	100.4	101.2
2. C 9 Koong	1—10—50	100.2	101.8	101.2	102.4	100.8	101.8	100.2	101.6	100.8	101.6	101.6	101.0	100.6	101.4
3. C 11 Komi	5—10—50	101.0	102.8	100.2	102.8	101.0	101.8	101.0	102.0	101.2	101.4	101.4	101.6	100.8	101.6
4. C 12 Reshma	7—10—50	101.4	102.6	100.8	101.6	101.0	101.6	101.2	101.8	101.0	102.0	101.6	102.0	101.0	101.6
5. C 16 Karbi	21—10—50	100.2	101.8	101.0	102.8	101.2	102.0	100.4	102.6	101.0	100.4	101.4	101.6	100.4	101.0
6. C 17 Zabida	23—10—50	101.0	102.4	100.4	102.0	100.4	101.4	100.0	101.6	100.2	101.6	100.8	101.0	100.6	181.4
7. C 18 Karsi	23—10—50	101.2	102.8	101.0	102.6	101.2	101.6	101.0	102.4	101.0	102.0	101.2	101.6	101.0	101.6
8. C 19 Chandi	27—10—50	101.0	101.8	100.6	102.0	100.8	101.0	100.4	101.4	101.2	101.8	131.4	101.8	101.2	101.8
9. C 21 Jaswant	29—10—50	100.8	102.0	100.8	101.4	100.2	101.0	101.0	102.2	101.0	101.6	100.4	101.2	100.0	101.4
10. C 24 Hari	11—11—50	101.0	102.6	100.6	101.6	100.6	101.4	101.2	102.0	100.2	101.2	101.0	102.0	100.8	101.4
11. C 25 Catch	16—11—50	101.4	102.4	100.8	102.0	100.2	101.4	100.8	101.6	102.0	102.4	101.6	102.4	102.0	101.8
12. C 26 Jersery	28—11—50	101.2	102.0	101.0	102.6	101.0	102.0	100.0	101.8	101.2	101.6	101.2	101.6	101.0	101.4
13. C 29 Sajnee	6—12—50	101.8	101.8	100.4	101.8	101.6	102.4	101.2	102.6	101.4	102.0	101.0	101.4	100.4	102.0
14. C 31 Urmila	7—12—50	100.8	102.2	101.2	102.8	101.4	102.6	101.6	102.4	101.2	101.8	101.4	101.8	100.2	102.4
15. C 32 Gamber	8—12—50	101.2	102.4	101.0	102.6	101.0	102.0	100.6	101.2	100.8	101.0	101.0	102.0	101.0	101.6
16. C 34 Binashan	15—12—50	101.2	102.6	100.6	102.0	101.0	101.6	101.2	102.2	101.0	101.4	100.6	101.2	100.2	101.8
17. C 37 Kunroo	3— 1—51	101.4	101.0	101.6	102.0	101.6	101.4	101.2	101.8	101.0	102.2	101.4	101.4	101.2	102.0
18. C 38 Kitty	10—1—51	101.4	101.6	100.4	101.0	100.2	101.2	100.6	100.8	101.4	101.8	101.2	102.2	101.0	101.2
19. C 40 Useful	18- 1—51	100.4	101.8	101.0	102.0	101.0	102.0	101.2	102.0	101.0	102.0	101.4	101.6	101.2	101.4
20. C 41 Sita	24—1—51	100.6	101.4	100.6	102.2	101.0	101.6	101.2	102.4	101.2	102.4	101.0	101.4	100.6	101.2
21. C 39 Raja		101.0	102.8	100.4	101.6	100.4	101.2	011.4	102.0	101.0	101.6	100.8	101.0	100.4	101.8
Mean Averages.		100.83	102.19	100.71	102.04	100.93	101.65	100.88	101.91	100.96	101.73	101.16	101.60	100.8	101.6
Atmospheric temperature		Max 74	Min 60	Max 76	Min 54	Max 82	Min 54	Max 86	Min 52	Max 84	Min 52	Max 72	Min 48	Max 62	Mix 56

TABLE II—(*contd.*)

Temp. chart of buffulo calves under 1 year of age.

Name of calves	Date of birth	7—2—51 M	7—2—51 E	8—2—51 M	8—2—51 E	9—2—51 M	9—2—51 E	10—2—51 M	10—2—51 E	11—2—52 M	11—2—52 E	12—2—51 M	12—2—51 E	13—2—51 M	13—2—51 E
1. C 8 Omi	29— 9—50	100.8	101.4	100.4	101.6	101.0	102.0	100.4	101.8	101.2	102.0	101.0	102.4	101.0	102.0
2. C 9 Koong	1—10—50	101.0	102.0	101.0	101.8	101.0	101.2	100.0	102.0	101.4	101.6	100.8	101.2	100.6	101.0
3. C 11 Komi	5—10—50	101.0	101.8	100.8	101.6	101.2	101.6	100.4	101.4	100.8	101.8	101.2	102.6	101.2	101.4
4. C 12 Reshma	7—10—50	100.4	101.2	100.6	101.2	100.4	101.4	100.0	101.0	100.6	101.6	100.6	102.0	100.8	101.0
5. C 16 Karbi	21—10—50	101.0	102.4	101.0	102.0	101.0	101.4	101.0	102.0	101.4	102.0	101.4	102.4	100.4	100.8
6. C 17 Zabida	23—10—50	100.6	102.6	101.2	102.4	101.8	102.0	100.4	101.0	100.8	102.0	101.2	102.0	101.0	101.8
7. C 18 Karsi	23—10—50	101.0	101.4	100.4	101.6	101.2	101.6	100.4	101.6	100.6	101.4	101.0	101.8	100.2	101.4
8. C 19 Chandi	27-10—50	101.0	101.4	101.0	101.2	100.6	101.0	100.4	101.6	101.0	102.2	101.6	101.6	100.6	101.2
9. C 21 Jaswant	29—10—50	100.6	101.6	100.8	101.4	101.0	101.4	100.2	101.6	101.0	102.2	101.0	102.2	101.4	101.2
10. C 24 Hari	11—11—50	101.0	102.6	101.2	102.0	101.2	102.0	100.2	101.4	101.0	102.0	101.4	102.4	101.2	101.2
11. C 25 Catch	16—11—50	101.2	102.0	101.0	101.8	102.0	102.4	100.4	101.4	100.2	102.4	101.6	102.0	101.4	101.2
12. C 26 Jersey	28—11—50	100.0	101.8	101.0	101.6	100.4	101.2	100.2	102.0	101.4	101.8	100.8	101.8	100.6	101.6
13. C 29 Sajnee	6—12—50	101.2	102.6	101.0	102.0	100.6	101.6	100.6	101.8	101.2	101.8	100 4	102.0	101.0	102.0
14. C 31 Urmila	7—12—50	101.4	101.6	101.2	102.2	101.2	101.2	100.4	102.0	100.4	102.0	102.0	102.6	101.4	102.4
15. C 32 Gamber	8—12—50	100.4	101.0	100.8	101.6	102.0	102.8	101.0	102.8	101.6	101.4	100.8	102.2	101.0	101.6
16. C 34 Binashan	15—12—50	102.0	102.0	101.2	101.8	101.0	101.8	101.0	102.8	101.4	102.0	101.2	102.8	101.2	101.8
17. C 37 Kunroo	3— 1—51	101.2	101.8	101.0	101.6	100.2	101.4	101.2	101.8	100.6	101.6	100.4	101.8	100.6	101.0
18. C 38 Kitty	10— 1—51	100.2	101.6	100.2	102.4	101.4	101.8	101.0	102.6	101.6	101.8	100.4	101.4	100.6	101.4
19. C 40 Useful	18— 1—51	100.4	102.0	Died on 8-2-51											
20. C 41 Sita	24— 1—51	100.0	101.4	100.8	101.4	101.0	101.6	101.0	101.8	100.8	101.8	101.0	102.8	101.6	101.8
21. C 39 Raja		101.0	102.0	101.2	101.6	101.4	101.8	101.2	102.4	101.6	101.4	101.2	100.8	100.6	101.0
Mean Average.		100.79	101.81	100.89	101.72	100.97	101.55	100.51	101.84	101.13	101.87	100.99	102.10	100.96	101.44
Atmospheric temperature		Max 62	Min 52	Max 62	Min 52	Max 72	Min 52	Max 80	Min 50	Max 82	Min 52	Max 78	Min 54	Max 78	Min 52

Overall mean average. Morning 100.90
Evening 101.80

TABLE III

Temp. chart of adult buffaloes

Name and number of buff	14—6—51 M	14—6—51 E	15—6—51 M	15—6—51 E	16—6—51 M	16—6—51 E	17—6—51 M	17—6—51 E	18—6—51 M	18—6—51 E	19—6—51 M	19—6—51 E	20—6—51 M	20—6—51 E
1. Paro	101.6	101.8	100.4	101.0	100.4	100.1	100.4	101.0	100.6	100.8	100.2	101.2	100.4	101.0
2. Land	101.2	101.6	100.6	100.8	100.0	100.6	100.1	101.2	100.4	101.0	100.0	101.4	101.0	101.2
3. Kishni	101.0	101.4	101.0	101.2	100.0	100.6	100.6	100.8	101.0	101.4	100.6	101.0	101.0	101.4
4. Sarni	101.4	101.6	100.2	101.4	100.0	101.0	101.0	101.0	100.6	101.2	100.8	101.4	100.6	101.0
5. Kafas	101.2	101.4	100.4	101.0	100.0	101.2	100.4	100.6	100.2	100.8	100.6	101.2	101.2	101.6
6. Muni	101.0	102.0	100.6	101.2	100.0	100.8	100.6	101.2	101.0	101.2	101.0	101.6	100.8	101.2
7. Rekha	100.4	101.0	101.0	101.4	100 0	101.0	101.2	101.4	101.2	101.4	101.2	101.6	100.6	100.8
8. Kitchen	101.0	102.0	100.2	100.8	100.1	100.6	100.2	100.8	100.8	101.0	100.6	101.4	101.4	101.6
9. Useless	100.4	101.2	100.2	100.6	100.2	100.4	100.6	101.0	101.0	101.0	100.2	101.2	101.0	101.4
10. Punjaban	100.8	101.4	101.0	101.4	100.0	101.4	100.8	101.0	101.2	101.4	101.0	101.6	101.0	101.4
Mean averages	101.0	101.54	100.66	101.08	100.2	100.82	100.68	101.0	100.8	101.12	100.62	101.2	100.84	101.28
Atmospheric temperature	Max 109	Min 91	Max 105 Rain 0.3"	Min 83	Max 91	Min 78	Max 97	Min 70	Max 105	Min 85	Max 107	Mix 86	Max 107	Min 85

Overall mean average. Morning 100.7
Evening 101.15

TABLE IV

Temp. chart of buffaloes over 2 years.

Name and Number	14—6—51		15—6—51		16—6—51		17—6—51		18—6—51		19—6—51		20—6—51	
	M	E	M	E	M	E	M	E	M	E	M	E	M	E
1. Latika	100.8	101.8	100.4	101.2	100.4	101.2	100.4	100.8	101.0	101.2	100.4	101.4	101.0	101.6
2. Pobar	101.4	102.0	100.6	101.0	100.8	101.2	101.0	101.6	100.6	100.8	100.2	101.1	100.8	101.0
3. Dolti	101.2	102.0	100.4	100.4	101.0	101.0	101.2	101.0	101.4	101.0	100.8	101.2	101.2	101.4
4. Kasturi	101.6	102.6	100.2	100.8	100.4	101.6	100.6	101.0	100.4	100.8	100.4	102.0	101.0	101.6
5. Zori	101.4	102.4	101.0	101.2	100.2	100.8	100.8	101.2	100.4	101.0	100.6	102.0	101.6	101.8
Mean averages.	101.28	102.16	100.52	100.92	100.56	101.2	100.8	101.12	100.76	100.96	100.48	101.64	101.12	101.48
Atmospheric temperature	Max 109	Min 91	Max 105 Rain 0.3"	Min 83	Max 91	Min 78	Max 97	Min 70	Max 105	Min 85	Max 107	Min 86	Max 107	Min 85

Overall Mean average M. 100.79
E. 101.35

TABLE V

Temp. chart of buffaloes 1-2 years.

Name and Number	14—6—51		15—6—51		16—6—51		17—6—51		18—6—51		19—6—51		20—6—51	
	M	E	M	E	M	E	M	E	M	E	M	E	M	E
1. Reta	101.2	101.4	100.0	100.6	100.6	101.2	101.0	101.4	101.0	100.6	101.0	101.6	101.2	101.4
2. Parbati	101.6	101.6	100.4	101.2	100.0	101.4	100.2	101.0	101.2	101.0	101.4	101.8	101.6	101.8
3. Kuldip	101.0	102.0	100.6	101.0	100.2	101.6	101.0	101.4	100.8	101.0	101.2	102.0	101.0	101.2
4. Koyal	101.0	101.6	100.4	100.8	101.0	100.8	100.4	101.0	100.4	100.6	100.8	101.4	101.2	101.4
5. Lekh	101.0	102.0	101.0	101.2	100.6	101.2	100.8	101.0	100.0	100.6	100.8	101.8	101.6	101.8
Mean averages.	101.16	101.76	100.5	100.96	100.44	101.24	100.68	101.16	100.44	100.76	101.04	101.72	101.32	101.52
Atmospheric temperature	Max 109	Min 91	Max 105 Rain 0.3"	Min 83	Max 91	Min 78	Max 97	Min 70	Max 105	Min 85	Max 107	Min 86	Max 107	Min 85

Overall Mean average M. 100.79
E. 101.30

THE

Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

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Editorial

A MOVE FORWARD

One of the foremost resolutions passed by the All-India Veterinary Association in one of its earliest All-India Conferences in the year 1924 was on the need for the early creation of an Indian Veterinary Council to look after the interests of the Veterinary profession and to co-ordinate its activities and functions on an All-India basis. Since then, during the last nearly 30 years, the profession has been pressing in its gatherings and Conferences for the creation of this statutory central body. *The Indian Veterinary Journal*, as the organ of the Profession, has been keeping the subject constantly before the profession and has been pointing out to the Government and to the general public how, for want of this central directing body, the profession was not getting its legitimate dues by way of public recognition of its potentialities. The Indian Council of Agricultural Research, through its Animal Husbandry Wing, has been considering the subject at several of its gatherings and the *ad hoc* Education Committee of that Wing had some time back recommended the setting up of a Statutory body called the Indian Veterinary Council by an Act of central legislation and functioning more or less on the lines of the Royal College of Veterinary Surgeons in the United Kingdom. Still, for some unknown reason, the powers that be did not listen to this persistent demand of the profession and, as a consequent result of it, the progress and development of the profession and Veterinary Education, in particular, have been in a disjointed way with varying standards of education in the different States. Handicaps and difficulties also accrued to the profession from the absence of a statutorily recognised register of Veterinary practi

tioners. The reasons which weighed with the Government and which resulted in this hesitation to form a Central Veterinary Council have not been apparent. Whatever the reasons may be, the profession felt keenly that it was not getting that amount of recognition at the hands of the Government which its role as the custodian of the livestock wealth of the country deserved. And, therefore, when the Hon. Minister for Food and Agriculture in the Central Government announced at the Veterinary Conference at Bombay in December 1951 that he was inviting "some leading Veterinary Surgeons to form themselves into a Committee for advising Government as regards the regulation of the profession of Veterinary Surgeons", we all heaved a sigh of relief that, after all, the Government had realised the importance of the profession and that something tangible would soon be achieved for regulating its development, for upholding its dignity and status and for safeguarding its interests. Here, again, disappointment was in store, for, owing to some technical difficulties, the Committee could not meet for some months. And, at last, came the news that the Committee was going to meet on the 11th October 1952 at Bangalore—and it did meet then. Shri P. N. Nanda, the Animal Husbandry Commissioner with the Government of India presided and conducted its deliberations. This in itself was a great move forward.

We understand that, at this meeting, the constitutional difficulties in the way of the Central Government undertaking legislation on an All-India basis on subjects which are 'transferred' to the States and within their domain since the Independence were fully discussed. The analogy of the Indian Medical Council did not hold good because that Council had been created long before our Independence. After the Independence, and after coming into force of the New Constitution, the powers of the Central Government to take up *suo moto* legislation on a subject which is primarily a State's concern is severely restricted. It can, however, undertake this legislation, if *two* or more States request the Central Government to legislate for such subjects and, even then, such a Central legislation will apply only to those States which choose to fall in line with it. Such being the legal and

constitutional difficulties, the Committee which met at Bangalore —it is designated as the Steering Committee—decided that the best way of creating an Indian Veterinary Council would be by enlisting the co-operation of the States in this matter, and advising them to undertake legislations in their respective States for forming State Veterinary Councils. It is learnt that the U.P. Government has already passed such a legislation and therefore it should not be difficult for the other States to follow suit and pass similar legislations. When once these State Councils are formed, it would be an easy matter for the creation of the Central Indian Veterinary Council with representations from these State Councils. It has also been decided, we understand, that, till the permanent Indian Veterinary Council on the above lines is formed, an Interim Veterinary Council may be created with representatives from the different States on lines which are more or less on those suggested by the All-India Veterinary Association at its last Conference held in December 1951. This Interim Veterinary Council may then take up the functions of the Permanent Veterinary Council until the latter is formed. These arrangements are the best under the circumstances and we congratulate the Steering Committee on its wise decisions and for giving a readily workable method of achieving our object of getting an Indian Veterinary Council formed at an early date. We only hope that this move forward will progress smoothly and steadily until the goal is achieved.

Meanwhile, it is up to the State Veterinary Associations to urge on their Governments the need for the early formation of State Veterinary Councils and for getting them represented on the Central Veterinary Council.

GOPASHTAMI

'May the cows prosper'. This has been the prayer that has been handed over to us from remote ages. In this simple prayer is conceived the entire economy of the land. And it is as true to-day as it was thousands of years ago. The neglect of the truth underlying this prayer has landed the country on famine and near-famine conditions. Ours is essentially a cow-centered

economy and, to use an oft-quoted expression, the cow and the bullock bear on their patient backs the entire economy of this country. This is really true and, however much industrialisation is encouraged, the country is bound to depend on the welfare of the cow and the bullock for her prosperity. Nearly 85 percent of our population are depending on the income from the land. The motive power behind the plough and the mhote is the bullock: the country-side transport is dependent again on the bullock; the fertility of the soil is maintained by the farm-yard manure obtained from the livestock of the farm: and the health of the nation is built up by the addition of cow's milk to our predominantly cereal diet. The cow is thus one of our precious valuable possessions and it is no exaggeration to say that it is on her welfare that the prosperity of the ryot and the country depends. Realising this great truth, our ancestors have taught us to look after the cow by deifying it. Worship of the cow has become part and parcel of our living. And, in spite of our past lapses in this matter, we are periodically reminded of our duty to the cow. The recent observance of *Gopashatami* during the last week of October 1952 in this country gave expression to our traditional respect and regard to this 'Giver of Plenty' and made us realise our acts of omission and commission in converting her into 'Giver of Scanty'. H. H. Sri Sri Sankaracharya of Kamakoti Peetam has appealed on the occasion for the greater protection of the cows. Advocating a 'son's attitude to the mother' in our attitude towards the cow, His Holiness said that it was the nation's greatest wealth and the life of Lord Krishna was connected with the welfare of cows. President Rajendra Prasad, whose broadcast speech on the occasion is published in this issue, has rightly stressed on the importance of the cow to our national economy and has outlined the schemes intended for *Gosamvardhan.* It is our fervent prayer that these schemes would gain the support of the Planning Commission and that, very soon, we would find the country-side humming with animal husbandry activities so that our land may once again be a land of Milk and Honey. May the cows prosper!

OIL CAKE AS CATTLE FEED

We are greatly pleased to hear the following views attributed to Dr. Panjabrao Deshmukh, Minister for Agriculture, New Delhi. Speaking there on the 22nd October 1952, the Minister is reported to have said that it was time that people desisted from using groundnut cake as manure as none of its manurial qualities would be lost if it were used first to feed cattle and the dung were used as manure. The Minister has also said that in his opinion the use of the groundnut cake as manure directly meant so much loss that Government could offer to purchase cow-dung for quite reasonable price and then distribute it free to the cultivators.

We have all along been pleading in this *Journal* for such a rational and wise use of groundnut cake and stressed the fact that its use as manure directly on the land was highly wasteful and uneconomic. Presiding over the Eighth Provincial Veterinary Conference held at Madras in September 1948, Sri R. Swaminathan, elaborated on the high biological and nutritive value of the groundnut cake as cattle feed, deplored its use as manure for the land and said 'why not throw it on the land through the alimentary tract of the cattle'. He also said, 'It is often forgotten that when cattle are fed on such concentrates, a good portion of the nitrogenous and mineral constituents remains in the dung and urine of the animals consuming the foodstuffs and, therefore, utilising the cake for the feeding of the livestock serves the double purpose of nourishing the starved cattle and starved soil simultaneously'. These practical suggestions were ignored by the Government and they themselves have been directing the wasteful usage of the oilcake as manure directly on the land and contributed to the growing malnutrition of our cows and bullocks. We do hope that, after the abovementioned convincing statement of the Minister for Agriculture, this wastage will be prevented and that groundnut cake will be available only as cattle feed hereafter.

The Late Sri M. R. SUBRAMANIA SASTRY

We deeply regret to record the death of Sri M. R. Subramania Sastry, Retired Lecturer in Pharmacology, Madras Veterinary College, on Friday, the 31st October 1952, at his residence in West Mambalam, Madras, after a long period of illness very patiently borne. By his death, the profession has lost a great

Pharmacologist and a very able and experienced clinician. He was an exceedingly sociable man, mixing freely with young and old and endearing himself to one and all. Possessed of a very high sense of duty, he was thorough in whatever he took up and his alert intellect and sound commonsense made a great impression on his associates.

Born in February 1894, the late Sri Sastry spent his early days in his native village of Maharajapuram and then moved on for higher studies to the adjacent town of Mayuram in Tanjore District. He then joined the Madras Veterinary College and took his Diploma in the year 1914. After passing out, he, like many of the early pioneers of the profession, took up service under the Government of Madras and served in different places with credit and distinction. He was popular wherever he was and, in the hill station of Ootacamund, where he was for nearly six years, he earned a great name as an able practitioner. Thereafter he was drafted to the Research Section and was posted as a Research Officer to investigate the Toxicology of some plants poisonous to cattle under a scheme sponsored by the I.C.A.R. His work there was greatly appreciated and then he was transferred to the Madras Veterinary College as a Lecturer in Pharamacology. Subsequently he became the Warden of the Hostel, R. V. O. and P. A. to the Principal in addition to his main duties. As a teacher he was a real acquisition to his *Alma mater*. Very clear and analytical in his exposition, his clinics were greatly sought after by the students with whom he was very popular. He also took active part in the Veterinary Association of the State and was for some time its Sectetary. Unfortunately, towards the end of his term of service, he was smarting under a feeling that his claims for promotion were not adequately recognised and he retired with a sense of soreness and disappointment. Once superannuated, he absorbed himself in Vedic studies and became practically a recluse from the profession except for occasional emergence as University Examiner for the B.V.Sc. Examinations. Fortunately, he was not allowed to remain in that obscure manner. The A. I. V. A. selected him as its nominee to serve as a Corresponding Member on the sub-committee formed by the Pharmaceutical Society of Great Britain in the compilation of the British Veterinary Codex. In that capacity he did very good work and his scrutiny of the first two batches of Monographs sent out by that Society has been deeply appreciated by all members of that Committee. We looked forward to a long period of useful work from him at least in this assignment but, alas!, His will has been otherwise. He has been called away to eternal rest at the comparatively early age of 58. He is survived by his widow, two daughters and two sons, the eldest of whom is Major M. S. K. Murty, Signal Corps, Indian Army. To all of them we convey our sincere and heartfelt condolences and assure them that their sorrow is shared by the profession at large. ———

The Late Sri M. R. Subramania Sastry, G.M.V.C.,
Retired Lecturer in Pharmacology,
Madras Veterinary College,
who died on 31-10-1952.

The Late Sri K. R. S. Aiyar, G.B.V.C.,
Professor of Bacteriology and Pathology
Bombay Veterinary College,
who died on 1-9-52.

INDIAN VETERINARY RESEARCH INSTITUTE, IZATNAGAR
ADVANCED COURSE IN ANIMAL HUSBANDARY
1951 - 52

Sitting (L. to R.)—M. R. Sircar, (*U.P.*), Dr. S. N. Ray, (*R.O.A.N.S.*), **Dr. S. C. A. Datta**, (*Director*), Dr. P. Bhattacharya, (*O c. A.G.S.*), S. Balwant Singh, (*O c. B.P.S.*), Dr. K. Sahai, (*O c. A. H. Class*).

Standing 1st row—N. S. Bhasth, (*Madras*). Lalchand, (*Punjab*), J. S. Pardeshi, (*Wardha, M.P.*) R. S. Singh, (*Bihar*), Kartar Singh, (*Punjab*), W. P. Shanta (*Malaya*).

Standing 2nd row—T. N. Pillai, (*Malaya*), V. P. Shukla, (*M.P.*) J. B. Prasad, (*U.P.*), H. K. Shah. (*Bombay*). S. G. Kshirsagar, (*Bombay*).

The Late Sri K. R. S. AIYAR

Another death we greatly regret to record is that of Sri K. R. S. Aiyar—Kalpathi Rama Aiyar Seshu Aiyar, to give his full name—which took place at Bombay on the morning of the 12th September 1952 after a very short period of illness. The late Aiyar was well known to the profession as an able Clinician and a great Patho-Bacteriologist of the Bombay Veterinary College. An alumnus of that College, he set a high standard of professional skill and ability by his hard and strenuous work, high sense of duty and a live interest in his profession. Short of stature but big of heart and head, he was loved and respected alike by his students, colleagues and the general public. He has died in harness and the profession is the poorer by his death. Our sympathies go out to the members of the bereaved family.

The following is a sketch of his career supplied to us by Shri S. R. Chadha, Principal of the Bombay Veterinary College.

Born on the 10th of March 1899 at Kalpathy in Malabar District of Madras State, Professor K. R. S. Aiyar came to Bombay in 1918, after finishing his high school studies, to join the Bombay Veterinary College, Soon after his graduation in 1921 he was appointed Veterinary Officer in the City and Harbour Veterinary Department and came under the influence of Hewlett who soon marked him out for a higher post in the Department. He was the first House Surgeon attached to the Bai Sakarbai Dinshaw Petit Hospital for Animals in 1923 and was taken on the college staff in the year 1924. He acted as Assistant Professor on several occasions and was finally promoted as Assistant Professor in the year 1939. He was deputed to the Indian Veterinary Research Institute, Mukteshwar, twice for post graduate training and was raised as Professor of Pathology in 1947, and in the year 1951, he was appointed Professor of Bacteriology which post he held till the last. He was in addition holding the post of Professor of Pathology also. He was a self-made man from the beginning and built up for himself a position in the Veterinary World which is very difficult to fill. His contributions to the study of Pathology, both in the form of collections of some rare pathological specimens admirably mounted and preserved in the department, and in the subsequent comment on the wider aspects of the problems involved, will remain as a permanent memorial to his immense energy and his devotion to his exacting standards. He had built up a fine reputation as a specialist of small animals specially dogs and his clients chiefly drawn from the richest strata of society will miss him for ever. A man of infinite

patience and inexhaustible energy, he endeared himself to his colleagues and students by his simple manners and kindly disposition.He passed away peacefully on 12th September 1952 after a brief illness.He is surviced by his wife and two children and a host of relations,and friends to bemoan his loss.

May Almightly rest his soul in peace.

Sri C. S. Balakrishnan, Veterinary Practitioner, Poona, in the course of an appreciative reference to the late K. R. S. Aiyar, writes as follows:

He was an extremely hard worker, having no other interest except his profession and remained a keen student of the Science till his death. The Pathology Department of the Bombay Veterinary College, which can stand comparison with any other in the country, is mainly his handiwork.

He divided his spare time between academic studies and practice, and his success in these directions is a stimulating example. He included, amongst his personal friends, some of the leading physicians and surgeons of the City and very deservedly commanded the co-operation and respect of the medical profession in all scientific matters. He was the leader in Canine practice in the State and it was common for mofussil clients to fly him out for consultation and advice. He was a very deft and able surgeon, carried out major operations privately and performed experimental operations for his medical friends. He was unique in freely performing canine blood transfusions. He was in his elements, however, as a physician, having full scope for his abilities there.

He was notable for his strict adherence to high standards of professional ethics, safeguarding the interests of the professional brother and of the patient alike.

Students unanimously admired and respected him for his love for his subject, his ability and readiness to teach, recognition of their merits, scrupulous integrity and complete impartiality.

He was keenly interested in the welfare of the profession and took an active part in the affairs of the Bombay Veterinary Medical Association from its inception and was the Treasurer of the Diamond Jubilee Celebration Committee at the time of his death. The Golden Jubilee and the Diamond Jubilee celebrations of the College owe a lot to his strenuous efforts.

His official life was blurred by the continuous struggle, from beginning to end, against red tape and injustice, and he had to contend again heavy odds to gain a very slow advancement. He was an uncompromising fighter in the cause of truth and merit and, in his personal case, relied solely on his overwhelming superiority on merits, when fighting for promotion.

He was an ardent and sincere friend and a strong but kind and considerate adversary. He was genial and earnest in private but plain and blunt in public, leaving both friends and supporters in no doubt about exactly where he stood in any matter.

He was a very good man, a rare Professor and a brilliant outstanding practitioner. The Veterinary world is the richer for the example of such an excellent life and the poorer for his loss.

GOPASHATAMI DAY

President's Broadcast

President Rajendra Prasad, broadcasting on the 26th Oct. '52 from the Delhi Station of the All-India Radio on the occasion of the Gopashtami Day, spoke as follows:—

India maintains about 150 million cattle which constitute nearly a quarter of the world's total bovine population. It is thus one of the most important countries of the world from the point of view of cattle. These animals are of great social and economic value to India which is predominantly an agricultural country, 86 per cent of whose population live on income from the land. The bullock is the only motive power available for operations like tillage, irrigation and carrying of the land produce to the market. A large proportion of the human population is vegetarian to whom the only source of animal protein in their diets is milk and its products. It has been rightly said that the cow bears on her patient back the entire structure of Indian agriculture. In fact, the cow, from times immemorial, has been the centre of our economic structure and it still maintains that position in our life.

Breeding

The average efficiency of our cattle, however, is largely limited by the economic and environmental factors. Cattle rearing centres on the small cultivator to the large majority of whom live-stock raising is an occupation subsidiary to crop production. The cultivator is also poor and resourceless. He lives on small fragmented holdings and the average number of animals possessed by him is not more than two or three. Grazing is poor except during monsoons and the available feeds cannot sustain more than a half of the existing population. Marketing facilities are extremely inadequate. There is an all-round shortage of good bulls of known breeding quality. The breeder is thus deprived of all facilities and incentives to pay proper attention to his animals. The result is that the growth of Indian cattle is very slow and they take double the time for their maturity as compared to other countries. The interval between calvings is very long and wastage due to starvation and disease is very high. Thus the cattle population, on the whole, is of a low order of efficiency.

Milk consumption in India

In India, the production of milk as well as the consumption of milk and milk products per head of the human population are probably the lowest in the world. According to the latest estimates the *per capita* consumption of milk is worked out to be 5.3 oz. per day. This may be compared with the *per capita* consumption of milk in some foreign countries; Australia 44.4 oz., Canada 56.8 oz., Denmark 40.3 oz., Great Britain 40·7 oz. and the United States of America 35.6 oz.

It is, however, a heartening fact that the present low production of our cow is not due to any intrinsic inability on her part to produce but due to unfavourable environmental conditions. Such experiments and investigations, as have already been conducted, have revealed that Indian cattle do posses undoubted potentialities for development and that they respond readily to better methods of breeding and feeding.

Key Village Scheme

The question of the development of cattle in India on an organised basis has been considered from time to time. It has been found that the main reason why the efforts of Governments as pursued now do not bear full fruit in the production of high class stock is due to the fact that the villager is not able to provide the conditions which Government are able to provide in their farms. The Key Village Scheme has, therefore, been sponsored recently. The immediate object of this scheme is to establish a network of key villages in suitable localities throughout the country where all the existing undesirable bulls will be removed and replaced by bulls of known quality. No scrubs will be allowed to work in any of these villages. This will enable the breeding part of the work to proceed satisfactorily. Once a Key Village is established, it is proposed that the other measures of cattle improvement such as better feeding, management and control of diseases would be introduced step by step.

Segregation of useless cattle

The above is only one aspect of the development of cattle. As is well-known, though Indian cattle do possess potentialities of a high order, all cattle are not so. There is a good proportion which is diseased and decrepit. The problem of cattle development in India, as elsewhere, is the problem of the segregation of the good from the bad and the prevention of the undesirables from further reproduction. A scheme for the starting of Gosadans or segregation camps, for the maintenance of old and unproductive cattle in interior forest areas has, therefore, been launched. It is considered that the unproductive cattle would advantageously be maintained on grazings which are not at present being fully utilised and where they might even prove useful for fertilising and developing the land. All male animals in these camps would be castrated and no further propagation would be allowed. In each camp, arrangement would

be made for a Charmalya section, where the remains of the dead animals would be fully utilised.

In order to further co-ordinate all work connected with cattle development throughout the country, the Government of India have recently established the Central Council of Gosamvardhana. The functions of this Council include :

(a) Advising, co-ordinating and assisting the State and regional Goshala federations in matters relating to the development of goshalas and pinjrapoles on proper lines. (b) Encouraging the establishment of key village centres for the breeding of cattle on scientific lines and the starting of gosadans for bovine cattle. (c) Taking such measures as may be necessary to prevent the slaughter of useful and productive bovine cattle. (d) Taking such other measures for Gosamvardhana as may be considered necessary from time to time.

Non-official effort

In addition to the Government effort, there is a great deal of public enthusiasm in the country for the cow. It is estimated that there are about 3,600 goshalas and pinjrapoles in India with a population of over six lakhs head of cattle which are being maintained at a cost of about Rs. 7 crores a year. In spite of many apparent drawbacks and handicaps from which these institutions are suffering, it has been noticed that, on the whole, these places, if organised on proper lines, could very well serve as useful centres for improvement of cattle and milk production and thus supplement the Government effort in the improvement of cattle to a great extent. Financial resources of most of these institution are ample. They have, in addition, public sympathy. What is needed, therefore, is just to put them on right lines. The Central Council of Gosamvardhana has under consideration a number of schemes for the re-organisation of these institutions on proper lines.

To-day is the Day of Gosamvardhana and Gopashtami is being celebrated all over the country. Such celebrations have a great significance. Our ancestors fully realised the intimate bearing of the welfare of the cow on the prosperity of man and, by fixing one particular day for this purpose, they intended to concentrate attention on the importance of the cow in our national economy. Gopashtami reminds us how much we owe to the cow and her progeny. Let us fully appreciate the significance of this day and not observe it only formally as we sometimes do.

We should make it a day of dedication to the service of the cow which is and has been not only a poem of pity, in the words of Mahatma Gandhi, but also a giver of the nectar of life and dispenser of plenty to us. That service should not be merely sentimental as it very often is. Sentiment has to be associated with intelligence and service to be effective and helpful has to be rendered in a way most suited to present-day conditions.

MEETING OF THE STEERING COMMITTEE FOR FORMING THE NATIONAL VETERINARY COUNCIL

A meeting of the COMMITTEE announced by the Hon'ble Minister for Food and Agriculture, New Delhi, on the occasion of the Joint Session of the Diamond Jubilee Celebrations of the Bombay Veterinary College and the All-India Veterinary Conference held in December 1951 at Bombay, 'for advising Government as regards the regulation of the profession of Veterinary Surgeons' was held at Bangalore on the 11th of October 1952. The following members of the Committee were present:—

1. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India (Chairman).
2. Dr. S. Datta, Director, I. V. R. I. Mukteswar.
3. Shri H. B. Shahi, Animal Husbandry Commissioner, U. P. Lucknow.
4. ,, Lakshmi Sahai, Director of Veterinary Services, Bombay.
5. ,, K. S. Nair, Professor, Osmania University, Hyderabad.
6. ,, M. S. Sastry, President, A. I. V. A. Bangalore.
7. ,, Rao Sahib T. Vinayaka Mudaliar, Retd. Livestock Development Officer, Bangalore.
8. ,, C. S. Balakrishnan, Veterinary Practitioner, Poona.
9. ,, R. Swaminathan, General Secretary, A. I. V. A. Madras.

Rao Bahadur V. R. Phadke was unfortunately unable to be present.

Opening the proceedings, Shri P. N. Nanda, the Chairman, addressed the members in the following words:—

Gentlemen,

I am glad to have the opportunity of welcoming you to the first meeting of the (Steering) Committee announced in Bombay by the Minister for Food and Agriculture, Government of India, in December 1951, for the purpose of formulating proposals for the setting up of a National Veterinary Committee. I am glad that you have found it possible to come and attend this meeting unmindful of the inconvenience that might have been caused. I would also like to thank the co-opted members who will be assisting us in our deliberations.

Before I actually take up the agenda, I should like to trace, in a very brief outline, the history of the proposal before us, so that everyone present here may have the necessary background knowledge.

The Fourteenth International Veterinary Congress held in London in 1949 recommended *inter alia* that, in each country, a permanent National Committee should be established, to effect liaison between that country, and the permanent Committee of the International Veterinary Congress. The duty of the

National Committee will be to undertake the work of propaganda for the Congress, to enrol members, to obtain subscriptions and to forward them to the Organising Committee of the Congress, and to supply information as to the office, rank and status of individual members of the Congress, especially, of the official representatives, of authorities, corporations etc. This recommendation was brought to the notice of the All India Veterinary Association, Madras, by the Government of India, with the suggestion that a Committee may be set up to have dealings direct with the International Veterinary Congress and the Permanent Committee of that Congress. The idea apparently was that a non-official body would be set up. Since then, the Executive of the All India Veterinary Association have been in correspondence with me on this subject and certain suggestions for the formation of a National Veterinary Council for India and, through such a Council, the formation of a National Veterinary Committee in the nature of its Executive Committee, were formulated.

The Joint Session of the Eleventh All India Veterinary Association and the Bombay Veterinary Medical Association held in Bombay in December 1951 considered those suggestions and resolved to recommend to the Govt. of India the formation of a National Veterinary Council with statutory powers. The financial position of the proposed organisation and the sources from which that organisation would derive its funds were not, however, stated. The details of the proposed Council and the National Committee were also stated in very general terms. The position, whether such a statutory body could be set up under the Constitution had also not received due attention. At the end of that Conference, the Minister for Food and Agriculture announced, as I have already referred to, the personnel of a Committee and he charged it with the task of finding ways and means to set up a National Veterinary Committee. This Committee I shall refer to as the Steering Committee.

As a matter of fact the idea of having a statutory body is not new.

In this connection, I should like to take you back to February 1949, when the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India held at Mysore, discussed the question of the setting up of a Veterinary (Education) Council for the Indian Union, if possible, on the lines of the Royal College of Veterinary Surgeons in the United Kingdom, to embrace State Examination Boards, and *University Faculties of Veterinary Science*, and to ensure uniformity and adequacy of standards. The ad-hoc Educational Committee of the Wing had recommended that a *statutory body* called the Indian Veterinary Council be set up by an Act of the Central Legislature to assume the following functions:—

(1) To ensure that the various Veterinary teaching Institutions in the country maintained an adequate and uniform standard.

(2) To lay down syllabuses and curricula for the courses of Veterinary Instruction.

(3) To advise the Veterinary Colleges on matters pertaining to the proper conduct of examinations.

(4) To maintain and safeguard professional ethics.

(5) To maintain a register of Veterinary surgeons.

(6) To safeguard the interests and integrity of the Veterinary profession.

The Animal Husbandary Wing of the Board of Agriculture and Animal Husbandry, however, agreed to the formation of an Education Council as an advisory body with the proviso that the Council should be composed of professional representatives.

The Agricultural Education Committee of the Central Advisory Board of Education had previously suggested that, with the growth of a large and comprehensive system of Agricultural Education, it had become necessary to ensure that the Institutions concerned maintained propoer standards of instruction and training. They, therefore, recommended that the I. C. A. R. might set up a Council of Agricultural Education (including education in Animal Husbandry and Dairying). The functions of the Council should be (i) to advise, (ii) to endorse diplomas and certificates issued by higher institutions of agricultural education, and (iii) to make recommendations to appropriate authorities in regard to the standards of agricultural instructions and examinations in Universities. The recommendations of the Animal Husbandry Wing and the Central Advisory Board of Education were considered by a Conference which was attended by State Ministers of Agriculture, Vice-Chancellors or Universities Deans of Faculty of Agriculture and Principals of Agricultural Colleges on the 3rd and 4th November 1951. The Conference recommended the setting up of an Indian Council of Agricultural Education, consisting of the Minister for Food and Agriculture, Vice-Chancellors of Universities, Principals of Agricultural and Veterinary Colleges, Officers of the I. C. A. R., Directors of Central Government Research Institutes, representatives of the Inter-University Board, Ministries of Food and Education etc., etc. This Council will function through two Executive Committees, one for agricultural and the other for animal husbandry (including dairying) subjects. These two Executive Committee will be concerned with the disposal of matters solely pertaining to their own individual subjects and the Education Council as a whole will take up general matters of policy affecting both sides.

In view of what has already taken place, I am afraid, the objective of the National Veterinary Council of India, the formation of which we are about to consider, has perforce to be restricted, as it is undoubtedly true that the Agricultural Education Council would be in a better position to implement and enforce the decisions taken. The National Veterinary Council could, however, cooperate with the Agricultural Education Council and make recommendations to it, when necessary.

As to the proposal now before us, there can be no two opinions about it. We all feel that a National Veterinary Council must be set up, and as quickly as possible. The question, however, is as to how this should be accomplished. The joint session of the All-India Veterinary Association and the Bombay Veterinary Medical Association have recommended that a statutory body should be set up by an Act of Parliament. This proposal was carefully examined in the I.C.A.R., and the constitutional position was explained to the All-India Veterinary Association, Madras, in reply to their reference to the Minister of Food & Agriculture. The fact is that Veterinary is a transferred subject and the Centre cannot undertake legislation unless State Governments, through their own legislature, empower the Centre to do so.

Another suggestion is that State Councils should first be set up and representatives from these State Councils should then constitute the National Veterinary Council, which would be a registered body, approved and recognised by Government of India and that till such time as a National Veterinary Council can be set up in the above manner, it is further suggested that the Steering Committee should function as the National Veterinary Committee. I would not dilate upon this, as fortunately, Mr. Nehemiah, Secretary, I.C.A.R., is present amongst us today and he would give you a complete picture of the constitutional position with regard to the setting up of a Council through legislation. He will also explain in detail as to how the National Veterinary Council could function as a Registered body approved by Government.

I hope that, after you have heard Mr. Nehemiah and have discussed the subject in detail, you will agree that the only practical solution which can be implemented forthwith is to set up a registered body in the manner indicated.

If this is accepted, I am of the view that it would expedite matters, if a small sub-committee is set up to draw up details now and to present its report to the full Committee in the afternoon.

The Sub-Committee may take into consideration the following while drafting the set up :—

(1) Under Preamble: it may state that the main object of the National Veterinary Council is to act as a liaison body between the Veterinary profession in India, the Government of India etc.

(2) The objects may be :—

(a) To promote and advance the development of Veterinary science in all its aspects in this country.

(b) To undertake such steps as are necessary for the maintenance and publication of an annual register of Veterinary surgeons.

(c) To draw up a code of ethics to regulate and control the conduct of its members.

(d) To do all other lawful things concerning the welfare and progress of the profession.

(3) Describe the functions in detail.

(4) Prescribe qualifications for registration.

(5) Suggest ways and means of financing the Councils (State & Central).

(6) Fix the number of State Councils which must be established before the Central Council could be elected.

(7) All other cognate matters.

The address over, the Committee deliberated over the subject and discussed the ways and means of setting up a National Veterinary Council for India. The Committee decided, according to the report in the *Hindu* of Madras, that such a body was necessary because there was at present no statutory body representing the Veterinary profession to serve as a liaison between the Government and the profession. In view, however, of the fact that Veterinary Science is a transferred subject under the Indian Constitution, the Steering Committee felt that it might not be possible straightaway to set up a statutory body, but suggested that, as an interim arrangement, the Centre, in co-operation with the States, should set up a National Veterinary Council without statutory powers to begin with. The States could empower the Centre for the setting up of the National body or Parliament could be requested to undertake legislation for the setting up of the National Veterinary Council. The Committee also opined that such a National Veterinary Council would also get up a Register of qualified Veterinary Practitioners which would remove certain handicaps now existing in the profession.

THE XVth INTERNATIONAL VETERINARY CONGRESS

The Organizing Committee of the above Congress has sent out the following bulletin inviting Veterinarians to the Congress which is to be held at Stockholm from August 9—15th, 1953.

Patron of the Congress. His Majesty the King.

The Object of the Congress.

The object of the international congresses is the advancement of the science and practice of Veterinary Medicine and Surgery. To this end discussions are arranged on what are considered to be the most important scientific and practical questions of the day, with a view to their solution by a mutual interchange of opinions and personal experience.

The Programme.

The subdivision of the scientific proceedings into plenary and sectional meetings has been published before. In addition to that, the following details may be mentioned concerning the programme planned. On the first day of the Congress a reception will be held for the congress members. A banquet will be held later during the week. Social arrangements of other kinds including a special ladies programme is being planned. Excursions and sight-seeing tours to places of veterinary and tourist interest in and out of Stockholm will be arranged both during and after the Congress.

Official Congress Languages : English, French, and German.

Congress members may be:

(1) Honorary members appointed at previous congresses.

(2) Ordinary members

(a) Official delegates appointed by the government of their countries. Invitations to send such delegates have been published by the Swedish Ministry for Foreign Affairs.

(b) Veterinarians and others who have a professional interest in the Congress.

(3) Extraordinary members

(a) Veterinary students.

(b) Persons belonging to families of congress members of any of the above-mentioned categories.

(4) Special members, i.e. veterinarians, institutions and others that do not take part in the Congress but wish to get the Proceedings of the Congress.

Congress Fees.

Honorary members pay no fees. Ordinary members will likely have to pay a fee of about 80 Sw. kronor and extraordinary members 40 Sw. kronor. The fee for special members has not yet been fixed.

Applications for attendance

Should be sent in through the National Congress Committees (or corresponding bodies) in plenty of time for us to have received them *before April 1st, 1953.* Application forms, including applications for accommodation, will soon be sent out.

The Organizing Committee hope that the XV International Veterinary Congress will be well-attended and welcome to Stockholm everyone who is interested.

AXEL ALEGREN
Chairman

AXEL ISAKSSON
Secretary

Travel to and from the Congress

Regular boat communications and air service render comfortable and quick travelling possible to and from Sweden. The Swedish railways are to a great extent electrified. Comfort is offered both in second and third class. Only a few day trains have a first class. In the sleeping cars a first class compartment has one berth, second class two and third class three berths. Long distance day trains on the main lines have dining cars, other trains a cafe compartment.

Sweden has a good net of roads for motor traffic. Many of the roads are gravelled however. Sweden has left-hand traffic.

Fare reductions.

From Swedish as well as other countries' traffic enterprises the Organizing Committee will try to procure the greatest possible reductions of fares to and from the Congress. Details about this will be given as soon as possible or during the spring of 1953 at the latest.

Accommodations .

Accommodations will be taken care of by the official travel bureau "RESO" in co-operation with a committee appointed for the purpose. Immediately before and during the congress days a special accommodation department will be arranged at the congress bureau.

Orders for accommodations

Forms for ordering accomodations and applications for membership of the Congress will be sent out as soon as possible. In order to get the reservations desired it will be necessary to send in orders *before April 1st 1953*. It is requested that all correspondence concerning these matters is conveyed via the National Congress Committees (or corresponding bodies).

Accommodation prices.

The prices below are given for guidance in ordering rooms. Prices are given with reserve for possible price alterations.

1: *First class hotels.*

(a) Single room	...	12—20 Sw. kr.
(b) Double „ (twin beds)	...	20—36 „ „

2. *Average hotels and boarding house.*

(a) Single room	...	8—12 „ „
(b) Double „ (twin beds)	...	16—24 „ „

3. *Private rooms.*

(a) Single room	...	7—8 „ „
(b) Double „ (twin beds)	...	12—16 „ „

4. *Group accommodations.*

Lodging at schools and similar places with from 10 to 15 beds in each room 3.50 Sw. kr. per night and day.

Alternatives 1 and 2 do not include tips and higher cost-of-living charges which together amount to about 20—30 per cent.

Meal prices.

Price for different meals vary but are at present about 3 Sw. kr. for breakfast, 4—7 Sw. kr. for luncheon and 5—8 Sw. kr. for dinner. The tip is usually 10 per cent, At the restaurants liquor is subject to certain restrictions but wine is not.

Notes and News

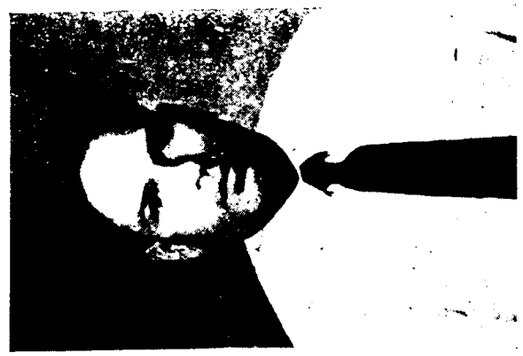
Sir Frank Ware C.I.E., F.R.C.V.S., who was formerly Animal Husbandry Commissioner with the Government of India has been appointed, according to a report in *The Veterinary Record*, as a Member of the Advisory Committee to advise the Home Secretary on applications for permission to perform experiments on living animals under the Cruelty to Animals Act in United Kingdom.

* * *

Expert Committee on Veterinary Biologicals:—Dr. Datta, Director, I.V.R.I., Mukteswar, who is the Chairman of the Expert Committee on Veterinary Biologicals has prepared a questionnaire covering the basis of the terms of reference to the Committee and has circulated it to all the Directors of Animal Husbandry and Veterinary Services, the Principals of Veterinary Colleges and

Shri Jafant Gulati, B.V.Sc., who has proceeded to England for higher studies.

Sri C. Seetharaman, B.V.Sc., M.Sc., I. V. R. I., Mukteswar, who took his M.Sc. degree from the Madras University recently.



Sri M. K. Srinivasan, G.M.V.C., I. V. R. I. Mukteswar, who has been appointed to the newly created post of Livestock Development Officer, Andamans.

Plate No. 9 Vol. XXIX, No. 3

Surra in Dogs

Fig. 1. Rear view before treatment. Note the pronounced oedema of both hind limbs and scrotum.

Fig. 2. Lateral view before treatment Note the oedema of the brisket, muzzle etc.

Fig. 3. Rear view after treatment. Note the disappearance of the oedema.

Fig. 4. Lateral view after treatment. Note the disappearance of the oedema.

[Illustrating article on Page 247]

Superintendents of Biological Products sections in the States within the Union for their comments.

* * * *

Livestock Research Station, Hosur, Madras State.—Dr. R. Nagana Gowda, Minister for Agriculture, Madras, spent more than four hours in inspecting this farm on October 23, 1952 and was much impressed with the attempts made there in increasing the milk yield of the Kangayam breed. Speaking with the Correspondent of the Hindu he said that the farm was 'one of the finest in the country now' with an excellent herd of Sindhi animals which variety could not now be got as Sind had been included in Pakistan. He was happy to find that the Department of Animal Husbandry, Madras, was trying to multiply that breed. Dr. Nagana Gowd also made a reference to sheep farming and said that cross breeding Bellary sheep with Bikanir ram, which had longer and finer wool, would help them to get a better quality of wool and would give a fillip to the wool industry. As for poultry farming, he stated that, in the Hosur farm, about 20,000 eggs were being produced every year from new breeds like the White leghorn and Rhode Island Red and that the Animal Husbandry Department would sell them to the public. He was sorry that half of them were being consumed as eggs. (From the *Hindu*, Madras, 28th Oct. 1952).

* * *

Animal Husbandry training in U. K.; British aid to Indians under Colombo Plan; Two officials of the Uttar Pradesh Government are due to arrive in Britain by air at the end of this month (Septr. '52) for further training in animal husbandry. They are Mr. Gur Saran Lal, Demonstrator in bio-chemistry in the physiology department of the U.P. College of Veterinary Science and Animal Husbandry, Mathura, and Mr. Vishnu Sahai Asthana, Assistant Veterinary Surgeon.

The officials' training in the U.K. is being provided by the British Government under the Technical Co-operation Scheme of the Colombo Plan. Both have been exempted from the first three years of the M.R.C.V.S. (Member of the Royal College of Veterinary Surgeons) diploma course and are taking the fourth and, if successful, fifth year of the course while in the U.K.

Mr. Lal will study at the Royal (Dick) School of Veterinary Studies, University of Edinburgh, and Mr. Asthana at the Royal Veterinary College, University of London. (*British Information Services, New Delhi*).

* * *

Sri C. Seetharaman, B.Sc., G.M.V.C., B.V.Sc., M.Sc.:—Sri C. Seetharaman was one of the first batch of students to have qualified for the newly introduced Degree of Bachelor of Veterinary Science from the Madras Veterinary College. Since his entry into the Indian Veterinary Research Institute, he was attached to the Virus Disease Laboratory. He was awarded

the Research Degree of Master of Science by the University of Madras, the subject of the thesis for the same being "Studies on Rinderpest". He is at present actively engaged in the Scheme for the Eradication of Rinderpest from India and is working under Mr. R. Daubney of International fame.

* * *

Shri Jaiant Gulati, B.V.Sc. (Panjab) who qualified from Hissar Veterinary College, in 1951, after short service, in the Civil Veterinary Department, Madhya Pradesh and P. G. training at the Indian Veterinary Research Institute, has proceeded to England to study at the Royal Veterinary College, London.

* * *

Frogs and Fishes travel by air:—The British Overseas Airways Corporation informs us that British and American herpetologisits—frog collectors—are beginning to "swap" their specimens by air. Also improved strains of exotic tropical fish, which usually have a high mortality rate as long distance air travellers, are being flown successfully from British to South Africa in B. O. A. C. Comet jetliners.

Snail-fin Mollies, Neon Tetras, Guppies and Glowlights—small, highly coloured fish from North and South America—have been included among freight being flown by Comets from London Airport to Johannesburg, a journey completed in under 24 hours.

The fish, which travel in groups of 50 contained in special canisters with breathing tubes, are being sent by Phillip Castang Limited—a London firm of livestock experts which celebrates its 250th anniversary this year—to private aquaria in South Africa.

Clinical Articles

A LATENT CASE OF BOVINE SURRA AT MUKTESWAR DIAGNOSED BY RAY'S M. B. 744 TEST

By

H. S. DHILLON, B.A., L.V.P.

Indian Veterinary Research Institute, Mukteswar-Kumaon.

In the protozoological laboratory of the Indian Veterinary Research Institute, Mukteswar, a batch of twelve apparently healthy hill bulls was received and about 5 c.c. of blood from the jugular vein of each animal was obtained for the collection of serum. The idea was to put the different samples of serum to the M. B. 744 and Complement Fixation tests, while the animals

were to be put to allergic test in order to determine their comparative efficacy so that any of the above tests giving encouraging results in the detection of latency of bovine surra might be adopted in the field with more convenience and greater efficacy.

The serum from all the samples of blood was separated and collected in clean sterile test tubes forty eight hours after bleeding. 0·5 c.c. of a 10 percent solution of M.B. 744 (Stilbamidine) in sterile distilled water was kept in each of the twelve agglutination tubes in a rack. One drop of serum from each sample was put on to the top of the above solution taking care that it fell straight on the surface of the fluid without touching the sides of the agglutination tube and that for every sample of serum separate pasteur pipette was used.

In case of hill bull No. 339 the serum gave a positive reaction i.e., the drop of serum instead of coming up on the surface of the solution and dissolving there immediately within a few seconds, went straight down to the bottom of the tube and took about ten minutes to be dissolved, while the same sample of serum gave a negative result when put to complement fixation test. The animal when put to allergic test on the same day also gave a negative reaction. In order to confirm the results obtained by M. B. 744 (Stilbamidine) the necessity for a biological test was felt. Two healthy rabbits Nos 256 and 304 and two healthy rats were injected subcutaneously with 5 c.c. and 2 c.c. of blood each respectively from the animal. The rabbit No. 256 died 6 days after infection showing teeming number of *T. evansi* in its peripheral circulation, while rabbit No. 304 died of trypanosomiasis 1½ months after infection. Both the rats died of *T. evansi* 15 days after infection. During this period the serum was put to Complement Fixation test twice with an interval of one month and both the times it gave negative results.

The above observations show that Ray's M. B. 744 test (Ray, 1950) picks up the positive cases of bovine trypanosomiasis at a much earlier stage than the Complement Fixation test. However, in conclusion, it may be mentioned that an extensive field trial has to be made before this test can be relied upon to serve as a routine measure in the hands of the field workers for the detection of latent infected cases of bovine surra.

REFERENCE

Ray, H. N. 1950. *Science and Culture.* **16**, 33-34.

SPIROCERCA LUPI INFECTION IN DOGS. A FEW CASES TREATED WITH HETRAZAN (LEDERLE).

By

S. N. VAIDYANATHAN, G.M.V.C.,

Assistant Lecturer in Animal Hygiene,

Agricultural College, Coimbatore.

Spirocerca lupi infection in dogs is fairly common in South India and one comes across such cases either with definite symptoms or in a quiescent and symptomless stage. The clinical symptoms include dysphagia frequent vomitting and retching, accelerated pulse and respiration, tumultuous heart sounds, emphysema of the lungs, cough, capricious appetite, dullness, emaciation etc. Sometimes, clinical symptoms are not very typical. The writer is reminded of a nicely thriving adult dog showing no symptoms but revealing ova of *S. lupi* in the faeces. In another case, the owner complained of his dog salivating very lightly in the mouth and going off feed. Faecal examination revealed eggs of *S. lupi*. Later symptoms were vomition and inability to retain any food. The findings of eggs earlier was sufficient guide to inform the owner about the cause of the trouble, and the limitations in treatment. It may here be freely admitted that the absence of any certain remedy against this worm has necessitated many a suffering canine pet being put to sleep. However, when the acute phase of the infection passes off, some of the affected animals live for a long time, although poor in condition. The writer knows of a terrier bitch which acquired *S. lupi* infection some seven years ago, suffered terribly from its effects and is still living today, although a mere skin and bones. During these seven years she has given several litters. With each litter she goes down in condition, but improves somewhat when once the puppies are weaned.

The most common seat of these worms is in the alimentary tract of the dog. They form tumours in the walls of the oesophagus, stomach and aorta and live in the cavities of these tumours. They are rarely found free in any of the organs of the host. The tumour in the wall of the aorta may lead to stenosis, formation of aneurism or rupture of the vessel followed by fatal haemorrhage. In the bronchi and pleural cavities, the parasites may cause respiratory disturbances. The writer has seen, on post-mortem of a dog, *Spirocerca lupi* tumour opening into the pleural cavity and setting up a fatal septic pneumonia. In another dog, reported to be rapidly running down in condition ending in death, post-mortem revealed that the bladder carried one such tumour with four *Spirocerca lupi* worms within it. Mixed infections with *Ancylostoma canina* and *Spirocerca lupi* are frequently met with in dogs in these parts although, occasionally, cases of pure infec-

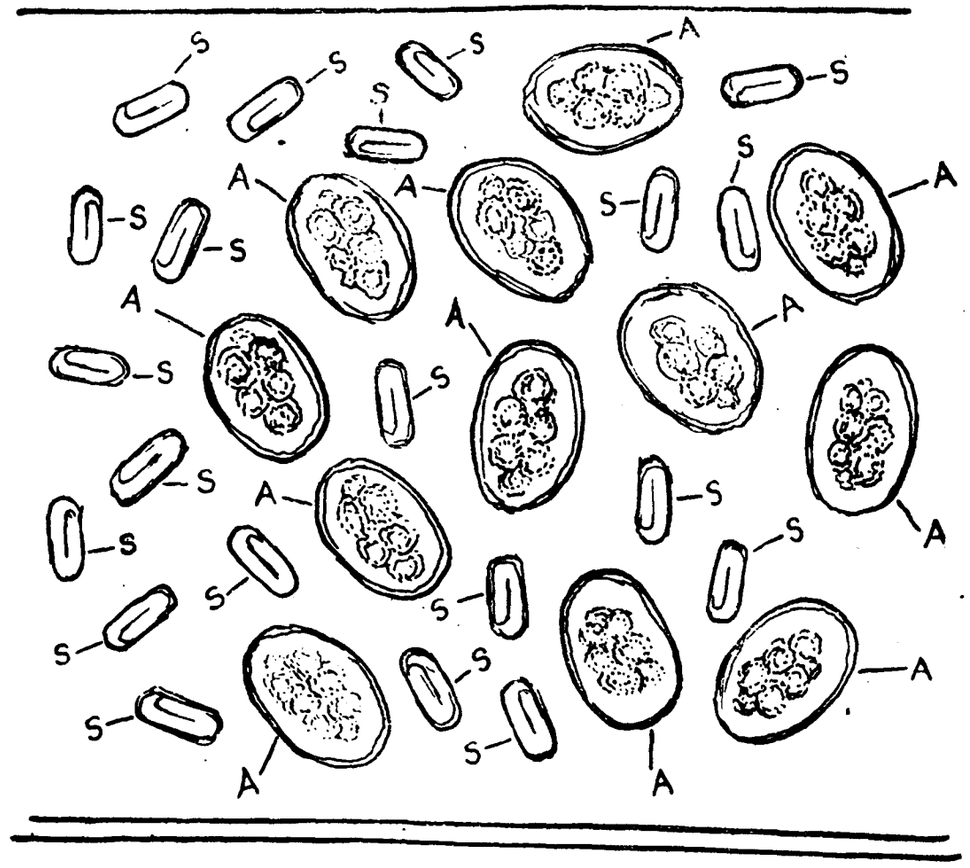


Figure showing (A) ova of *Ancylostoma caninum* and (S) *Spirocerca lupi* from a dog.

tions with *S. lupi* alone are seen. These latter cases are difficult to diagnose in the early stages but, later on, after close observation and careful study of the symptoms for some time, they become obvious.

It would appear that, in the majority of the cases, nature has provided for the easy exit of the worm eggs from the worm tumours even from rare locations. The diagnosis of these cases can, therefore, be confirmed in many of the affected cases by the microscopical examination of the faeces, coughed out material, peritoneal fluid, urine etc. The eggs of *S. lupi* have definite characteristics, as would be seen from the camera lucida drawing attached to this article, which make their identification comparatively easy.

The intermediate host for this worm has been said to be a coprophagous beetle. The *S. lupi* eggs develop into the infective larvae and become encysted in the beetle, chiefly in the tracheal tubes. When such beetles are swallowed by an unsuitable host, the larval worms become encysted again in the oesophagus, mesentery or other organs of that host. The final host may become infected by ingesting either the affected beetles or other animals in which the encysted forms occur. Such cysts have been found in numerous amphibia, reptiles, birds and small mammals. The cockroach has been incriminated in these parts and, therefore, in advising prophylaxis, special attention must be paid to prevent healthy dogs from eating cockroaches, dung beetles, frogs, mice, hedge hogs, lizards, etc.

The treatment of these cases of Spirocercosis has not been satisfactory at all. Sometime back, McGaughey (1951) reported about the beneficial effect on four dogs with *Spirocerca lupi* infestation by using Caricide (Hetrazan) in doses of approximately 10 mg. per pound body weight.

1-diethyl carbamyl-4-methyl piperazine dihydrogen citrate is issued by Lederle Laboratories Division, American Cyanamide Company, under the trade name of Hetrazan, 50 mg. tablets, for the treatment of human beings affected with filariasis, and Caricide, 400 mg. tablet for the treatment of canine filariasis.

In the four cases reported by McGaughey, a diagnosis of *S. lupi* infection had not been established by the positive findings of the eggs in the faeces or vomit but based on some of the clinical symptoms mentioned previously.

The following case report is of an Alsatian dog showing infection with *Ancylostoma caninum* and *Spirocerca lupi*, confirmed by the finding of the eggs of both of these worms, responding to treatment with Hetrazan with improvement in clinical symptoms and general condition, concurrent with the disappearance of eggs in the motions. This dog, aged about six months, was first seen on 29-1-51. It had eczematous patches all over the

body. Faecal examination was negative for ova of parasites. Treated with Acetylarsan and T. C. F. Liver Extract with Vitamins B Complex and C injections. Discharged on 6-3-51 with improvement of the eczema. Further history is as follows :—

9-4-51 Indigestion. No ova of parasites in the faeces.

3-5-51 Attended hospital for sprained hip. Condition somewhat poor. Faecal examination revealed no ova or parasites in the faeces.

24-5-51 Reported to be passing blood-stained stools. Faecal examination revealed stray ova of *S. lupi*.

9-12-51 The dog had become terribly run down in condition. Back arched. Abdomen tucked up. Not feeding well. Report of occasional vomition. Faecal examination revealed both ova of *A. caninum* and *S. lupi*. Weight of dog, 40 pounds. 2 c.c. Tetrachlorethylene was given as a capsule followed by iron tonic (oral).

From 20-12-51 to 24-12-51.—Hetrazan 50 mg. tablet was given, one twice a day, and from 25-12-51 to 29-12-51 two tablets twice a day.

On 1-1-52 faecal examination revealed still stray ova of *A. caninum* and ova of *S. lupi*. A second treatment for ancylostomes was given and this was followed by iron tonic orally.

From 10-1-51 to 19-1-52 Hetrazan two 50 mg. tablets was given twice a day.

20-2-52 The dog had greatly improved in condition. No ova of *S. lupi* could be detected in the faeces.

Faecal examination made on 5-4-52 and 23-6-52 also revealed no ova of *S. lupi*.

No conclusion is drawn as to whether the worms have been killed or rendered inactive.

Acknowledgment

The author is grateful to Dr. F. Joseph, Lecturer in Animal Hygience, Agricultural College, for encouragement and suggestions given in the treatment of cases.

REFERENCES

McGaughey, C. A. (1951) Prel. note on the treatment of Spirocercosis in dogs with a piperazine compound caricide (Lederle). *Vet. Record*, No. 51, Vol. 62.

Monnig, H. O. (1949). Veterinary Helminthology and Entomology.

Since writing the above article, the author has continued his observations on the dog treated with Hetrazan and has sent the following addendum :—

21-7-52 No eggs of *S. lupi* could be detected.

24-8-52 Stray eggs of *S. lupi* found in the motions. Condition of the dog good. Weight 47 pounds.

30-8-52 Eggs of *S. lupi* found in numbers in the faeces.

31-8-52 Recommended treatment with 200 mgs. of Hetrazan a day.

There is reason to conclude that, with the dosage schedule adopted in this case, egg-laying has been suspended for nearly 6 months after cessation of treatment. It is presumed no re-infection has taken place in the meantime.

I have since treated two more cases of Spirocercosis in dogs at the same dosage rate and here again egg-laying has been suspended for a short time in one case, and, in the other, it is only gradually reducing within the short period observed.

It would appear, therefore, a revised treatment schedule may have to be adopted for the results to be more satisfactory. However, it must be said that there has been great improvement in the condition of the subjects treated, with disappearance of clinical symptoms, increase in weight and return to normal generally.

SURRA IN DOGS

By

T. Rama Rao, G.M.V.C.,

Veterinary Asst. Surgeon, i/c Veterinary Hospital, Kakinada, East Godavari District, Madras.

Surra is very commonly met with among equines in this District and occasionally among bovines. This note relates to the disease as seen in canines.

Case No. 1 : On 7-6-1951, a medium sized tan coloured, non-descript bitch was brought to the hospital with the complaint of anorexia, weakness and emaciation. The blood examination revealed no protozoal organisms, but a clear picture of anaemia. 2 x 2 c.c. of liver extract intramuscularly on alternate days followed by carminative mixture daily were given. The animal improved and the owner discontinued treatment.

On 23-6-1951 the animal was readmitted with the same history. The temperature was 104°F. The blood smears were examined by the District Veterinary Officer, Kakinada and they revealed Trypanosomes. The animal was very weak but there was no oedema in any part of the body. The coat was staring and rough and extreme emaciation was noticeable. The conjunctival membranes were icteric.

Treatment: Antrypol (I.C.I.) 4 c.c. of 10% solution was injected intravenously followed by 2 c.c. of Acetylarsan (M & B) on alternate days. As the emaciation and anaemia had progressed two far, the animal died after a week.

Case No. 2: A cross-bred adult dog (I.P. No. 1456) was brought to the Hospital on 11-10-1951 with oedema as illustrated in the photograph. The following were the observations on preliminary examination :—

Oedema of muzzle, sub-maxillary space, brisket, chest, all four limbs and scrotum; animal dull, very anaemic, weak and disinclined to move about; faeces normal but polyuria noticed; appetite normal; temperature 100.8°F.; heart: palpitating, cardiac impulse pronounced; respiration, 30 and a fluttering pulse of 135.

As the symptoms were indicative of cardiac embarassment, cardiac stimulants were administered. Wet films and blood smears on examination revealed Trypanosomes and this was later confirmed by the Principal, Madras Veterinary College.

Treatment: The next day morning i.e. 12-10-1951, 5 c.c. of 10% solution of Antrypol was injected intravenously with some difficulty owing to oedema of hind limbs. [In such cases the recently introduced I.C.I.. product Artrycide (Methyl sulphate) might be more useful as it can be injected even subcutaneously].

The following are the observations from the date of first injection :

Date.	Morn. temp.	Pulse.	Respn.	Eve. temp.	Observations.
12-10-51	100°F	140	32	100°F	Appetite normal.
13-10-51	99°F	120	32	100°F	Oedema of hind limbs and scrotum slightly reduced. Animal appears bright and moves about freely. Appetite normal.
14-10-51	101°F	110	32	100°2F	Oedema much reduced except on hocks and abdomen. Wrinkles appeared on scrotum. Animal active and feeding well.
15-10-51	102°F	90	32	102°4F	Oedema of limbs almost reduced. Animal very active and able to get up a bench.
16-10-51	103°F	88	32	102°4F	Animal feels weak and inclined to lie down. Urine and faeces normal. Oedema completely gone.
17-10-51	102°F	96	32	102°F	Animal became quite normal in appearance. Blood examination was negative.

18-10-1951 and 20-10-1951 } Liver extract 2 c.c. given intramuscularly.

Animal was discharged and the owner was advised to bring it again on 1-11-1951 i.e. 3 weeks after first Antrypol injection to give the second injection, if necessary.

1-11-951 : Appeared quite normal.

Blood examination revealed no organisms, but Antrypol 5 c.c. of 10 solution was given as a precaution.

One month later, the animal was brought to the hospital. He appeared very healthy and completely recovered.

Acknowledgment

I am extremely grateful to the District Veterinary Officer, Kakinada, for his encouragement and advice in the treatment of this case.

'SULPHAMEZATHINE' TREATMENT OF BOVINE RINDERPEST

By

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The clinical symptoms of bovine rinderpest are too well-known to veterinarians in India to need detailed discussion, but the following quotations may serve to underline the essential part played by the secondary pathogenic bacteria in this virus disease :

"In the intestines necrosis of the epithelium and villi takes place, with exudation of plasma, which uniting with epithelial detrius forms a pseudo-membrane. The necrotic process, especially in the rectum, may extend deeply, so that the whole thickness of the mucous membrane may slough away. In this process possibly various intestinal bacteria play a part (bacilli of the coli-typhoid group, necrosis bacillus)." [1]

"In typical cases the disease lasts 4 to 8 days. After the prodromal febrile symptoms the mucous membrane is usually affected on the second day, and on the third or fourth day the clinical picture is complete, but death may occur in a further 2 or 3 days. Sometimes the condition is aggravated so rapidly that the disease may be fatal from septic conditions on the second or third day after the onset, or in fulminating cases in a few hours." [1]

It is, therefore, reasonable to presume that (a) rinderpest mortality is very largely due to secondary bacteria which are pathogenic only with the help of rinderpest virus, and (b) if these bacteria can be controlled without risk to a critically sick animal by a suitable non-toxic agent, then gangrene of the epithelium and septicaemia can be avoided, and the animal given a vastly better chance of recovery. With this aim in view a few cases have

previously been treated with some success by sulphapyridine, but economic considerations, and the following technical advantages of 'Sulphamezathine' led to the successful trials now reported:

(a) It is readily absorbed by all routes of administration and is slowly excreted. The therapeutic blood level in cattle from one dose persists for more than 24 hours.

(b) It is practically tasteless and is readily accepted by animals in their food.

(c) Maintenance doses are half the initial dose. It is rarely necessary to prolong treatment for more than 5 days.

(d) It is non-toxic.

Technique.—As it was impossible for me to attend daily I gave the affected cattle 'Sulphamezathine' Sodium Solution 33 1/3% parenterally at the rate of 15 c.c./cwt. on the first day, and left with the ryots six to ten 5 Gm. tablets, or an equivalent number of 0·5 Gm. tablets of 'Sulphamezathine', to be given orally over the following 3 days, at the rate of 2·5 Gm./ cwt. Two cases, Nos. 19 and 22, were given the complete course orally.

Case No.	Bree	Main clinical symptoms	Doses given		Remarks
			33% Solution	Tablets (days)	
1.	Ongole Breeding bull. 5 yrs.	Dysentery T. 104°F	1	3	Dysentery stopped in 12 hours. Ruminating on 3rd day.
2.	Ongole Bullock 7 yrs.	,, ,,	1	3	Dysentery stopped in 24 hrs. Ruminating on 4th day.
3.	She-buffalo	Temp. 105°F	1	3	Temp. normal in 24 hrs. No dysentery.
4.	,, ,,	,, ,,	1	3	Do.
5.	Ongole Bullock 4 yrs.	Dysentery for 3 days; before treatment in a state of collapse T.101°F	1	...	Death 6 hrs. later
6.	,, ,,	T.105.5°F	1	3	Temp. normal in 24 hrs.
7.	Buffalo cow				
8.	,, ,,				
9.	,, ,,				
10.	Ongole Bull 6 yrs.				
11.	Buffalo cow				
12.	,, ,,	T. 106.5°F	1	3	
13.	Heifer calf				
14.	,, ,,				
15.	Bullock				Temp. normal in 24 hrs.
16.	,,				
17.	,,				
18.	Buffalo Bull				
19.	,, ,,	Dysentery T.104.5°F	...	4	
20.	Bullock 5 yrs.	T.105°F	1	2	
21.	Heifer 2 yrs.	T.106°F	1	2	
22.	Bullock 5 yrs.	T.106°F	...	4	

Except for case No. 5, which was in a state of collapse when first seen, all treated animals recovered when the complete course was given, an efficiency of 95·5%. The death rate in neighbouring untreated animals was 46%.

Conclusion

'Sulphamezathine', given by injection or orally, but preferably in combination, in the dosage recommended, is outstandingly successful in controlling pyrexia and dysentery associated with bovine rinderpest. The cost of treatment for a 4-day complete course of 100 c.c. of the 33⅓% sodium solution and 10 x 5 Gm. tablets is Rs. 12 and Rs. 13, for the average Ongole adult animal and *pro rata* cheaper for smaller cattle. At this price ryots have shown a keen interest in treating animals. It is probable that a 3-day course is enough for treatment if started in the early stages of the disease.

Summary

20 cattle and buffaloes showing clinical signs of rinderpest were treated with one dose of 'Sulphamezathine' Sodium Solution 33⅓% (I.C.I.), at 15 c.c. cwt. bodyweight, followed by two or three oral doses of 'Sulphamezathine' tablets at 2.5 Gm. cwt. at 24 hours interval.

Two animals received the full course by oral administration at equivalent doses. The death rate in 22 treated animals was 4.5%, and in untreated controls was 46%.

I wish to thank Dr. M. C. Chellam, District Veterinary Officer, Kistna District, for encouragement and advice given throughout this work.

REFERENCES

1. Hutyra, Marek and Manninger (1946) "Special Pathology and Therapeutics of the Diseases of Domestic Animals", Pp. 1264 and 1273.

TETANUS IN A BULL CALF

By

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A bull calf, aged 15 days, came to this hospital on 11—4—52 for treatment with symptoms of lock-jaw. According to the history of the owner, the umbilical cord of the calf was cut with a rusted knife by a farm labourer after delivery.

Symptoms.—The animal was stiff all round. The fore limbs were kept wide apart. The hind limbs were drawn under the body. The head was stretched and nostrils dilated. The tail was raised and held in a quivering state. The animal was not able to turn round and was excited. The umbilicus was swollen and pus was oozing out. Feeding was said to be slow in the beginning but now the jaw was locked and the animal was

not feeding. Temperature was 103° and respirations accelerated. Bowels were costive.

Treatment.—Immediately A. T. Serum 7500 I.U. was given I.M. The wound was opened out, enlarged sufficiently to drain the pus and dressed with Tr. Iodine gauze packed inside. Soap-water enema was given and the bowels were emptied. One grain of Extractum Belladoma siccum was given internally.

On 12—4—52, another dose of A.T. Serum 7500 I.U. was given I.M. and the other treatment was continued. There was a slight relaxation of the stiffness.

On 13—4—52, a third dose of A. T. Serum 7500 I.U. was given I.M; the enema and Belladonna treatment was continued along with the dressing for the wound. The animal had shown rapid improvement and it could partly open the mouth and could swallow, though with some difficulty. It had also began to move slowly. Temperature had come to normal.

On 14—4—52 against my advice, the calf was removed to another village and the progress could not be assessed. Enquiry after 15 days showed that it had returned to normal condition. I advised iron tonics to the calf to hasten its recovery and it was adopted.

Discussion.—It is evident from the history that the channel of infection was umbilicus. The orthodox magsulph treatment was not adopted in this case and the recovery with such low dosage of A.T. Serum is very significant. Altogether only 22,500 units of A. T. Serum were given. Local treatment of wound also aided in the recovery of the animal. Much larger doses of A. T. Serum could not be given due to the poverty of the patient and its non-availability locally.

AUREOMYCIN IN CANINE PRACTICE

By

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From a glance at the literature on Aureomycin, one could see that it could be used safely on infections due to virus, rickettsia and leptospira. Since many of the diseases in dogs can be traced to some of the above etiological factors, it was decided to try this drug on dogs,

especially in cases where penicillin had failed. The following case reports may be found interesting :—

Case No. 1. Corneal opacity.—An Alsatian bitch was brought to this hospital on 10-4-52 from Warangal with the history that the dog had been dull in the beginning and later developed a heavy cloudiness of the cornea of both the eyes. She was treated at the local hospital with Penicillin and Streptomycin injections. Though the animal appeared a little bright and was taking her feed, she did not regain her normal vigour. The owner was more worried about the cloudiness in her eyes.

The temperature was normal. The faeces and blood were found negative and the urine examination showed bile pigments and albumen in large quantities. Suspecting that it may be a latent case of leptospirosis, it was decided to try a course of Aureomycin. A capsule of 250 mg. was divided into four doses and one dose was given every 4 hours daily. On the third day the cornea was crystal clear and the dog was found extremely active. The treatment was continued for five days. The urine was found quite clear and normal. The dog was discharged cured on 15-4-52 and was reported to be quite normal and active on 15-6-52.

Case Nos. 2, 3 and 4. Distemper. On 15—4—52 two Alsatian pups, aged 2 months, were brought with the history that they were not keeping well for the previous two or three days. The owner had lost a pup recently from distemper and, therefore, these two pups were suspected to be suffering from the same disease and had been treated with Sulphatriad and Penicillin. Still they persisted in maintaining high temperature although they were taking milk. They were put on Aureomycin, one capsule of 250 mg. divided into four doses, and six doses were given every day. The temperature came down to 101·8°F from 104·4°F on the previous day, and maintained normal subsequently. The Aureomycin was conti. nued for another five days alternated with Vitamin B tablets to check possible nervous complications. Both of them recovered and discharged as cured on 16—4—52.

An Alsatian dog aged about one year was admitted in this hospital 23-5-52 at 12 noon with a high temperature 104.2° F and a history that he was dull and not feeding for four days. There were discharges from the eyes and nose and the case presented all the symptoms of distemper. The blood smears were negative.

It was immediately put on a course of Aureomycin, a capsule of 250 mg. divided into four doses and given once every four hours. The temperature came down to 103·6°F. at 4-30 P.M. and 103°F. by 8-30 P.M. The next morning it was 101.4°F and remained so for the next two days. It was discharged on the 26th April after a course of this medicine for another two days.

Case No. 5. Pyrexia, persistent, of unknown origin.—An Alsatian dog, aged two years, was in indifferent health with no high temperature. He was given a worm dose and was followed up with digestive mixtures. This did not put him right and he went completely off feed and became very dull. He was then admitted as an in-patient on 27-5-52, when the temperature was 102.8°F. Lungs were found clear. There was a little husky cough. He was then given only a diaphortic mixture.

28-5-52. A.M. Temperature 102·6°F. Noon 105·8°F. 6 P.M. 105·8°F. Blood smears were taken at the height of the temperature and found negative. In the meanwhile 4 lakhs of Duracillin were given intramuscularly and 2 tablets of Cibazol were given with a dose of Mist. Diaph. At 9 P.M. temperature was 104·4° F.

29-4-52 Temperature, morning 102·2°F. Noon 102.2°F. 6 P.M. 102.4F. Another dose of Duracillin and Cibazol 2 tablets thrice daily were given.

30-5-52 Morning temperature 104·6°F. Blood smears were negative. Aureomycin 250 mg. in four doses were given on this day.

31-5-52 Morning temperature 101°F: Noon 100·6°F. 6 P.M. 99·6°F. Aureomycin continued. Animal was a bit active.

1-6-52 Morning temperature 99·4°F. Noon 101·4°F. 6 P.M. 101·4°F. Aureomycin was continued. The animal was brighter.

2-6-52 Morning temperature 101°F. Noon 100°F. 6 P.M. 100°F. Aureomycin was stopped. The animal was very bright. Took his food more willingly and in large quantity and was barking loudly.

3-6-52 Morning temperature 104·6°F. Noon 100°F. 6 P.M. 100°F. No Aureomycin. Only carminative mixture.

4-6-52 Morning temperature 101·4°F. The dog was taken home by the owner, who after a few days reported that the dog was keeping quite well.

Case No. 6. Skin infections:—A golden Spaniel, aged 1½ years, was brought to this hospital on 31-5-52 with the history that the dog was scratching very much behind the ear on the right side and the place was raw. The place was washed with warm mild dettol solution, dried and sulfanilamide ointment with codliver oil was applied on the first day. As there was not much improvement and the dog was scratching too much, the dressing was changed to Penicillin ointment. This was continued for two days with no encouraging results. The dog did not stop scratching. It was then decided to try Aureomycin ointment. Surprisingly, the dog stopped scratching the part the next day and the raw oozing surface appeared a little dried up. The same line of treatment was continued for another five days and the dog was discharged cured on 7-6-52. A raw patch of 1 to 2″ healed up in such a short period of one week.

Case No. 7. Suspected food poisoning:—A Fox-terrier male, aged 3 years, was brought to the hospital at 10·45 A. M., on 1-5-52 with the history that he had eaten a lizard and was vomitting very much. Temperature was 105·6° F. A soap water enema was immediately given and the posterior portion of the alimentary tract was washed out. Blood smears were taken later and proved negative. The case was put down as a case of food poisoning and a dose of castor oil with good stimulants was administered. Two tablets of Cibazol were also given to the owner with instructions to give one after every four hours.

2-6-52 The next day morning temperature was 104·4° F. The animal was very dull and in a prostrate condion. Completely off feed. A capsule of Aureomycin of 250 mg. was given in 4 doses.

3-6-52 Morning temperature 100.6°F. The animal was very lively. Drank a little milk and broth by itself. Aureomycin was continued.

4-6-52 Morning temperature 101·4°F. Much more lively. Drank more milk and reported to be barking as usual. Aureomycin continued.

5-6-52 Temperature 101°F. The dog was perfectly normal and was reported to be taking his normal food with much vigour. Aureomycin stopped and the case discharged.

These cases show that Aureomycin is a useful antibiotic in veterinary practice and that its administration is helpful in cases which are resistent to Penicillin.

Our thanks are due to Mr. R. S. Raghavan, B. V. Sc., a new graduate of our veterinary college here, who took keen interest in this work and co-operated with us very willingly.

Correspondence

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

Veterinary Public Health and its administration

The following extracts from the replies to the Questionnaire issued by the Masani Committee appointed by the Government of Bombay in 1951 for improvement and modernisation of Slaughter Houses in the Bombay State may be found interesting.

Early in 1951 the Bombay Government appointed a Committe to report on the present conditions of the existing Slaughter Houses in

Bombay State and to suggest their improvements and modernisation. Shri R. P. Masani, the former Municipal Commissioner, Bombay City, and exVice-Chancellor of the Bombay University was appointed as the Chairman of this Commission. Two members of the Veterinary profession viz. Dr. Laxmi Sahai, the Director of Veterinary Services, Bombay State and Dr. J. P. Pereira, G. B. V. C., the present Superintendent of Municipal Markets and Slaughter Houses, Bombay City, were among the members of this Committee. (Vide I. V. J. Vol. XXVII, No. 5, March 1951). Another member was Mr. Rajah of the Govenment Tanning Institute of Kherwadi at Bandra in Greater Bombay.

The Committee issued a questionnaire, a copy of which was sent to me for my views and replies, as I am an ex-Superintendent of Bombay's Markets and Slaughter Houses and one of the Veterinary personnel in the initial stages in the Public Health Department, then the Public Gardens and finally with the Public Markets and Slaughter Houses Department in the service of the Bombay Municipal Corporation for over 35 years.

It will be evident that all the Veterinarians who are in the employ of the several Municipalities and Local Bodies really belong to the Public Health Administration from the nature of the work they are assigned to carry out.

We may here refer to the article "Veterinary Surgeons and Public Health" by C. Seetharaman, Indian Veterinary Research Institute, Mukteswar (Bombay Veterinary College Magazine, Diamond Jubilee Commemoration Volume 1951). It is of considerable interest and study from the Public Health point of view. On account of the considerable progressive approach made towards the health problems and the advance in civilization which has influenced the Indian public in their dietary habits, there has been an appreciable increase of the meat-eating population. Thus to cope with this increased public demand the production of meat has been enhanced, but at the same time consideration is being given to the control of animal diseases which are communicable to man through diseased meat. The first issue of defence therefore consists in enforcing a strict *ante* and *post-mortem* examinations from the point of Public Health for prevention against the spread of such dangerous animal diseases to man as Anthrax, Tuberculosis, Rabies, Brucellosis, etc. There are also certain diseases which while manifesting definite symptoms produce apparently no appreciable changes in the internal organs, but yet render the meat unsafe for human consumption. If such cases escape detection and the pesssbility of the latent danger in the carcases of animals were overlooked, a number of cases of meat poisoning can be traced after the consumption of meat of food animals that have not undergone a strict *ante-mortem* examination. Equally important is the *post-mortem* examination by a trained Veterinarian equipped with wide knowledge in Anatomy,

Physiology, Pathology, Bacteriology, Parasitology and Hygiene. His inspection is therefore of great value to detect morbid conditions in the various organs of the animal slaughtered for food. Local morbid conditions found located in the various parts of the body are the cysts of parasites, tumours, etc. These in the live state of animals usually escape diagnostic attention, but they can be only detected in the carcases at the time of the post-mortem examination, rendering the meat unfit for human consumption.

But apart from the animal diseases which are communicable to man there are certian diseases like septic-throat, dysentry, typhoid, foot and mouth disease, etc., which are spread through the agency of animal products. Their incidence can be prevented by eradicating the germs and virus from animals by a qualified Veterinary Surgeon, who, with his skill and training in clinical and preventive medicine, is of great help to the Public Health Administration. Take for instance the B. C. G. Vaccination against Tuberculosis. It was first initiated by a Veterinarian. Jenner—a Veterinarian—made the first attempt for vaccination against small-pox. The transmission of diseases from animals to man through insect bites was first established by a Veterinarian. It was long before the discovery of mosquitoes which act as vectors in Yellow fever, Sleeping-sickness and last but not the least Malaria.

Now coming to the Questionnaire No. 10 in Section 1, which runs as follows.—"Do you think that the present methods of inspection of animals both *ante-mortem* and *post-mortem* are satisfactory? If not are you of the view that theyshould be tightened? What is your view about introducing legislation on the subject? The reply to the above questionnaire was as follows.—

"Yes. There is room for improvement in the present method of inspection of animals both *ante-mortem* and *post-mortem*. In many of the Slaughter Houses in the State, non-qualified staff or staff with an elementary knowledge of meat inspection is employed. This should be remedied by the employment of qualified Veterinary Graduates with sufficient allurement of pay and prospects. In fact there should be a Veterinary Public Health service on a par with the Medical Public Health service so that Veterinary Officers of Public Health may work in harmony with the Medical Officers of the Public Health Department, helping each other in their own sphere of work in the interest of sanitation and public health of the City. The work of Veterinary Officers of Public Health may be confined to the inspection, supervision and administration of Slaughter Houses Markets and other places where foodstuffs are handled viz. meat, fish, game, poultry, eggs, provisions, fruits, vegetables, milk and milk products, dairy inspection and milk production wherever necessary. Such a Veterinary personnel should posses an additional qualification in Sanitation i.e., passing

the Sanitary Inspectors' Examination or possess a D.V.H. Diploma or Degree when such a post-graduate course is introduced by the Bombay University like the D.P.H. for medical graduates. Further such a Veterinary Public Health service should be under the Director of Public Health in case of Government and under the Municipal Commissioner or Chief Officer in case of Municipal Corporations and Local bodies, looking after the specialised type of work. The Director of Public Health to Government may be assisted by a Deputy Director of Veterinary Public Health, having the requisite qualifications in Veterinary and Sanitary sciences.

On the whole the present methods of inspection need to be tightened.

Yes. It is necessary to introduce legislation on the subject so that uniformity will be implemented in the methods of *ante-mortem* and *post-mortem* examinations, supervision and conduct of all the Slaughter Houses in the State".

It is also necessary to have a Post-graduate course instituted at the Bombay Veterinary College in Bacteriology, Pathology, Hygiene, including Food inspection and Municipal Public Health. For instance we may have a degree in Bachelor of Hygiene or as mentioned previously a Diploma or degree in the Veterinary Public Health, just like the B. Hy. or D.P.H. in medicine, as the College is now affiliated to the Bombay University. There are enough facilities in Bombay with the large Municipal Markets, Slaughter Houses, Dairies, Milch cattle stables, Refrigeration and Ice-plants in the City. Food inspection should not be confined to meat and milk but also should be extended to the inspection and construction of milch cattle stables and dairies, fish, poultry, eggs, fruits and vegetables, refrigeration and preservation of perishable foodstuffs and provision stores and canned foodstuffs, a vast range of field for training in Public Health inclusive of destruction of stray and ownerless dogs in the city by the latest scientific methods using electricity.

We have now a fine Taraporewaila Aquarium established at the seashore at Chowpati near the Charni Road Gardens for the study of Marine Biology, which is under the Director of Fisheries, Bombay State. Only last month or so a batch of Veterinary Officers of the Indian Army Remount and Veterinary Services took a course at the Marine Biology Station and were given demonstrations at the Municipal Markets in fish inspection by the Municipal Veterinary staff, employed at the Crawford Market, Bombay. Students from the Grant Medical College of Bombay in their final year examination are made compulsorily to attend the City's markets in batches, where they are given demonstrations in fish inspection, meat inspection, refrigeration of the perishable foodstuffs, etc , by the Municipal Veterinary staff attached to the Crawford Market of Bombay.

Veterinary Public Health is a very important branch of Veterinary services and should not be neglected as a specialization in our forward march,

if the Veterinary Colleges have to train Graduates for employment in the Public Health service of Municipal Corporations, Municipal Boroughs, etc., where there is ample field.

It may perhaps look strange that a Veterinary Public Health Officer should be placed under the Director of Public Health in case of Government service, and under the Municipal Commissioner or the Chief Officers in case of Municipal Corporations or Local Bodies, etc. But one cannot overlook the fact that such an officer apart from his veterinary skill and knowledge of sanitation must be equally conversant with the Public Health Act or the Municipal Act or the Borough's Act with their Bye-laws, Rules and Regulations, etc. Thus he may be able to implement them fully only when he is under the control of a uniform body that is empowered with the powers of enforcement under the provisions of the Act.

The Masani Committee, I understand, have already made their recommendations but the report from Government so far has not been published probably due to the sad demise of Mr. J. S. Sawant, who was the Secretary of this Committee, this year.

D. S. LAUD, G.B.V.C., F.R.H.S., F.Z.S.

Bombay, 6th July 1952.

Ex : Superintendent of Markets and Slaughter Houses, Bombay Municipal Corporation.

Reviews

Fundamentals of the Histology of Domestic Animals.—By Dr. Med. Vet. ALFRED TRAUTMANN and Dr. Med. and Dipl. Vet. JOSEF FIEBIGER, Vienna Veterinary School. Translated and revised from the 8th and 9th German Edition, 1949 by Robert E. Habel, D.V.M., M.Sc., New York Veterinary College and Ernst L. Biberstein, D.V.M. Bailliere, Tindall & Cox, Ltd,, London, W.C. 2. Price 67*s*. 6*d*. net.

Fundamentals of the Histology of Domestic animals translated into English by R. E. Habel meets a long felt need of a veterinary student to gain a comparative knowledge of the minute structure of animal tissues. The text is profusely illustrated containing a large number of coloured plates which enhances the value of the book as a guide both to the teacher and the student. The comparative data pertaining to the structure of tissues of several types of domestic animals will serve as an inspiration to further research and understanding of the functions of several animal tissues not yet well known.

Dairying in India.—By James N. Warner, M.Sc., The Allahabad Agricultural Research Institute, Allahabad. Macmillan & Co., Ltd., Calcutta, 1951. Price Rs. 15 net.

This book is the second of a series of animal husbandry manuals published under the auspices of the Indian Council of Agricultural Research. This is probably the only book that presents a fairly complete picture of dairying as it exists in this country. The author has done well in incorporating in a single book the widely divergent fields of the physiology of mammary development and milk secretion, dairy chemistry and dairy economics. In attempting to cover such a wide field the space allotted to each aspect had necessarily to be curtailed bringing out the most salient features. It is to be deplored that although the book was written in 1945 it could not be published until 1951. The science of dairying has made such rapid strides during these six years that this book does not incorporate the latest information on the various aspects. But, for this serious flaw, the book is well written, moderately priced and should be of considerable value to students of dairying.

Sheep Diseases.—By I. E. Newsom, D.V.S., D.Sc., Dean of Veterinary Medicine, Colorado A. & M. College, U.S.A. Pp x-352, with 110 figures. Bailliere, Tindal & Cox, Ltd., London, W. C. 2. Price 54s. net.

Until quite recently the emphasis on sheep diseases was comparatively less and the few books published on Sheep diseases are very old and out of print. Individual workers all over the world have of course devoted much of their time in tackling the disease problems in sheep and continue to do so even to day. But few attempts are there in recent past to present all the available information regarding sheep diseases in a single book, though there are many books on the general management aspect of sheep husbandry. Belschner of Australia is one of those few workers who attempted to present all the information about the sheep management and diseases quite recently.

Specialisation in sheep husbandry began receiving more and more attention in recent times and with it the need for more comprehensive knowledge of sheep diseases has also gained importance. Newsom, who is the Dean of Veterinary Medicine and President, Emeritus, of Colorado A. & M. College, deserves to be congratulated for his latest book on 'sheep diseases'. The publication is none too late and fulfils the long-felt want for such a comprehensive work. The author possesses a deep knowledge of the problems and has contributed much to the research in Sheep diseases himself. The presentation of the material in the book has been arranged very systematically so that the reader can easily pick out the information he wants. The subjects are dealt with in a thorough and concise manner unlike other voluminous works. He has done well in taking the trouble of adding reference at the end of each disease for the benefit of the Veterinarians and other research workers as well. In this way he has been able to reduce the size of the book without at the same time neglecting the important details such as important lesions and symptoms, differential diagnosis and treatment etc. He has rightly eliminated many details of Histopathalogy for certain diseases which would merely swell the pages and may not interest the general students and the farmers.

The book is divided into 4 parts, the first two of which deal with all the Infectious and Parasitic diseases respectively. The third part deals with the non-infectious diseases which include a chapter on the deficiency diseases. Part four of the book dealing with poisons and poisonous plants covering nearly 75 pages is a very useful addition and focusses the attention of workers and farmers, to this important aspect of sheep management. The index is not as comprehensive as is usually expected of such books, but any inconvenience felt in this respect is obviated by the systematic arrangement of the headings of diseases and the chapters. However, brevity seems to be the dictating factor in the presentation of the material though the discussions are exceptionally clear and lucid. One cannot escape the feeling of hurry while going through the book. The book is very useful and valuable for all students and enlightened farmers while the list of references are an additional help to research workers and Veterinary practitioners. It should find a place in the library of every College, Research Institute or Sheep breeding station.

The book contains 118 illustrations in all and is neatly printed on thick glazed paper. It is presented in an attractive size with good binding and adds to the credit of the well-known publishers-Bailliere, Tindall and Cox, Ltd., London.

Text-book of Meat Inspection.—By Horace Thornton, B.V.Sc., M.R.C.V.S., D.V.H., F.R.S.I., Chief Veterinary Officer, City and County of Newcastle-upon-Tyne. Second Edition 1952. Bailliere, Tindall & Cox, Ltd., London, W. C. 2, Pp. viii—646, with 260 figures. Price 55s. net.

Thornton's Text Book of Meat Inspection needs no introduction to the students and the Public Health Veterinarian. The fact that, in the short space of rather less than three years, a second edition has to be brought out speaks by itself to its popularity and the enthusiasm with which the book was received by the profession.

This opportunity for a 2nd edition has been availed of by the author to completely revise the whole book and bring it up to-date. The language is lucid, the arrangement of the text is methodical and concise with numerous illustrations and the get up of the volume is very attractive.

We welcome the new second edition and commend it to the profession.

The Inspection of food.—A Handbook for students of Public Health, Agriculture and Meat Technology.—By HORACE THORNTON, B.V.Sc., M.R.C.V.S., D.V.H., F.R.S.I. Bailliere, Tindal & Cox, Ltd., London, W. C. 2. Pp. viii—223, with 58 figures. Price 12*s.* 6d net.

Horace Thornton, the author of the well known Textbook of Meat Inspection, has brought out this guide on the Inspection of food ranging from meat, poultry, eggs, game and rabbits, fish and shell-fish to milk and milk products and also cereals, pulses, etc. The whole subject has been dealt with in just over 200 pages and naturally, this condensation has made the various sections very brief and concise. The book will be very useful for students who want to memorise the important points on the various aspects of meat and fish inspection. It will also serve for refreshing one's knowledge of the subject, although, we would like to have more information on meat inspection. The book is very readable and will be found to be a very valuable guide to those interested in the subject of inspection of food.

Government of Travancore-Cochin. Administration Report of the Animal husbandry Department, for the year 1950—51.

Sri V. K. Madhava Menon, G.M.V.C, was in charge of the Department during the period under review.

In the year, 34 hospitals, 22 dispensaries and 11 stockman stations continued to function under the Department. About 1,13,382 cases were treated in these institutions and 5, 549 operations were conducted. The number of patients admitted in the hospitals and dispensaries came up to 567. Besides the regular work at the hospitals and periodical visits to the dispensaries, stockman stations, etc., the Veterinary officers were also attending to other duties such as ante-mortem examination of animals intended for slaughter for human consumption, issue of permits for slaughter and meat inspection in non-municipal areas, periodical inspection of grant-in-aid bulls as well as Government stud bulls stationed throughout the State, control of epidemic among livestock and attending the sick elephants of the Forest and Devaswam Departments. The Veterinary Officers worked in collaboration with the Disease Investigation Officer for the control of epidemics in the State.

Seven posts remained vacant during the year, since qualified Veterinarians were not available for appointment.

For the treatment against Ranikhet Disease commonly prevalent among poultry, Ranikhet disease vaccine was got down from outside and vaccinations were conducted on a mass scale during the year and about 19000 birds were vaccinated.

The Department is maintaining a Livestock Farm at Ollukara, Trichur. It is the nucleus centre for all livestock activities in the State. During the year, 4 bulls, 4 cows, 1 heifer and 13 bullcalves of the Red Sindhi breed and 6 bull-calves of the Gir breed purchased from the Indian Veterinary Research Institute were added on to the existing strength of the livestock. Thus the present strength of the livestock in the Livestock Farm, comes up to 47 bulls including 6 buffaloes, 52 cows including 5 she-buffaloes and 71 young stock. The calves are reared in the calf rearing station, Nelliampathies, under natural conditions.

The Poultry unit, Pettah, Trivandrum consisting of 20 white leghorn birds at the beginning of the year was strengthened by the addition of 51 birds of the Rhode Island Reds during the course of the year under review.

Two Key Villages were started under the Pilot Key Village Scheme sponsored by the Indian Council of Agricultural Research and the method of artificial insemination was also taken up. The semen is received by air from the Indian Dairy Research Institute, Bangalore.

Towards the close of the year, the Department actually commenced works in connection with the various livestock schemes sponsored by the Indian Council of Agricultural Research and the Government of India, such as Goat Improvement Scheme, Poultry Development Scheme and Disease Investigation Scheme and the Key Farm Centres Scheme and considerable progress has been made towards the implementation. The total expenditure of the Department was Rs. 2, 79, 702 and actual receipts Rs. 34, 408.

Rajasthan and Ajmer Veterinary Investigation Officer's report.—Report the year ending 31-3-52.

The report reveals a shocking state of things. To quote the words of the Disease Investigation Officer who is the author of this report:—" During this year, only few items could be undertaken and the work turned out also is not as it should be, due to the following reasons.—

(a) For want of budget sanction in time, no salary was paid to Veterinary Investigation Officer and staff till January, 1952 and no tours could be undertaken for want of funds under T. A. The question of salary and other emoluments of the officer is unsettled till date (12-6-52), status and privileges still undefined.

(b) Due to the same reasons, no laboratory was available, throughout the financial year. The equipments brought from Ajmer were insufficient to take up any research work.

(c) Assistant was not appointed during the year. In other States there are two Assistant Disease Investigation Officers besides the Disease Investigation Officer engaged in investigation work. Rajasthan is more extensive than most of the other states with as much importance in livestock wealth, as other provinces and only one Disease Investigation Officer is working ; as such, without an Assistant, it is rather too much for one officer ; besides, the laboratory has not even an attendant for the upkeep of the laboratory.

(d) Due to famine conditions large herds of cattle, sheep and goats had migrated from Rajasthan and Ajmer to adjoining States in search of fodder, hence very few outbreaks were reported during the year."

We wonder who is really responsible for such a state of things. It is distressing that, at a time when the country demands intensive livestock work, the personnel of the Department is denied even the barest of facilities and is practically allowed to waste its time and energy. We do hope that things would have been corrected by this time and that the Investigation Officer is enabled to carry on his work by the provision of adequate facilities.

Government of West Bengal. Annual Report of the Civil Veterinary Department for the period from the 15th August 1947 to 31st March 1948.

This report contains a record of the effects of the tragedy of the partition of Bengal at the time of the country's Independence in August 1947 and also of the splendid way in which the personnel of the Civil Veterinary Department of West Bengal rallied round and pulled up together around the reorganised Department. Prior to the partition, the head of the Department was the Director but, after the event, the Department was placed under the Director of Agriculture, Animal Husbandry and Fisheries with an Assistant Director of Veterinary Services to help him. The Department also was named Veterinary Field Section. Not a very happy and satisfactory arrangement, it may be said, but probably it was the best under the circumstance obtaining then.

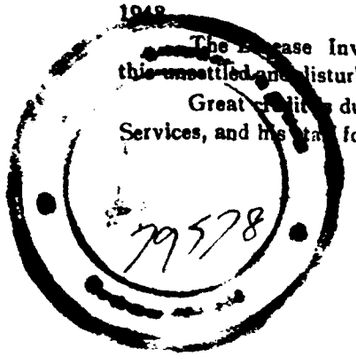
During the period under review, Rinderpest was responsible for the highest number of deaths viz. 1341 head of cattle in 381 outbreaks. The mortality has not been higher still due to the "prompt attendance and increased co-ordinated prophylactic action by the staff". Over 7 lakhs of prophylactic inoculations had been done against this disease alone. The other contagious diseases like H. S., Anthrax and Black Quarter have also been attended and the death roll has been kept very low.

The hospitals and dispensaries showed good out-turn of work but the dual control of these institutions by the Government and the local boards is not conducive for efficient and smooth working. The control should be unified preferably under Government owing to the financial difficulties of local bodies.

As regards the College, its work has been really hampered during the session owing to partition of the Province, and consequent opting out of a good number of officers and ministerial staff and also from the very heavy loss owing to the sudden demise of Sri S. C. Mukherjee, a veteran Lecturer, on 8th January 1948.

The Disease Investigation sections have done some good work even in this unsettled and disturbed conditions of the State.

Great credit is due to Sri P. C. Banerji, Assistant Director of Veterinary Services, and his staff for the efficient work done in these troublesome days.



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