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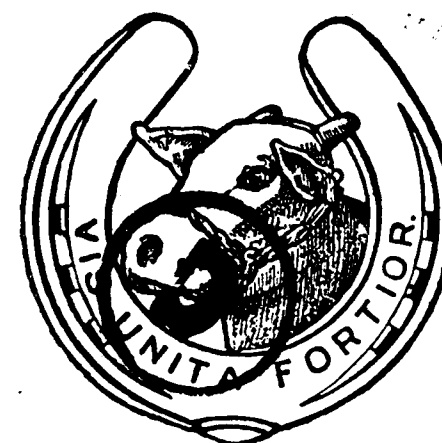
Vol. XXXIV, No. 2

MARCH, 1957

THE INDIAN VETERINARY JOURNAL

(The Journal of the All-India Veterinary Association)

*A Bi-Monthly Record of
Veterinary Science*

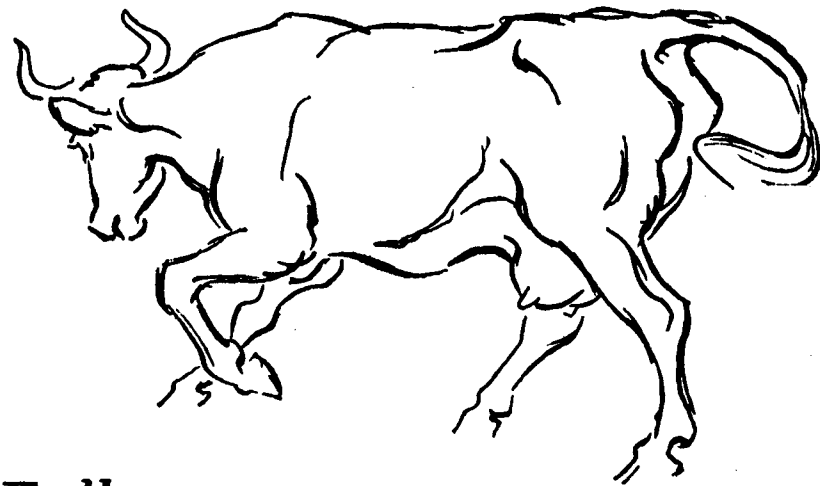


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EDITOR

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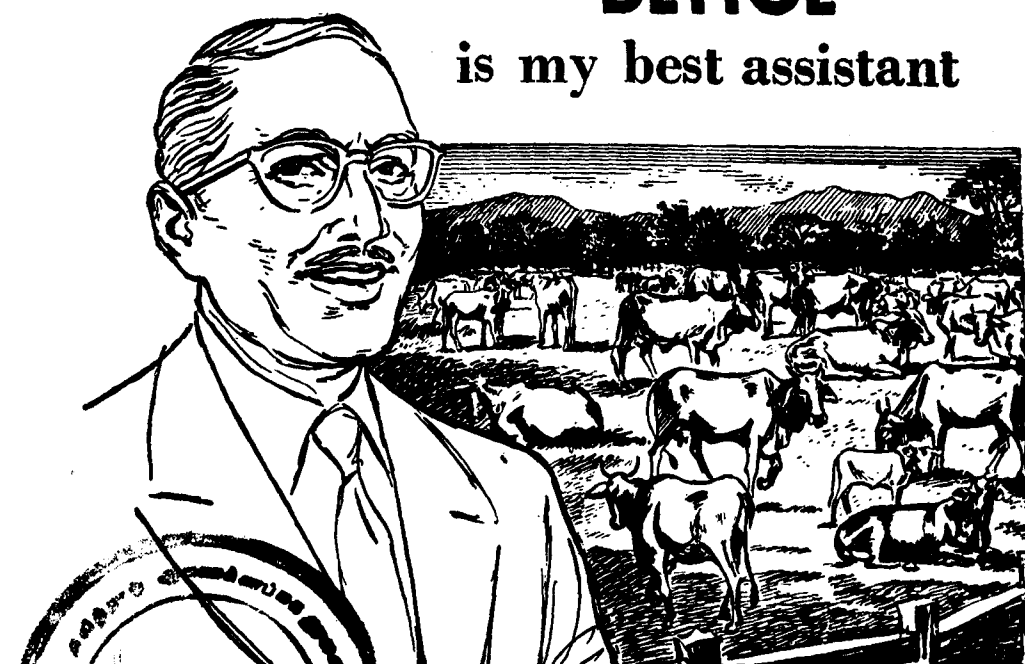
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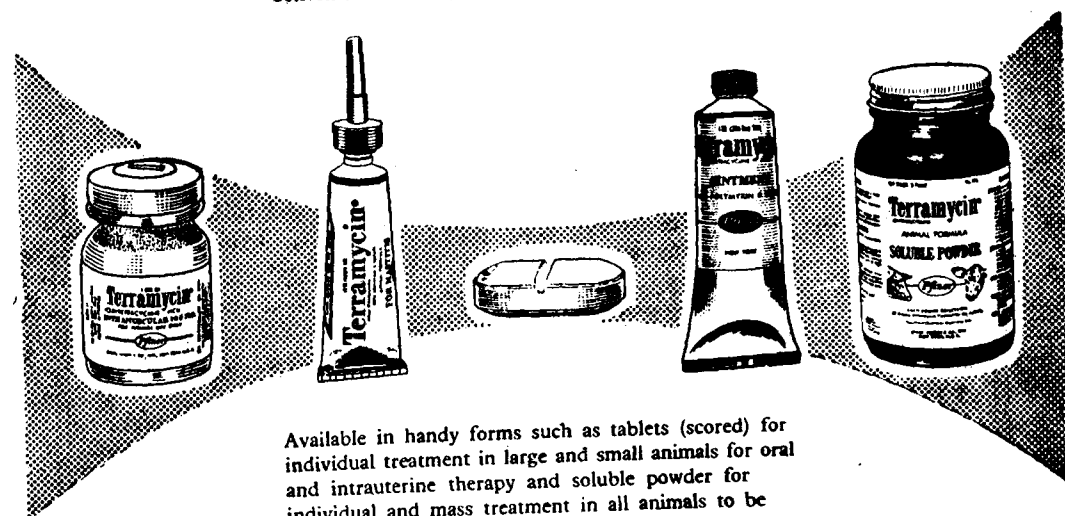
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Editorial

BONE - MEAL

We draw attention to an article by Mr. A. Mukerji on the potential dangers of using unsterilised or imperfectly sterilised bone-meal, both as a feeding stuff in livestock and as a fertiliser in fields and gardens. Though the possibility of such dangers was known to the profession and was never ruled out, such specific cases of direct infection traceable to the use of bone-meal as a manure and on a fairly wide scale are rare on record. Mr. Mukerji has done a distinct service in warning the profession and others against the indiscriminate use of all kinds of bone-meal and other proprietary preparations containing it. Neither the profession nor the 'consuming' public, can do much in the matter, unless the Government set up proper agency for stricter supervision and safe production of this stuff through necessary legislation if required. This is a matter of urgency which must be brought to the notice of the Government immediately. This can brook no delay and we do expect the Directors of Animal Husbandry in every State to move their respective Governments in the matter as it is within the competence of State Governments to deal with this subject. The Government of India should provide for stricter control on the export of this stuff to foreign countries. Apart from the bad name it brings to this country, the danger of infection at the other end, both to man and animals, as has been cited by Mr. Mukerji in his paper should make our Central Government more alive to their responsibilities and take such immediate steps as are necessary. We do hope the Datta Committee who are at work in appraising

the Slaughter House conditions, Meat Inspection practices and other cognate matters will draw pointed attention to this question of proper sterilisation of bone-meal. Here is an opportunity for impressing on the Government and the lay public, the important role a Veterinarian could play in the matter of Public Health. Anthrax has long been associated with bone-meal as a possible source of infection, but the finding of pathogenic *clostridia* in the samples examined, makes it doubly dangerous. More work is bound to follow and more data are bound to be collected.

In the meanwhile all agencies dealing in the stuff either singly or combined with other stuffs should be immediately warned to be more careful in the processing of this article. We hope the subject will receive the attention it deserves at the hands of all concerned.

VETERINARIANS ON LEGISLATIVE BODIES

ELECTIONS will soon be on us and the new Legislative Bodies will not be long in the coming. From the look of things, we presume they will be more or less of the same colour and composition without much new innovation. Politicians will as usual sweep the polls leaving very little chance for peasants and professional men. We don't grudge them their victory for they deserve to succeed when they work so hard for it. But until the several scientific professions, industries, arts, etc., develop sufficiently and feel heartened to enter the political arena, stand on their own legs and take care of their interests, they deserve to be protected by the State through proper nominations. This power of nomination is vested with the Governor in every State and with the President for the Lok Sabha.

The importance of the Animal Husbandry work is now fully well understood in the country and is openly admitted from many a platform by the politicians themselves. India possesses approximately 230 million cattle and buffaloes or about 1/3 of the world's recorded number. The annual value of milk produced in India is estimated to be over 180 crores of Rupees. The total value of eggs sold in the course of a year amounts to

5½ crores of Rupees, to mention only two of the major items of animal products. The prosperity of the peasant is in direct proportion to the development of his livestock wealth. But if one goes through the proceedings of the Legislative Assemblies and Councils, one is struck by the absence of clear grasp of Animal Husbandry problems and lack of enlightened guidance wherever needed. This is understandable as these problems involve scientific knowledge of specialised nature and as such may not be within the comprehension of the ordinary non-technical class of members. And yet the efforts put in by them are something admirable and we feel it is unfair to them to be left alone in the Councils without proper support from professional experts on such technical matters.

In the absence of such help, the debates on such subjects never reach the required standard and fall flat on the ears of the scientific men and perhaps disappoint the discerning public. Apart from all these considerations, the Animal Husbandry work itself fails to evoke sufficient interest and consequently suffers to the great detriment of the livestock wealth of the land. The 'peasant's prosperity' continues to remain a catch-word or phrase and eludes realisation in spite of all the good intentions of the Government.

We make bold to assert that if the common man is to come into his own, his prosperity is inextricably linked with the improvement of his livestock for better work and for better yield of milk, wool, eggs and meat. The men who are intimately connected with this work of national prosperity are the Veterinarians. Should such a profession go un-represented on the Legislative Bodies of the land? This is a question we pose to the authorities concerned and request that one seat in each Legislative Assembly should be reserved for a Veterinarian and one in Lokh Sabha under Article 80 of the Constitution. When Music, Painting, Dancing and other Fine Arts could get representation on the Legislative Bodies, the claims of a scientific profession of such vital importance to the improvement of the national wealth and health should not be easily brushed aside. The estimated outlay on Animal Husbandry and Dairying in the

Second Five Year Plan is about 66 crores of Rupees. A Veterinarian in each Assembly will be of great help to elucidate hard facts and help the Administration. We therefore appeal to the authorities concerned not to fail to infuse sufficient enthusiasm for better work in this important profession, by granting the representation asked for.

We charge the profession in every State to work for this happy consummation. They should remember that it is a duty they owe to the peasants at large and should not in any way lack in their efforts.

BOMBAY'S MISFORTUNE

BOMBAY has been in the grip of misfortune from time to time, in the matter of Animal Husbandry work in that State. The very mention of the word Bombay brings back to memory the high role she has played as a nursing ground for Veterinary Science in this land. Yes, it is no exaggeration to state that she virtually 'mothered' this young profession in India.

She was the first to start a Veterinary College in India so early as 1886 and her alumni naturally formed the nuclei of the teaching staff of the various other Veterinary Colleges that came into existence much later. It was in the State of Bombay that the Indian Veterinary Research Institute was born but later on shifted to the high altitudes of the great Himalayas. In recent years, Bombay has been much in the picture with regard to her Aarey Milk Colonisation Scheme—the first of its kind in the East. But her efforts to continue to maintain the rate of progress have been thwarted from time to time by some stroke of misfortune or other. First came the famous 'Thomas Report', which recommended total abolition of the Bombay Veterinary College in 1932-33, as a measure of retrenchment in those days of general financial depression. We had to come out with an Editorial on "Bombay's Hour of Trial" (April 1933) and plead with all the emphasis we could against such a catastrophic proposal. The storm however blew away without causing any harm and the profession survived. Then came the proposal to shift the Bombay Veterinary College from Bombay to Poona.

The *I.V.J.* again played its own part to put a stop to this proposal. Later Bombay was making herculean efforts to get the Bombay Veterinary College affiliated to the University but some impediment or other prevented the happy consummation of this event until 1946. Whereas the Madras Veterinary College which was started only in 1903 was able to get herself affiliated 10 years earlier i.e. in 1936. Even that affiliation is still on a temporary basis in Bombay even after 10 years of experience gained.

Again the course of studies and training at the Bombay Veterinary College has been so shaped from time to time as to make the Veterinary Surgeons of the land best fitted for all Animal Husbandry work. But they have been deprived of the opportunity to utilise all that knowledge and training and serve the country in the best manner possible. The Livestock Section is not with them and the Government of Bombay have probably not yet made up their mind as to who is best suited for this work! This is an old old story which we are tired of repeating in these pages. We had already said what Sir Thomas Dalling gave expression to at a Seminar held in that very gay and prosperous town of Bombay itself only recently. He laid stress on "the necessity to centralise this vast subject in all its branches and aspects in the hands of specially trained personnel *viz.* Veterinarians". They may say it is a Veterinarian who said it. But men of Sir Thomas calibre are far above such squabbles. Now let us see what an eminent non-Veterinarian and a world renowned Dairy Expert has said on this matter. Dr. Norman C. Wright in his report on the Development of Cattle and Dairy Industries of India has said so early as 1937 "I consider that the unification of livestock improvement and Veterinary work into a single Department of Animal Husbandry will ultimately be essential for the successful development of the cattle industry". We appeal to the Government of Bombay to follow the advice of such eminent men of Science.

The expanded State of Bombay has very little time to loose. With an area of 188,240 square miles and a population of 478 lakhs her responsibilities have multiplied in Animal

Husbandry matters and she has to look sharp to bring about an all-round expansion of this work in her State. We even go so far as to say that one more Veterinary College of Animal Husbandry and Veterinary Science may be necessary in Bombay State. Let us hope the Government will soon do the needful in the matter.

THE PUNJAB VETERINARIANS

The Punjab has been in the vanguard of progress in all Animal Husbandry matters for quite a long time now. Several are the reasons for this proud position – not the least being the alertness and ceaseless efforts of the Veterinarians who have been in charge of the Animal Husbandry work in that state from the very beginning. At any rate they have had this Animal Husbandry work on their hands much longer than in most of the other States. They have proved to the hilt that the Veterinarians are the best suited for Animal Husbandry work and that they take to it like fish to water. But we notice that of late, a sense of frustration has been growing on the members of the profession due to their poor scale of pay, in spite of repeated representations. Their starting salary is only Rs. 120/-, though their run-on-grade reads very alluring on paper, going up to Rs. 350/- in about 18 years of service! But no professional man worth the name is going to end his service in the last grade itself. Hence in actual practice this figure of Rs. 350/- remains a mirage as very few, if any, reach this Rs. 350/- as Veterinary Assistant Surgeons. Most of them get promoted to higher categories in the meanwhile. Even otherwise the distant prospect of a living wage is no substitute for the needs of the present hour. So what counts is the pay of the present hour which is Rs. 120/- p.m. It is no wonder therefore that the Veterinary Graduates passing out of the Punjab Veterinary College at Hissar desert their native home, naturally much against their will and seek employment elsewhere. This is a matter which deserves the serious consideration of the Punjab Government and we feel confident they will do so in their own interest in the not distant future.

This frustration seems to have spread also to the activities of the Professional Associations there. At present there are three different Veterinary Associations in the Punjab (1) of Class 1 Officers, (2) of Class 11 Officers and (3) of Veterinary Assistant Surgeons. These perhaps are found necessary to present the several service conditions of each one of those categories to the Government. But none can dispute the fact that a common Veterinary Association for all professional men, whether in service or not, whether in higher or lower category, is an absolute necessity in all progressive States. It provides a common forum for exchange of notes on all matters of professional interest. Even broad policies affecting the progress of the profession in our land can be discussed there.

The All-India Veterinary Association has been in existence for over 34 years now and has shown the way to unite and benefit the profession. It is no doubt not so active as it should be due to reasons beyond its control. The vastness of the country itself is a powerful contributing factor. Almost all the States have an affiliated Branch of the said Association but the Punjab is without one. For those who know the genesis of the All-India Veterinary Association, it is unthinkable that the Punjab could have fallen back after the glorious lead she had given to the rest of India. The All-India Veterinary Association was ushered in at Moradabad in 1922 under the presidency of Prof. Karam Ellahi of the Punjab Veterinary College and the First All-India Veterinary Conference was held at Lahore in March 1923, amidst scenes that still linger in the memory of those who attended it. It was a historic occasion.

It makes one sad to think that that land of brave patriots, is now without an affiliated Branch of the All-India Veterinary Association.

We appeal to all our professional colleagues in the Punjab to unite in the name of Bharat and revive the old Punjab Branch of the All-India Veterinary Association and fall in line with other States.

Original Articles

SEROLOGICAL EVIDENCE OF "Q" FEVER IN MAN AND ANIMALS IN CEYLON

By

D. W. AMERASINGHE, D.V.M.,
Chief Municipal Veterinary Surgeon, Colombo,
and

C. L. WISIDAGAMA, G.V.Sc., P.G. (I.V.R.I.),
Municipal Veterinary Surgeon, Colombo.

In an earlier article, Amerasinghe and Wisidagama (1956) reviewed the literature on the serological surveys on "Q" fever in India and also the results of their serological findings of "Q" fever among sheep and goats imported from India to Ceylon for slaughter.

Under the aegis of the World Health Organisation, Kaplan and Bertagna (1955) reviewed the literature from various countries and recorded their findings that "Q" fever is known to occur in no less than 51 countries, notable exceptions, so far, being Ireland, Holland, Poland, Sweden, Norway, Finland and New Zealand.

Schmid *et al* (1952) first recorded the incidence of this disease in man and domestic animals in Ceylon. The object of this work is to confirm their reported findings and also to estimate the degree of infection in man and the importance of different types of animals in the epidemiology of the disease in Ceylon.

Materials and Methods

The authors obtained human and animal sera for this study from the following sources:—

1. *Animal sera*.—(a) Sera of sheep, goats, cattle, pigs and buffaloes were obtained from random selection of individual animals brought to the Colombo Municipal Slaughter House from different parts of the Island.

(b) Dog sera were obtained from the impounded stray dogs at the Municipal Dog Pound.

(c) Sera of fowls were obtained from the local poultry dealers in the city.

2. *Human sera*.—(a) From the employees of the Colombo Municipal Veterinary Department.

(b) From the private employees of the butchers of the Colombo Municipal Slaughter House.

(c) From a few registered milk vendors in the city.

(d) From the sera referred to the Medical Research Institute, Borella, for examination from cases of continued fever from the different hospitals in the Island.

The technique followed has been the same as described by Kaplan *et al* (1953) and adopted by the authors (1956). All animal and human sera were inactivated at 60°C. for 30 minutes before the test. All sera tested were screened for positive reactions at a dilution of 1/16. Those giving a positive fixation at 1/16 (++++) were further tested at higher dilutions. Every test included a 4 tube complement control, a positive, negative, sheep cell and haemolytic control. The guinea-pigs used for this survey were pre-tested for any evidence of "Q" fever and were found negative. "Q" fever antigen used was the American Strain-Nine Mile diagnostic antigen*, supplied by the World Health Organisation.

Results of the survey

Test results on animal and human sera—Complement Fixation Tests.

TABLE I
Animals.

	No. tested	No. positive	Percent positive	Titre				
				16	32	64	128	256
Goats	132 { Males 57 Females 75	8 { Males 2 Females 6	6.06	3	2	1	2	—
Sheep	132 { Males 53 Females 79	5 { Males 2 Females 3	3.78	1	2	1	1	—
Buffaloes	115 { Males 74 Females 41	6 { Males 3 Females 3	5.21	3	1	—	1	1
Cattle	138 { Males 76 Females 62	6 { Males 3 Females 3	4.34	1	1	3	1	—
Pigs	100 { Males 37 Females 63	2 { Males 1 Females 1	2.00	—	1	1	—	—
Dogs	58 { Males 30 Females 28	2 { Males 1 Females 1	3.44	—	2	—	—	—
Domestic fowl	50 —	—	—	—	—	—	—	—

* Obtained from Lederle Laboratories Division, American Cyanamid Company, New York.

TABLE II
Humans.

	No. tested	No. positive	Percent positive	Titre				
				16	32	64	128	256
(a) <i>Municipal employees</i>								
Slaughter House labourers (cattle, buffaloes & pigs)	41	1	—	1	—	—	—	—
Dog Pound & Veterinary Clinic labourers	8	—	—	—	—	—	—	—
Cattle & dog seizers	7	—	—	—	—	—	—	—
Slaughter House & Quarantine Station labourers (sheep & goats)	9	1	—	—	1	—	—	—
Total	65	2	3.07	1	1	—	—	—
(b) <i>Butchers employees</i> (skinning labourers)								
Slaughter House (cattle, buffaloes & pigs)	107	6	5.6	2	3	1	—	—
Slaughter House	30	2	6.6	—	1	1	—	—
Total	137	8	5.8	2	4	2	—	—
(c) <i>Milk vendors</i> Private dairies	11	1	—	1	—	—	—	—
(d) <i>Pyrexial cases</i>								
Patients negative for typhus & salmonella (Colombo & outstation hospitals)	175	nil	—	—	—	—	—	—

Discussion

The authors have attempted to study the serological evidence of "Q" fever in several species of domestic animals and a fairly representative sample of humans in the Island. Among the sera of various animals tested that of goats show the highest serological evidence of "Q" fever. This accords with the findings in Ceylon of Schmid *et al* (1952).

The authors (1956) showed that among imported animals from India, there was a higher incidence of the disease among sheep than goats. In Ceylon, where the breeding of sheep at present is not as widespread as the breeding of goats, it could be recorded that the goat

is the most probable source of infection for man in the Island. Evidence from other parts of the world show that sheep and goats are the main source of infection for man:—Lennette *et al* (1949); Zavagli (1951); Terhaag (1953); Marmion *et al* (1954); Angeloff and Kujungiev (1955).

The authors have also to record for the first time serological evidence of "Q" fever among pigs and dogs in the Island. As mentioned in the earlier publications, the authors find it desirable to use the 1/16 dilution for preliminary screening of sera before the test. It was also observed that among dog sera, a large percentage of samples showed anti-complementary activity.

Table II shows greater serological evidence of the disease amongst those closely associated with the slaughter and handling of animals. "Q" fever positive samples of human sera were also subjected to agglutination tests against Salmonella, Typhus and Brucella. The results observed were all negative except for one sample which showed a reaction against the 'H' antigen of *S. typhi* in a dilution of 1:50.

Summary

1. Serological evidence of "Q" fever in man and animals in Ceylon has been discussed.
2. The study reveals serological evidence of "Q" fever among goats, sheep, cattle, buffaloes, pigs, dogs and humans, who are closely associated with animals.
3. It is observed that in the Island the goat is the most probable source of infection for man.
4. Serological evidence of "Q" fever in pigs and dogs is reported for the first time in Ceylon.

Acknowledgment

The authors wish to express their thanks to the Colombo Municipal Council for affording them facilities to carry out this work at the Municipal Veterinary Laboratory. They are also indebted to the World Health Organisation for providing them with the "Q" fever antigen and positive sera to carry out this survey, to the Deputy Director of Laboratory Services of the Department of Health Services for supplying the Hæmolysin used for this study and for useful advice given to them from time to time, to Dr. A. Amerasinghe, Public Health Veterinary Officer of the Department of Health Services, for guidance and valuable assistance, to the City Microbiologist of the Colombo Municipal Council for assistance during the course of this work and for

testing the human sera for Salmonella and Typhus. Thanks are also due to Mr. E. B. Rudolph of the Colombo Municipal Veterinary Department for technical assistance and to several others for their co-operation.

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STUDIES ON THE FEEDING OF THYROPROTEIN TO LAYING BIRDS

BY

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Although Poultry Physiologists have given special attention to the effect of the thyroid hormone upon feathering and egg-laying in fowls, there are conflicting reports in the literature regarding the feeding value of thyroid to poultry. Some workers were unable to demonstrate effect of thyroid feeding on egg production whilst others have reported rather phenomenal results with thyroid in the rejuvenation of hens.

With the development by Reinecke and Turner (1942) of iodinated caesin possessing high thyroidal activity which could be produced at a very low cost in comparison to the natural product, considerable interest has developed during the past few years to determine the effect of thyroprotein on egg production and on body weight at levels in the physiologically optimum range.

The present investigation was carried out with Protamone brand of iodinated protein which is a compound of caesin and iodine having

thyroid like properties obtained from Cerophyl Laboratories, Incorporated, 2433 Broadway, Kansas City, Mo., U. S. A.

A total of 63 White Leghorn, Rhode Island Red and Barred Plymouth Rock pullets, aged about 8 months, were divided into comparable groups according to their handling qualities. The birds were housed in three laying batteries, each having accommodation for 21 laying birds. Group I received an all-mash laying ration consisting of yellow Maize 49 parts, Wheat Bran 20 parts, Ground nut cake 10 parts, Ground Oats 10 parts, Fish meal 7 parts, limestone 3 parts, salt 0.5 part and Shark Liver oil 0.5 part. Group II was fed the above laying ration supplemented with 0.08 per cent of Protamone and Group III was supplemented with 0.027 per cent Protamone. The records of egg production and body weight during the four month experimental period, (May to August) are recorded in Table I.

TABLE I

Body Weight and Egg Production.

	Group I			Group II			Group III		
	Control			0.08% Protamone			0.027% Protamone		
	W.L.	R.I.R.	B.P.R.	W.L.	R.I.R.	B.P.R.	W.L.	R.I.R.	B.P.R.
Average body weight in oz. at the beginning of the experiment	52.4	67.7	56.1	51.4	59.1	55.5		60.8	
Average body weight in oz. at the end of the experiment	63.6	88.8	67.3	59.4	72.6	64.8		78.9	
Average monthly egg production per bird.	17.2	13.1	12.4	10.5	7.8	9.7		12.6	
Percentage mortality	Nil	Nil	Nil	Nil	42.8	28.6		Nil	

It will be seen from Table I, that the inclusion of 0.08 per cent Protamone had adverse effect on the performances of the laying birds in all the three breeds. The dosage of 0.027 per cent of Protamone appeared to be in the physiological range as body weight and egg production compared favourably well with the control birds.

As the birds fed on ration supplemented with 0.08 per cent Protamone showed definite detrimental effect on egg production and body weight, determinations were made to study their possible changes in

body temperature, heart rate, respiration rate and haemoglobin concentration. A representative number of birds were also sacrificed to study the average weight and histological changes in adrenals and thyroids. The results are summarized in Table II.

TABLE II

	Group I			Group II 0.08% Protamone		
	W.L.	R.I.R.	P.P.R.	W.L.	R.I.R.	P.P.R.
Body temperature in °F	106.7	106.6	106.6	106.7	106.5	106.7
Pulse rate per minute	336.7	335.0	316.7	418.0	435.3	428.2
Respiration rate per minute	36.6	36.0	41.3	38.1	44.4	45.1
Average weight of thyroid in mgm. per gm. body weight	16.94	18.23	19.13	11.64	13.67	6.86
Average weight of adrenal in mgm. per gm. body weight	9.36	5.46	5.73	8.28	5.86	6.86
Concentration of haemoglobin in gm. per 100 ml. of blood	7.45	8.40	8.57	10.63	10.13	9.30

The results in Table II show that birds fed on ration supplemented with 0.08 per cent Protamone developed definite increase in heart rate, almost leading to tachycardia. The haemoglobin concentration in blood also increased due to higher thyroxine concentration. The thyroids were definitely smaller in weight almost shrunk in some cases in birds fed with high dose of Protamone. There were no significant differences in body temperature and in the weight of adrenals.

As the effect of thyroprotein in the physiological range of 0.027 per cent of Protamone did not prove beneficial in young birds in their first year of production, experiments were carried out to study the effect of 0.027 per cent Protamone in two year old Desi hens.

The results are summarized in Table III.

TABLE III

	Control Group.	Group fed on Protamone.	0.027 per cent.
No. of hens	10	10	
Average number of primaries moulted during the four month experimental period	6.6	6.2	
Total No. of eggs produced during July to Oct. '54	161	173	
Average gain in body weight in oz.	8	11	

It is known that the activity of the thyroid gland decreases in hot weather and with age. The results in Table III show that the feeding of 0.027 per cent Protamone to two-year old hens produced an increase in egg production although the above dosage did not have any effect on the moulting of the primary feathers.

Summary

The present investigation was carried out with Protamone brand of iodinated protein which is a compound of caesin and iodine having thyroid like properties. It was observed that inclusion of 0.08 per cent Protamone had an adverse effect on the performances of the young laying birds. The heart rate and haemoglobin concentration showed a definite increase due to higher thyroxine concentration. The thyroids were smaller in weight and shrunk. The dosage of 0.027 per cent Protamone appeared to be in the physiological range as body weight and egg production compared favourably well with the control birds. The effect of thyroprotein in the physiological range of 0.027 per cent Protamone did not prove beneficial in young birds in their first year of production. Further experiments were carried out to study the effect of 0.027 per cent Protamone in two year old hens. The results show that the feeding of 0.027 per cent Protamone to two-year old hens produced a significant increase in egg production, although the above dosage did not have any effect on the moulting of the primary feathers.

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STUDIES ON THE BACTERIAL FLORA OF THE INTESTINAL TRACT OF THE HONEY BEE (*APIS MELLIFICA*)

1. On the Isolation of *Salmonella florida* from honey bees.

By

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Agriculture in India has been, from times immemorial, a cottage industry but, of late, schemes for intensive breeding of honey bees have been introduced and this has brought in fresh problems of rearing and disease control. Heavy mortality in honey bees at one of the apiaries :

India attracted our attention and studies were carried out on fairly large samples of adult bees from different colonies of the apiary to establish the exact etiological agent. The object of this article is to record the occurrence of *Salmonella florida* in the intestines of honey bees suspected to have died of an unknown disease.

Knowledge concerning the bacterial flora of the intestinal tract of honey bees in health and disease is very meagre; White (1906, 1912, 1921) recorded the occurrence of *Bacillus tenuis apis*, *Achromobacter eurydice*, *Bacillus rigidus api*, *Bacillus subgastricus* and *Bacillus influenzae apis*, now classified under the family *Achromobacteriaceae*, in the intestinal contents of diseased bees. He also isolated *Bacillus constellatus*, a strict anaerobe which was later classified under order *Actinomycetales* and genus *Bifidobacterium* by Prevot (1938). Bahr (1919) described *Bacillus paratyphus alvei* and Harduroy *et al* (1937) classified it as *Salmonella schottmuelleri* Var *alvei*. But it is now grouped under genus *Hafnia* of the family *Enterobacteriaceae* (Edwards, 1956), and is reported as pathogenic for bees and wasps. Metalnikov and Kostitsky (1933) described *Bacterium apis* Nos. 1, 2, and 3 as associated with intestinal diseases of honey bees. Kruse (1896) and Burnside (1928) reported *Bacillus apicum* and *Bacillus apisepticus* respectively as pathogenic for honey bees. Serbinow (1915) isolated *Proteus alveicola* from infectious diarrhoea of honey bees. Edwards (March, 1956) in a personal communication to one of the authors states that to the best of his knowledge *Salmonella* strains have not been previously isolated from bees. He recalls nothing else concerning *Salmonella* in these insects.

Salmonella florida was isolated for the first time from the faeces of a patient suffering from febrile diarrhoea, (Cherry, Edwards and Bruner, 1943). According to Edwards (1956) *Salmonella florida* occurs occasionally both in man and animals in U. S. A. and its distribution and action are those of the usual non-host adapted *Salmonella* type. It appears that *Salmonella florida* has not, till now, been isolated from insects and is thus deserving of report.

The strain was isolated from the material which was received in the form of few dead bees collected from different colonies of an apiary which was experiencing sudden heavy mortality. The following history was supplied with the material:—

"About a dozen of our bee colonies at Panchgani were destroyed suddenly by a large scale death of workers. There were no symptoms of Foulbrood, Acarin, Dysentery. Examination of contents of stomach and intestines of dead bees did not reveal poisonous contents of stomach plants, in the local flora. Use of insecticides around could not also be considered as a definite cause".

As the case was suspected for Foulbrood of honey bees, the material was subjected to the usual cultural and biological tests, in mice but the material proved negative for evidence of infection either with *Bacillus alvei* or *Bacillus larvac*. But a Gram-negative, non-lactose fermenting rod was isolated in pure culture and is the subject of the present report.

The identity of the organism.—The morphological and cultural characteristics were those of a Gram-negative, aerobic, non-sporing rod of the family *Enterobacteriaceae*.

The techniques and methods followed for biochemical examination of this strain were those of Kauffmann (1954), Moller (1954, 1955) and (Kauffmann and Mollar, 1955). The biochemical reactions are set out below:—

Adonitol	—	Ammonium citrate	—
Dulcitol	+	K No ₃	—
Sorbitol	+	Indole	—
Arobinose	+	V. P.	—
Xylose	+	M. R.	+
Rhamnose	+	Urea	—
Maltose	+	d-tartrate	+
Salicin	—	l-tartrate	+
Inositol	—	i-tartrate	—
Lactose	—	Sodium citrate	+
Sucrose	—	Mucate	+
Trehalose	+	KCN test	—
Glycerol	+	Aminoacid decarboxylases	
Mannitol	++	Lysine	+
Glucose	++	Arginine	—
H ₂ S	+	Ornithine	+
Gelatin	Not liquefied.	Glutamic acid	—
Ammonium glucose	—		

Key: — ++ = Acid and gas.
— = Negative.
+ = Positive.

Serology.—The preliminary serological tests carried out in this laboratory showed that the organism belonged to group H and the final typing was done for us by Dr. P. R. Edwards in the U.S.A. and the organism was found by him to conform to the following antigenic structure according to which it has been named as *Salmonella florida*.

1, 6, 14, 25: d-1, 7.

Pathogenicity.—Pathogenicity tests conducted in young weaned Swiss-white mice showed that the organism is highly pathogenic when

given subcutaneously or intraperitoneally; no pathogenicity trials have yet been made on healthy honey bees but it is proposed to do so as soon as a brood of healthy bees becomes available.

Discussion.—This is the first time that a *Salmonella* is being isolated from intestinal contents of bees suspected to have died of an unknown disease. However, as no information is available regarding the normal bacterial flora of the intestinal tract of the honey bees, it is difficult to assess the probable pathogenic significance of the organism. But as all members of the genus *Salmonella*, which are primarily intestinal parasites, are pathogenic for man, animals or birds giving rise to food poisoning, enteritis or typhoid like infections, it leads us to believe that this may be the causal agent of the unknown disease which took such a heavy toll of bees. *Salmonella florida* was found to be highly virulent for mice causing, on intraperitoneal inoculation, a suppurative peritonitis and fatal septicaemia. As feeding and pathogenicity trials remain to be conducted on healthy honey bees, it has not yet been possible to advance definite experimental evidence incriminating this organism as the cause of this unknown disease, although the circumstances of the case under report are strongly suggestive of its being the cause of the condition. However, irrespective of its pathogenic significance, the mere occurrence in honey bees of *Salmonella florida*, a potential pathogen for man and animals, is of interest and deserves report.

Summary

1. *Salmonella florida* has been isolated from the intestinal contents of honey bees suspected to have died of an unknown disease.
2. The probability of its being the etiological factor of the unknown disease is discussed.

Acknowledgment

Thanks are due to Dr. P. R. Edwards of the U.S.A. for final typing of the strain.

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"LEG DISORDER IN COCKERELS"

By

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Among the fastly growing Rhode Island Red chickens from 10 to 20 weeks of age, kept in the College Poultry Unit, a peculiar leg disorder or weakness leading to frequent squatting on the hocks or walking with a twisted gait at times or in advanced stages unable to stand for a long time, was noticed only in the cockerels, but not in the pullets. The affected birds with ruffled drooping feathers appeared to develop lameness in one of their legs.

The leg weakness, marked staggering or incoordination or paralysis might be due to either diseases like leucosis, encephalomyelitis, botulism, arthritis, or fowl tick fever, or dietary deficiencies such as rickets, encephalomalacia, perosis, curled toe paralysis, avitaminosis A, or poisoning by nitrate or phytotoxins (37). The affected cockerels had been examined in the College hospital for possible diseases or poisons causing the above symptoms, but found to be negative. The examination of dietary deficiency, if any, as the contributing factor,

was undertaken to see if by supplementing specific nutrient factors to the same feed the condition was curable.

The cockerels and pullets were receiving identical feeds, consisting of 4 ounces of mash whose percentage composition was wheat flour 15, wheat bran 20, rice bran 20, groundnut cake 20, fish meal 20, and churn meal 5, and about 5 ounces of equal parts of wheat and cumbu (bajra) grains for each fowl in 5 feeds a day. About 1.0 percent shark liver oil calculated to supply each bird in the mash 1500 I.U. vitamin A and 150 I.C.U., vitamin D, was added to the mash everyday before feeding. The birds were kept on the range with wire fence and with free access to water, shell and stone grits. They were given fresh lucerne daily in bunches. The birds were vaccinated against Ranikhet or Newcastle disease, at 11 weeks of age.

The results of experiment with a few selected birds with noticeable defect are presented here. Except supplementing the usual diet with known amounts of vitamins or minerals for the experimental birds, they and the control birds were under the same management and identical condition. The experiment was conducted with affected birds 18 weeks old and lasted 6 weeks.

I. Growth of Cockerels

Though the leg disorder was noticeable after 10 weeks in cockerels developing ruffled feather, a study of their growth from hatching showed that all these birds were growing quickly at optimum rate as shown in the Table I and they weighed about 5 pounds at 5 months of age. The growth of cockerels was greater than that of pullets after 8 weeks and at this stage, the defect manifested mainly in one of the legs of the males.

TABLE I

*Growth of Affected Cockerels from 0 to 24 Weeks.
Weight in Ounces.*

S. No.	Bird No.	Wt. at Weeks								
		0	3	6	9	12	15	18	21	24
1	364	1.25	5	13	25	33	48	69	78	78
2	375	1.38	5	15	26	39	56	72	83	8
3	377	1.25	4	15	23	34	52	68	82	84

II. Examination of the Feed

The mash was analysed to contain 1.3 percent Calcium and 0.68 percent Phosphorus against the requirements of these minerals at 1 and

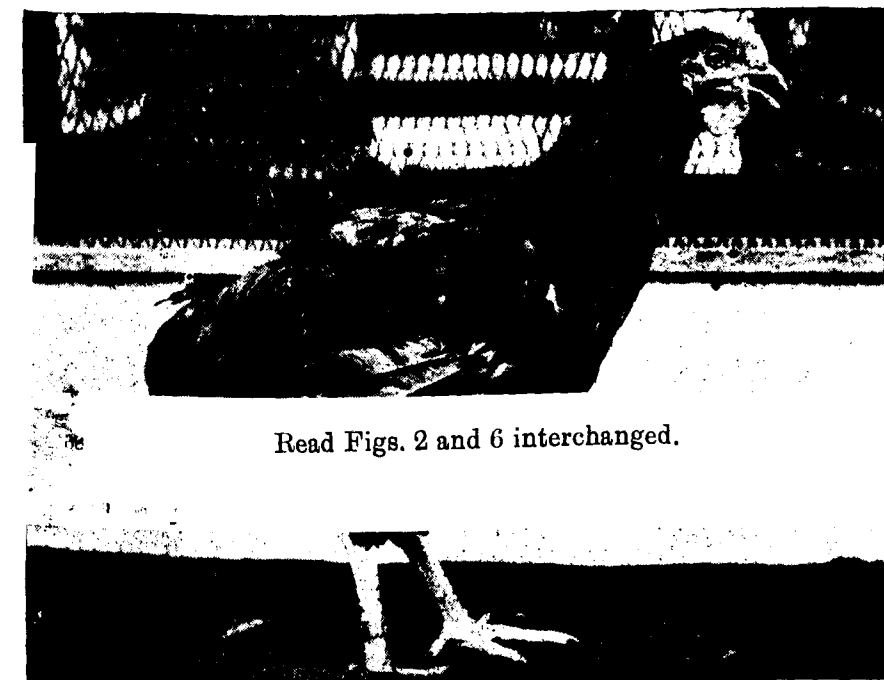
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Fig. 1.
Control Bird (364) with left leg disorder at first.



Read Figs. 2 and 6 interchanged.

Fig. 2.
Control Bird (364) with aggravated left leg disorder at end.

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Fig. 3.

Experimental Bird (375) with left leg disorder at first.

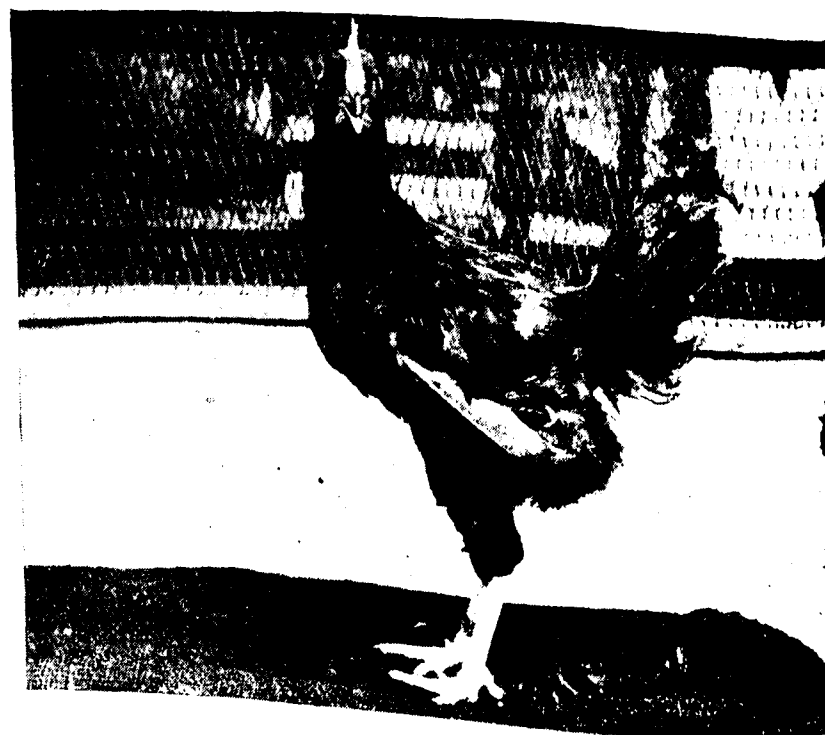


Fig. 4.

The same bird (375) cured of the disorder at end.

0.6 percents respectively. Therefore Ca. and P. in the mash were adequate and balanced. As the feed used produced adequate growth, no gross energy nutrients could be regarded as inadequate. Lucerne leaf consumed was found to be 4 grams on dry basis for each bird and it was about 1.6 percent in the total feed, which might seem insufficient. But the shark liver oil added to the mash gave each bird about 1500 I.U., of vitamin A and 150 I.C.U., vitamin D, against the recommended requirements of 1000 I.U., vitamin A and 90 I.C.U., vitamin D for the quantity of feed consumed. Churn mineral at 5 percent level in the mash was expected to supply the needed trace minerals.

III. Vitamins and Minerals Supplement Feeding

The 3 affected cockerels at 18 weeks of age, divided into a control bird and two experimental birds for feeding vitamin and mineral supplement, were radiographed in the leg joints before and after the experimental feeding. During the first week the two experimental birds were given each daily 500 milligram of enriched yeast pellet containing 2 mg. Thiamine 3 mg. Riboflavin 3 mg. Niacin 3 mg. Folic acid 2 mg. Pantothenic acid 0.5 mg. Pyridoxine 5 mg. Choline and 5 mg. Manganese sulphate. For 10 days they were watched for any improvement and the affected legs were X rayed to observe any difference. As no improvement was seen in the condition, it was thought that these vitamins or manganese were of no use.

After 10 days, the experimental birds were given daily for another week instead of the above supplement,—1000 I. U. Vitamin A and 100 I. C. U. vitamin D and 6 mg. alpha tocopherol or vitamin E. The birds improved considerably in their gait and appearance. By withholding either vitamin A or D or E, supplementing each for 5 days successively, the same birds appeared to show again the leg weakness. After this, all the three fat soluble vitamins were continued to be given to the same birds together as before for further 7 days, they became cured of this defect.

The picture and radiographs of the legs and joints of these three birds are given both in the beginning and end of the experiment for critical comparison. The frontal view of radiographs of hockjoints of all the affected birds at the beginning and end, showed normal hock joint and calcification without any abnormality.

All the affected birds at the start had slightly developing black feathers at the tips in the wings, necks and tails. The black feathers began to turn white and then normal colour in the treated birds while the black feathers increased in the control bird retaining the leg disorder

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in an aggravated condition at the end. The effect of vitamin supplement on blackened feathers is summarised in Table II.

TABLE II

Effect of Vitamin Supplement on Blackened Feathers.

No.	No. of Black feathers at start	No. of Black feathers at end	Difference in No. of Black feathers
<i>Control</i>			
364	123	146	+ 23
<i>Treated</i>			
375	121	93	- 28 (*)
377	135	97	- 38 (*)

(*) Feathers turned white and brown normal colour.

IV. Discussion

The weakness of limbs with ruffled feathers and incoordination of movement might be traced to vitamin A deficiency. But the defect of the same age under the identical conditions of management and feeding leads us to infer that it is associated with the physiological needs of the male birds which grow at a faster rate than the females after 8 weeks till which period both sexes make practically the same growth increment. But it is found that vitamins A, D and E all together are required additionally more than those present in the above feed produce optimum growth, to overcome the weakness or leg disorder and ruffled stage and blackening of feathers. In order to understand clearly the significance of the above physiological condition and the rational therapy in the use of vitamins A, D and E together for curing the above leg disorder in cockerels, it is essential to discuss the nutritional role of these vitamins and also the development of hock joint and muscle in legs of cockerels.

Hickman and Harris, (34), have suggested a dual role for the tocopherols or vitamin E, viz., a true specific vitamin-like function, perhaps as an enzyme component or cofactor; a less specific anti-oxidant action and thirdly a pharmacological action, when administered in large amounts, (32). Recently the biochemical role of vitamin E is explained by Nason and Lehman, that the tocopherol is involved in the aerobic oxidation of reduced pyridine nucleotide (DPNH), as "an activator of Cytochrome C Reductase", (46).



Fig. 5.

Another experimental bird (377) with left leg disorder and with black feather tips, at first.



Fig. 6.

The same bird (377) after being cured with black feathers turned white.

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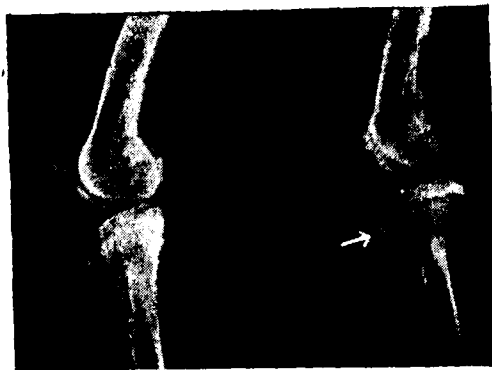


Fig. 7.

X-ray picture of hock-joints of control bird (364) at first showing normal calcification but undeveloped longitudinal groove in the left hypotarsus.



Fig. 8.

X-ray picture of hock-joints of the same bird (364) at end, with normal calcification and still undeveloped longitudinal groove in the left hypotarsus.

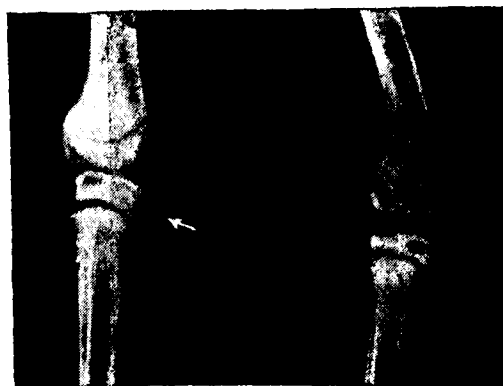


Fig. 9.

X-ray picture of hock-joints of the experimental bird (375) at first showing normal calcification but still undeveloped longitudinal groove in the left hypotarsus.

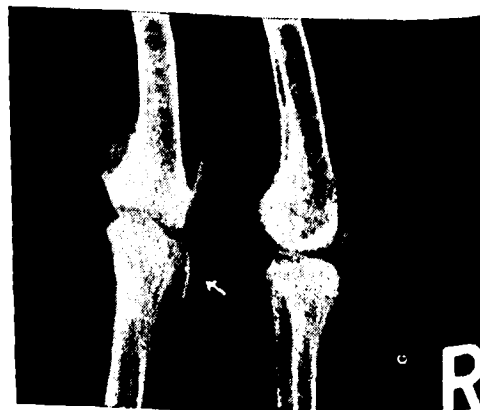


Fig. 10.

X-ray picture of hock-joints of the same bird (375) at end showing normal calcification and well developed longitudinal groove in the left hypotarsus.

The inclusion of cod liver oil in diets low in vitamin E, produces typical signs of vitamin E deficiency in chicks as well as in other species. The toxicity is due to the presence of highly unsaturated, easily oxidised fatty acids. Vitamin E exerts its anti-oxidant action by preventing the peroxidation of the fatty acids (23).

In chicks two well defined deficiency diseases are produced by lack of vitamin E and they are nutritional encephalomalacia and exudative diathesis, which are exceedingly complex. Nutritional encephalomalacia or 'Crazy Chick Disease' was first produced by Pappenheimer and Goettsch (50). The predominant clinical signs are ataxia, head retraction and spasms of the limb muscles, followed by complete prostration. Since vitamin A deficiency is also concomitant with vitamin E deficiency, Adamstone distinguished the gross lesions of vitamin E deficiency in chicks as consisting of general disintegration of the cerebellum, accompanied by a greenish-yellow discoloration, haemorrhage and oedema (4). Degeneration of the neurones characterised by pyknosis and shrinkage was typical of ischaemic necrosis, though lesions occurred rarely in the cerebrum. Wolf and Pappenheimer studied the blood supply to the cerebellum and found proliferation of the capillary endothelium, small capillary haemorrhages and thrombosis of many capillaries (62). Thus circulatory disturbances are the primary cause of the symptoms.

Alimentary exudative diathesis, also a sign of vitamin E deficiency in chicks, studied by Dam and Glavind, (24), is characterised by generalised oedema, and chicks develop a straddling stance due to the accumulation of fluid under the skin of the ventral body surface and in severe cases fluid accumulates intraperitoneally with distention of the heart and pericardium, the latter being filled with fluid (6). Chicks die developing stupor and laboured breathing. The oedema is associated with haemorrhage in the fatty layers under the skin and the fluid accumulates from sterile inflammation and hyperaemia of the capillaries.

Encephalomalacia and exudative diathesis may occur separately or together, being determined by the composition of the diet, though vitamin E deficiency is the cause for both conditions. Diets with a high content of salt or of phosphate accelerate the appearance of exudates. A low carbohydrate diet counteracts the appearance of exudates. If there is no fat in the diet, exudates are rarely produced and encephalomalacia never occurs. But the presence of highly unsaturated fatty acids accelerates the signs of both diseases. Some fats favour the production of exudates and others of encephalomalacia. Cod liver oil, lard and linseed oil favour the production of encephalomalacia if the carbohydrate: protein ratio is low (7). Whitelegorns are significantly more resistant to nutritional encephalomalacia caused

by vitamin E deficiency than the heavier breeds as Rhode Island Reds and Barred Plymouth Rocks (35; 36).

From the above account, it is clear that these leg disorders may not be the typical symptoms of simple vitamin E deficiency even in the insipient stages.

Ascorbic acid, cystine or nordihydroguaiaretic acid can reduce the tendency to exudative diathesis caused by a vitamin E deficient but rich in cod liver oil diet (22; 25). Cystine was not beneficial against encephalomalacia but ascorbic acid was effective, but ineffective with diet containing pig's liver. With cod liver oil in diet, vitamin E content of chick's body fat increased and the formation of peroxides was prevented by ascorbic acid or nordihydroguaiaretic acid but not by cystine. Vitamin E deficiency did not affect growth of young rats, though olive oil increased their growth (53), and increased the formate formation in nucleic acids of liver and skeletal muscles (27), showing one of the metabolic function of vitamin E as regulating the turnover of nucleic acid, which is increased by vitamin E deficiency in skeletal muscle (45). Sodium bisulphite in presence of Iron, Manganese and Cupric salts in diet by accelerating the oxidation of rancidity in unsaturated fat increased the incidence and severity of vitamin E deficiency in chicks (48; 64). The oxidative rancidity developing in unsaturated fat was due to the destruction of vitamin E, whose function was the maintenance of the integrity of the unsaturated fatty acid molecule. Vitamin E prevents encephalomalacia by acting as a biological anti-oxidant and also diphenyl-p-phenylene di-amine acts in the same way by its action in the intestinal tract (57).

The myosin, actin and actomyosin of the contractile muscle protein in rabbits differed in their nitrogen content on a diet deficient in vitamin E, which caused muscular dystrophy (9; 3). Vitamin E has been shown to be concerned in collagenoses and massive intra-muscular injection and oral doses of vitamin E, regenerated degenerated collagen bundles and reformation and rehabilitation of elastic tissue fibres in men (20). In rabbits deprived of vitamin E, myosin disappears partly or wholly and the actin filaments disintegrate which is ascribed to failure in the polymerisation of their protein constituent (8). It is shown that thyroid accelerates the appearance of muscle lesions in rats characteristic of vitamin E deficiency but does not modify the type of lesion (59). Vitamin E deficiency in male chicks, 6 to 14 weeks old, reduces the basophilic cells and the activity of pituitary gland and also reduces the size of testes and the thickness of the walls of the seminiferous tubules (33).

Wheat germ oil, a rich source of vitamin E, by daily oral administration to chicks, has been shown to have no effect on growth,

Leg Disorder in Cockerels

By

V. MAHADEVAN, M.A., D.Sc., F.R.I.C.



Fig. 11.

X-ray picture of hock-joints of the experimental bird (377) at first showing normal calcification but undeveloped longitudinal groove in the left hypotarsus and partially developed groove in the right hypotarsus.

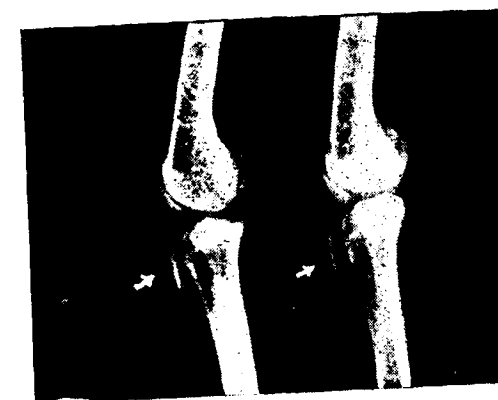


Fig. 12.

X-ray picture of the same bird (377) at end showing normal calcification and well developed longitudinal grooves in the both hypotarsi.



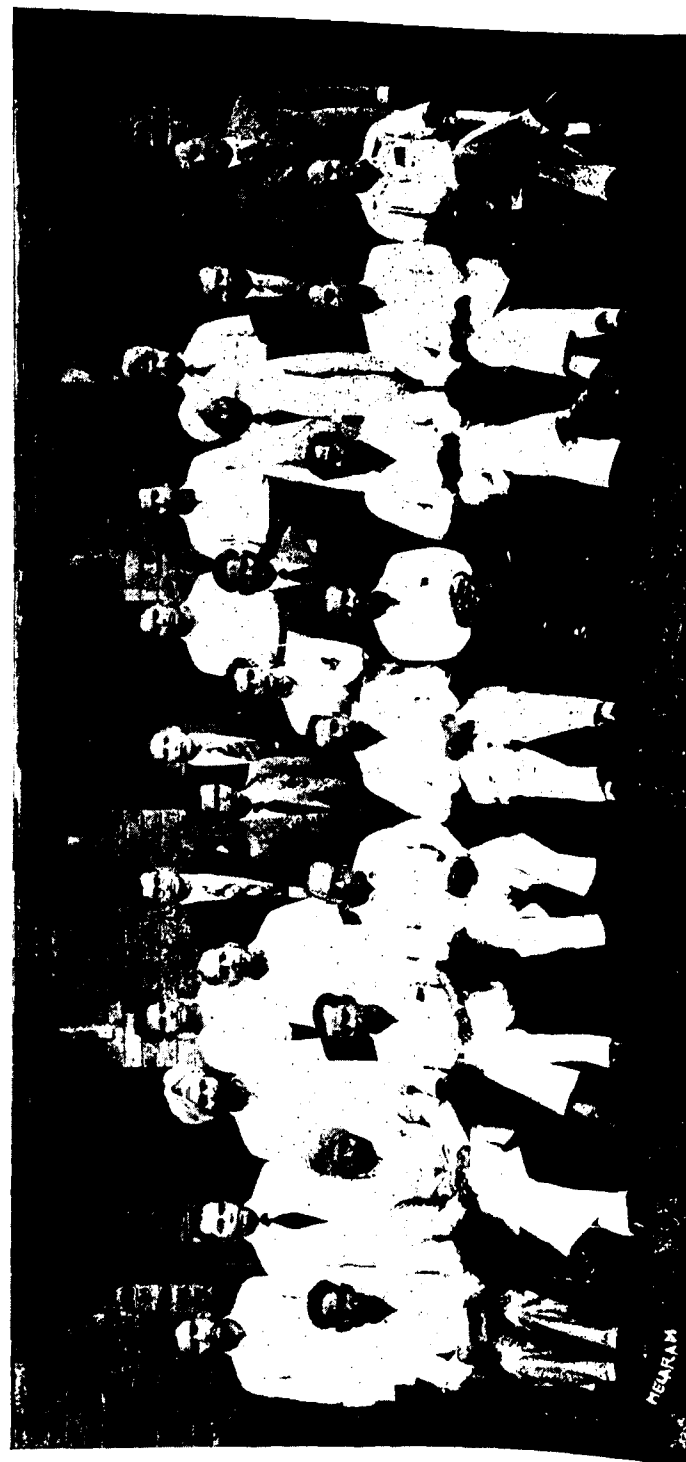
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THE INDIAN VETERINARY RESEARCH INSTITUTE, IZATNAGAR,

ADVANCED COURSE IN ARTIFICIAL INSEMINATION
AND
PHYSIO-PATHOLOGY OF REPRODUCTION 1956-57



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Chet Ram (A.R.O.)

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S. C. Roy (Tripura),
S. A. Razzaque (Behar),
K. L. Mati (M.P.),
D. H. Nath (Assam),

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G. Singh (A.R.O.),
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No. 2

"LEG DISORDER IN COCKERELS"

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sexual maturity, hatchability and egg production (11). But a new compound Oryzanol present in rice bran oil or rice germ oil, differing from vitamin E, has been shown recently in Japan to promote growth and activity in reproductive organs (54). In a study of preventing perosis in growing turkeys, it is concluded that there appeared to be little or no interrelationship between vitamin E and Phosphorus (41:58). Vitamin E has been shown to have neuro protective action on pigeons fed polished rice and guineapigs given strychnine (49). The biochemical role of vitamin E in neuro muscular protein can explain the need for additional vitamin E in curing leg weakness in cockerels described under our experimental condition.

The normal development of the hock joint in cockerels of Rhode Island Red-Light Sussex Cross, from 4 weeks to 20 weeks of age by weekly radiograph studies, is described by Bruce and others in 1946 in the following words (14).

"In the newly hatched chick the tibiotarsus and tarso-metatarsus are similar in form to the corresponding bones of the adult fowl and the hock is a simple hinge joint. Ossification of the hock takes place from two centres in the distal end of the tibiotarsus and one in the tarso-metatarsus and these centres are considered to correspond to the tarsal bones of mammals, but do not exist as separate tarsal bones. One ossification centre occupies each tibial condyle and the third forms the head of the tarso-metatarsus.

During the first 8 weeks after hatching no change in the shape or proportions of the bones forming the hock was observed.

After 8 weeks, the medial upper tarsal increases in relative size and approaches the less rapidly lateral tarsal. Within the next two weeks the gap between them disappears and the fused tarsal centres begin to unite with the tibia. Fusion proceeds from the centre onwards until at 12 to 14 weeks the tibiotarsus appears as a single bone. At first a line of dense calcification marks the site of union but this becomes less conspicuous and disappears entirely at about 20 weeks leaving no sign of the triple origin of the tibiotarsus.

The formation of the tarso-metatarsus takes place less rapidly. Fusion of the three metatarsals has not begun at about 14 weeks, but is complete by one year.

The lateral radiograph at 24 week shows the simple hinge joint. The hypotarsal sesamoid bone which develops over the medial ridge of the trochlea and is seen posterior to the lower tibial epiphysis at 14-16 weeks. The hypotarsus, a bony prominence which contains a longitudinal groove and canal giving passage to the flexor tendons of the

foot, is seen at the posterior aspect of the upper end of the tarso-metatarsus. These tendons become calcified in the adult fowl at 20-24 weeks."

The early changes in the hock joint in perosis by radiographic and histological studies are described by the same authors thus (15).

"The early signs of perosis-swollen hock joint, unsteady and ungainly gait-bandy or bow legs-may occur both in rickets and perosis. The specific feature of differentiating early perosis from rickets is bending of the swollen metatarsus just below its upper epiphysis, the direction of bending being either anterior, lateral or medial. At this stage the tendons may slip from the condylar groove and come to rest on one of the condylar ridges. A bird in this condition is able to walk, but all its conditions are clumsy. As the metatarsus increases in length, the bend also increases and when the tendons slip completely from the condyles, the metatarsus becomes rotated and the joint greatly swollen.

The hock joint was always swollen and contained an excess of fluid, sometimes, blood stained.

In rickets, there was neither slipping of the tendon nor deformity of the leg bones. Calcification is much reduced in rickets and the bones are tough but pliable; in perosis calcification is normal and the bones are brittle and can not be bent. Perosis develops from 4 to 7 weeks. The main feature of perosis seems to be a disorder of the process of cartilage growth and replacement. The occurrence of the shorter tongues of ossifying cartilage and their uneven arrangement may be an underlying cause of the bending of the metatarsus, which is the early change in perosis. Gross bending of the bones and slipping of the tendons are due secondarily to mechanical factors, such as high body weight, confinement and wire floors. Apart from its radiographic features rickets is readily distinguished from perosis by the abundance of osteoid tissue, the paucity of calcified bones and the fibrous character of the bone marrow".

Perosis may be caused by deficiencies of different factors in the diet such as Manganese, (below 45 to 50 p. p. m.) (21); Choline (0.2 percent) (21); Biotin (39); Nicotinic acid (12, 40); Riboflavin (5, 51); and Folic acid (26). The etiology of perosis is complex and a variety of dietary factors is necessary in the enzyme systems concerned in normal bone formation. The contributory factors are close confinement in battery brooders, wire floors (55), heavy breeds of birds and diets high in minerals.

From the normal calcification, nonbending of the bone revealed by radiographs both in lateral and frontal views showing the bone

structures and the age of the birds, the cases here cited cannot be distinctly classified under perosis or rickets. The failure to recover at first even though yeast, biotin, riboflavin, folic acid, choline and manganese were supplemented for a week, suggests that the cause for the leg disorder observed must be traced to other factors than the above ones for the simple rickets or perosis.

In a study of the rate of growth and calcification of the sternum of normal male and female New Hampshire chickens and those having crooked keels, Buckner and his associates observed that the fat free dry sternum increased in weight and in volume more rapidly in males than in females (71, 18). The Specific Gravity of the sternum was the same in males and females up to 8th., week, when the males' sternum became denser, the position being reversed from the 16th., to 22nd., week. The length of the keel was the same in male and female till the 20th., week, when the male sternum became longer than the female. The rate of ossification of the keel was similar up till the 12th., week, when the process proceeded more rapidly in the female until the 28th., week when the calcification reached the metasternum. Later these authors have shown the influence of vitamin D on the growth and calcification of the sterni, tibiae, femora and metatarsi of New Hampshire cockerels (19). Even the deposition of Gallium in bone of rachitic rats and chicks was shown to be specifically accelerated by vitamin D, employing tracer technique (28). The action of vitamin D may be explained by a reaction of the vitamin or a derivative thereof with calcium at the absorption barrier (44). In the study to explain the mode of action of vitamin D on the biochemical processes in muscles, Jovanovic suggested that vitamin D₂ activated the phosphatases in muscle which had become inactivated by the acid products of metabolism and thus promoted the resynthesis of phosphoric esters (38). Barnicot has shown that either calciferol or vitamin A could favour even the resorption of bone and even in some cases perforation of the bone fragment by local action and increased the active osteoclasts round the perforation, whereas estradiol or cholesterol had no effect of either resorption or deposition (4).

A diet deficient in vitamin D has been shown by Glazener and Briggs to produce blackening of feathers in New Hampshire and Rhode Island chickens, but not in White, Barred or Buff and Plymouth Rocks and they conclude that this abnormal blackening of feathers is intensified by the presence of chronic rickets and is related to the metabolism of calcium and of the thyroid gland (31, 43). Both low and high levels of calcium intake showed blackening at the base of the wing feathers at 4 weeks to 7 weeks of age on a vitamin D deficient diet but low intake of Phosphorus produced no blackening under the same conditions. With

0.2 percent desiccated thyroid gland supplement, blackening developed and with 0.2 percent thiouracil in the place of thyroid, failed to produce blackening even though the birds were rachitic.

In a study of the interrelationship of vitamin D and the sex hormones in calcium and phosphorus metabolism of rats, Norman and Mitter showed that the female hormone stunted growth, increased the density of the bone shaft, accelerated epiphyseal closure and increased the percentage of bone ash (4). The male hormone stimulated growth, diminished the density of bone shaft, the percentage of bone ash, delayed epiphyseal closure and depressed slightly the value for blood calcium, but did not increase that for inorganic phosphorus. Thus the male sex hormone was rachitogenic, while the female sex hormone was antirachitic.

Turner has shown that feeding estrogen to laying hens at both high and low levels resulted in leg weakness and egg production stopped at higher levels of estrogen (60). For the mineralisation of tissues especially osteoid tissue, vitamin D and thyroxine must be present in the organism in a balanced equilibrium (13).

Vitamin D₃ supplement in the mash of cockerels containing carotene from dried grass increased the vitamin A storage in the liver from 10 I. U. to 508 I. U., (10). Addition of 14.3 gram of rice bran oil per kilogram diet also raised the vitamin A and carotene values of the liver in chickens (2). In growing Turkeys utilisation of carotene but not of preformed vitamin A, was improved when the ration was supplemented with 1 percent wheat germ oil (42). Vitamin E had been found to act as an antioxidant for vitamin A by its stabilising action on vitamin A in oily solution (29). Vitamin A deficiency produced ataxia and leg weakness in chickens (61). In chicks maintained on a diet with 1.6 mg. carotene per kg. as sole source of vitamin A, the cerebrospinal fluid pressure was found to rise rapidly as an early sign of vitamin A deficiency before any overt-sign of neurological disturbances and no abnormality could be found in bones at necropsy (63).

The above studies show clearly that the leg disorder and blackening of feathers in cockerels from 10 weeks to 20 weeks on a diet which is suitable for optimum growth for both cockerels and pullets in the free ranch condition should be related to the hormonal effect on the fastly growing adult. The insipient effect of over activity of parathyroid and thyroid controlling growth and sexual development results in the increased secretion of male hormone in cockerels, which is rachitogenic and interferes with calcium, phosphorus metabolism in the skeleton and produces blackening in feathers. Vitamin D or vitamin D and A, alone must be able to cure the ricket like condition, if the calcification of bones alone is

to be rectified. Our radiographs show the normal calcification and nonperotic conditions, except the calcification and development of longitudinal groove in the hypotarsus which is more clearly distinct in the cured bird than in the uncured bird. The role of vitamin E in the nerve metabolism especially in the flexor tendon nerves passing through the groove and in collagenosis seem to explain under the endogenous stress of rachitic condition in the fastly growing male birds, the necessity for vitamin E in conjunction with vitamin A and D to overcome the leg weakness caused by the excessive activity of thyroid and parathyroid and increased production of male hormone in cockerels, even though the feed contained these factors in amounts needed for proper growth. By increasing vitamins A, D and E, the leg disorder has been completely cured in the supplemented birds with the proper development of the hypotarsus with longitudinal groove through which flexor tendons pass and with the normal calcification of the tendons.

V. Summary

1. An atypical leg disorder in one of the legs, mainly left of fastly growing Rhode Island cockerels is observed in the Poultry Unit at the Madras Veterinary College. The birds developed blackening of feathers and incoordination in walking leading to frequent resting on the hock joint at 10 to 20 weeks of age. The female birds under the same conditions were not affected.

2. The feed given contained on analysis required amounts of calcium, phosphorus, vitamins A and D and other trace minerals derived from churn meal incorporated at 5 % level in the mash. Lucerne leaf consumed was about 1.6 % of total feed on dry basis.

3. Feeding 500 mg. enriched yeast with additional vitamins B1, B2, Niacin, Folic acid, Pantothenic acid, B6, Choline and Manganese sulphate to experimental birds did not cure the condition, when observed for a week. Nor was there any improvement as compared with the control.

4. Feeding additional vitamins A, D and E, quickly improved the experimental birds and the black feathers began to turn white and then normal colour. But withholding either of vitamins A or D or E, the birds began to show leg weakness. But all three given together for 10 more days effected complete cure, while the control bird aggravated its lameness and blackening of feathers.

5. Radiographs of affected birds' legs and hock joints before and after the supplement feeding experiment show normal calcification of bones and hock joint developments with undeveloped longitudinal groove in the hypotarsus through which the flexor tendon nerves pass

in the affected legs and which become well developed in the cured birds, while in the control lame bird it remains undeveloped.

6. Discussing the role of vitamins, the development of hock joints and perosis in birds from the literature, the condition here observed cannot be compared to any of the above deficiencies or to the perosis as described by previous workers.

7. Due to the rapid growth of cockerels between 10 to 20 weeks of age and the increased production of male hormone an endogenous rachitic condition mildly produced interferes with the calcification of soft tissues like the flexor tendons passing through the developing longitudinal groove through the hypotarsus and attending collagenosis of tendon nerves and this peculiar physiological condition in the cockerels at a stage of critical adult growth causing this leg weakness is cured with additional vitamins A,D and E, producing proper development of hypotarsus and the longitudinal groove through which flexor tendon nerves pass with proper calcification required for the proper control of leg movements without showing weakness or fatigue. The above observations agree with those of others explaining the nutritional role of these vitamins which may be required at times of physiological stress of rapid growth in greater amounts than needed for growth alone under the influence of male hormone secreted in greater amount and which is known to be rachitic.

VI. Acknowledgment

Grateful acknowledgment is recorded by the author to the Principal, Madras Veterinary College, for his keen interest in the problem and the facilities provided and to Sri R. Venkatakrishnan, Sri M. Ranganathan and the College Artist for technical assistance rendered respectively in the laboratory, for the radiographs and photos of fowls printed here.

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UNSTERILIZED OR IMPERFECTLY STERILIZED BONE MEAL - A POTENTIAL SOURCE OF SOME DISEASES IN MAN AND ANIMALS

(Some observations in West Bengal)

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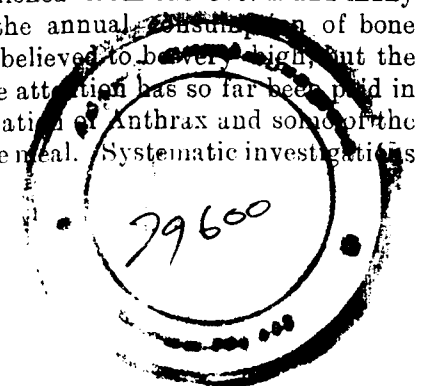
Introduction

Bone meal is used as a feeding stuff in animals and also as fertilizer. For this latter purpose, it is now being used rather extensively in various parts of India not only by the agriculturists but also by many town dwellers in their gardens. The fact that bone meal may carry the viable spores of Anthrax and some clostridial diseases should be borne in mind and all precautions have to be taken to ensure that the lives of man and animals are not endangered by such virulent infective agents.

For feeding the bone meal industries, the bones should be collected from regions free from outbreaks of animal diseases, particularly due to spore bearing bacteria, as far as that can be ascertained by enquiries and then the bones should be crushed to fine powder and then sterilised either by hot-air or by steam pressure allowing the heat to penetrate into the fine particles and reach the spores, if present. Coarse grinding may save some labour and money, but from the Bacteriologist's point of view this is unsatisfactory as coarse particles present difficulties for proper sterilization. If the method of collection of bones is indiscriminate and the subsequent sterilisation is also not perfect, then the dangers following the use of such meal are very great. For various reasons, the methods of collection may not always be controlled according to the required standard, but the processing and subsequent sterilization should always be done perfectly under expert supervision. Any neglect in the latter process may lead to dangerous results. It must be admitted that in spite of careful sterilization, a few resistant spores, although attenuated, may still remain viably concealed in the bone particles. Cases like this are not improbable when manufacturing is undertaken on a large scale. Moreover, transport containers, commonly the gunny bags, may often get contaminated when infected bones are transported from the collection places to the mill. If due to ignorance such gunny bags are again used for transporting sterilized bone meal to the consumers, then the object of sterilization is defeated and the sterilized bone meal may remain a potential source of pathogenic spores due to gunny bag contamination. Utmost care has, therefore, to be taken at every stage from the collection source to the consumer's place via the mill.

Eastern countries, particularly India and Pakistan, have earned bad reputation in this industry as bone meal exported from these countries have repeatedly been found to contain viable Anthrax spores which on several occasions, actually infected many people and animals in those countries. In 1943, the Ministry of Health of the United Kingdom issued a press notice to Agricultural and Medical journals pointing out that care should be exercised in the handling of imported bone meal fertilizer from India. It was made clear that the increase in Anthrax among farm animals in the U.K. was linked up with the increase in imports of some feeding stuffs and fertilizers, notably bone meal. Similar reports have been published from the U.S.A. and many other foreign countries. In India, the annual consumption of bone meal for feeding stuff and fertiliser is believed to be very high, but the actual figures are not available. Little attention has so far been paid in India to find out any possible association of Anthrax and some of the Clostridial diseases with the use of bone meal. Systematic investigations

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into this problem both in the Veterinary and Public health laboratories are necessary in the interest of our own country.

In West Bengal, the incidence of Anthrax and Black-quarter among cattle continued to increase progressively every year for the last 4 or 5 years, particularly in some districts, viz-Burdwan, Birbhum, Midnapur and Bankura, where bone meal manure is being extensively used by the agriculturists. In some parts of these districts the number of outbreaks of Anthrax and Black-quarter during 1954-'55 was about 4 or 5 times more than the number of similar outbreaks during the year 1951-'52 when bone meal manuring was done on a comparatively smaller scale in those areas. Moreover the outbreaks were reported more frequently throughout the cultivation period during which the cattle, particularly the bullocks, had access to the bone meal manured soil. Suspecting the bone meal manure as a source of such diseases the District Veterinary Officer of Burdwan sent the first samples of bone meal from local godowns in May, 1956 to the Bacteriology laboratory of Bengal Veterinary College for examination. Clostridial spores capable of producing Black-quarter in experimental animals were detected in such samples. Since then many more samples were received from various parts of these districts which were examined with identical results. In one sample, a mixture of Anthrax and Clostridial spores was detected.

Materials and Methods

45 bone meal samples and 6 paddy mixture samples were examined between May and November, 1956. The latter variety consists of Ammonium sulphate, super phosphate, bone meal, oil cake, etc. and is said to be a good manure, particularly for paddy cultivation. All these samples were collected from sale depots situated in various parts of the affected districts. As a routine procedure, representative portions of the samples were suspended in sterile distilled water and heated in water bath at 65°C for $\frac{1}{2}$ hour to destroy the vegetative forms of organisms. The cooled supernatant fluid constituted the material for cultural and biological tests. Plain broth and plain agar slopes were used for detecting Anthrax bacilli and Robertson's cooked-meat medium, glucose-broth and glucose-agar stab were used for detecting anaerobes. Two guinea-pigs were used for each sample, one of them was injected intramuscularly with 1 c.c. of the material in the inside thigh and the other guinea-pig was injected subcutaneously with 1 c.c. of the material in the inside thigh of one leg and the material was rubbed over the scarified area on the inside thigh of the other leg. Portions of materials from 20 bone meal samples were sterilized in the hot-air oven at 180°C for $\frac{1}{2}$ hour and suspended in sterile distilled water. The supernatant fluid constituted the material for cultural and biological

tests. Portions of all the 45 bone meal samples were grouped in 5 lots, each lot consisting of representative portions of 9 samples. Each lot was separately suspended in sterile distilled water and Seitz filtered. The filtrate constituted the material for cultural and biological tests. One healthy bull-calf was used for testing the pathogenicity of the cultural growth of anaerobic bacilli in one of the samples. Sub-culture and sub-inoculations were done almost in all cases. In a small number of tests, rabbits were used as experimental animals in addition to guinea-pigs.

Only 2 soil samples from epidemic area and 2 from area free from this disease were received for bacteriological examination. The samples from epidemic area were collected from fields previously manured with bone meal and control samples were collected from fields which had never been manured with bone meal.

Results

All the 45 bone meal samples contained pathogenic clostridia which killed all the experimental animals within 18 to 36 hours without fail producing extensive lesions resembling those of Malignant Oedema and Black-quarter. Smears from local lesion, heart blood, liver surface and other internal organs were examined microscopically and gram-positive bacilli morphologically identical to *Clostridium welchii* and *Clostridium septicum* were observed in the large majority of cases, and *Clostridium chauvoei* observed only in few cases. (*Cl. welchii* alone found in 10 cases, *Cl. septicum* alone found in 12 cases, a mixture of *Cl. welchii* and *Cl. septicum* found in 19 cases and *Cl. chauvoei* found in the remaining 4 cases). In one sample, there was a mixture of Anthrax and Clostridial spores and both were separated out by cultural and biological tests. The clostridium in this sample resembled *Cl. septicum*. The lesions in the experimental animals consisted of crepitating swelling at the site of injection, particularly noticed in the case of bull-calf and in variable degrees in other tested animals, haemorrhages in subcutaneous tissue, dark red appearance of the tissues at the site of injection, which, when cut, showed extensive necrosis and dark red coloured exudate containing gas bubbles. The regional lymphatic glands were markedly swollen and haemorrhagic. Sero-sanguinous fluid in varying quantities was found in abdominal and thoracic cavities. The internal organs were found to be generally congested. In a few cases oedema of the subcutaneous tissue was extensive. The guinea-pig, which died of Anthrax, showed lesions of septicaemia. Characteristic long filaments of *Cl. septicum* were seen in smears from liver, while single rod forms with plenty of 'citron bodies' were seen in smears from local lesions of experimental animals which died of *Cl. septicum*. The rabbits used in the biological tests died showing black-quarter like lesions when injected

with *Cl. septicum*, whereas they were found to be resistant to *Cl. chauvoei*.

All the sterilized bone meal samples proved negative on cultural and biological tests. The filtrates also proved negative on similar tests. The latter experiment also suggested that the filtrates were free from exotoxin of *Cl. botulinum*.

All the 6 paddy mixture samples were treated exactly on the same lines as bone meal samples, but found to be negative on biological tests. Aerobic cultures yielded only *Subtilis* group of organisms. It appears that the composition of paddy mixture is such that the pathogens, if present in any individual component part, are ultimately inactivated in the final mixture. Again the percentage of bone meal in the mixture is low and therefore, the chances for contamination through bone meal are correspondingly minimised.

Although the number of soil samples received in the laboratory was extremely small, yet the findings were nevertheless interesting. While the control samples were found to be free from any pathogens, both the experimental samples collected from bone meal manured fields in the Black-quarter epidemic area were found to contain a mixture of *Cl. septicum* and *Cl. welchii* which proved to be lethal for guinea-pigs, although the deaths occurred nearly 4 days after inoculation. More number of soil samples from infected areas could not be obtained at that time as unprecedented flood came upon many of these areas which interfered with the collection work.

Portions of 6 bone meal samples, selected at random, were sent to the I. V. R. I., Mukteswar, for verification of the results obtained in this laboratory. The following is the report received from the I. V. R. I. "Specimen Nos. 1, 2, 4 and 6 resulted from the anaerobe which on cultural examination has been found to be indistinguishable from *Cl. welchii*. All these strains proved to be non-toxicogenic and failed to prove lethal to white mice on biological test. However, this does not mean that these organisms would have no pathogenic significance under favourable circumstances. Specimen Nos. 3 and 5 resulted in the isolation of *Cl. septicum*." Author's findings on these 6 samples corroborated with the I. V. R. I. findings except on the question of virulence of the *Cl. welchii*. Tests done with portions of these samples (Nos. 1, 2, 4, and 6) in this laboratory resulted in the isolation of *Cl. welchii* which proved to be lethal for guinea-pigs on intramuscular inoculation.

Discussion

There is no scarcity of foreign literature recording the finding of Anthrax spores in bone meal and holding such bone meal responsible

for Anthrax in man and animals. There are many recorded cases showing how men got the infection through handling of the bone meal at different stages of its manufacture and transit, and through cultivation work either in the fields or in the gardens which were manured with bone meal, and also showing how farm animals got the infection through feeding of the bone meal and while working in the fields manured with bone meal. In India, similar records for Anthrax are not wanting, although they are comparatively few mainly because of our lack in vigilance. But finding of *clostridial* spores in bone meal and the possibility of its correlation with the outbreaks of Black-quarter in the field seems to have been overlooked by earlier workers. A close study of the present investigation reveals a variety of interesting facts which, when linked together, prove that unsterilized or imperfectly sterilized bone meal is a potential source of not only Anthrax, but also of some *Clostridial* diseases to which both man and animals are susceptible.

Typing of organisms isolated from Black-quarter cases occurring in India was undertaken at I.V.R.I. some time back. Pathological specimens from Black-quarter cases occurring in West Bengal were not sent to I. V. R. I. for the above purpose. However, the examination of specimens received from other parts of India revealed that *Cl. chauvoei* is the most common organism causing Black-quarter; *Cl. septicum*, in comparison with the former, is found in a small number of cases. In the present investigation, Black-quarter due to *Cl. septicum* alone was frequently noticed in several outbreaks. Cases due to *Cl. chauvoei* were comparatively few. Could this finding be linked up with that of bone examination? The fields were manured with bone meal from which *Cl. septicum* was isolated in the majority of samples. Again, Superintendent of Veterinary Services at Burdwan reported that outbreak of Black-quarter was noticed in the area where fields were manured with bone meal, but the neighbouring area where bone meal was not used as a manure remained free from this disease. Similar observations were also made by some of the field officers in Bankura and Birbhum districts. The outbreaks were controlled by large scale immunisation with Black-quarter serum and vaccine. Whenever there was delay in despatching the biologicals to the affected area, reports of fresh infections and more deaths were usually received.

Bone meal samples, from which *clostridia* were isolated and were found to be lethal for guinea-pigs, after sterilization in this laboratory, were found to be negative on cultural and biological tests. This experiment was very significant and emphasized the importance of proper sterilization of bone meal before its use either as a manure or as a feed stuff and at the same time proved that the present bone meal samples received from sale depots were either not sterilized at all or the sterilization was imperfect.

In natural attacks of Black-quarter, the infection usually enters the body through cuts and abrasions. Infection through oral route is not common; however, the possibility cannot entirely be ruled out. Injuries in plough animals, particularly in legs, are not uncommon and the chances for the infected soil to come in contact with the injured tissue materially are very real. Moreover, the virulence of Black-quarter organisms is increased when kataphylactic agents which retard phagocytosis are introduced with the organisms. These agents include various other bacteria, silicon, etc. which are abundant in the soil. Even though the Black-quarter organisms have been attenuated by imperfect sterilization or due to some other factors, their association with the kataphylactic agents in the tissues will frequently result in the increase of their virulence and thereby causing deaths, among infected animals.

Anthrax was detected in this laboratory from materials collected from the carcass of a farm bullock belonging to the Fulia colony in Nadia district which was fed with bone meal. Direct association of Anthrax with bone meal feeding was also apprehended in a few other cases. Bone meal samples were received from these cases, but the Anthrax spores could not be detected in them. In this connection the limitations of the laboratory examination should have to be understood. The bones of a single infected animal may contaminate a large quantity of material, and Bacteriologists can only report on samples. If these happen to be negative, it does not necessarily mean that the main bulk, is free from Anthrax spores. A negative result thus gives no ground for a feeling of security. These observations also hold good for samples contaminated with clostridial spores.

Summary

(1) Correlation of Black-quarter outbreaks in certain parts of West Bengal with the use of bone meal manure in the cultivation fields of those areas has been investigated.

(2) *Cl. septicum*, *Cl. welchii* and *Cl. chauvoei* were detected in the 45 bone meal samples received from various sale depots and were found to be lethal for guinea-pigs and calf on experimental inoculation. The lesions produced in them resembled those commonly associated with Black-quarter. Out of these clostridia, *Cl. septicum* was found to be the commonest. The same organism was also frequently found from naturally affected cases in the field. In one sample of bone meal, a mixture of Anthrax and *Cl. septicum* spores was detected.

(3) Anthrax in farm bullock following feeding of bone meal was recorded.

(4) Portions of bone meal samples received from sale depots, after proper sterilization in the laboratory, were found to be free from pathogens in contrast to the result of examination of the remaining portions of such samples, all of which were found to contain pathogenic clostridia.

(5) Epidemiology of Black-quarter, particularly in relation to the bone meal manured soil, has been discussed.

Acknowledgment

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General Articles

BIRTH RATE AMONG GOATS

By

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Introduction :—A flock of "Malabar Goats" are being maintained at the District Livestock Farm, Malabar. The flock was built up with stock purchased from the villages in the district. Eleven does, with kids at foot for a few, and one buck were received in March 1951 and 2 more does, with kids at foot, were added during March 1953. The flock has, therefore, been in existence for about 4 years with the year ending 31st March 1955. It is generally believed that the goats are prolific breeders giving birth to more than one kid at a time and the purpose of the present study is to assess the incidence of the multiple births among goats and the factors influencing such multiple births, if any.

Observations :—Eleven purchased does with their daughters, grand daughters and a few great grand daughters had been in stud during different parts of the period of observation. Thus in all 47 does had been in stud with a total of 103 kiddings resulting in the birth of

174 kids in all. The data on different births (*Viz*) Single, Twins, Triplets and Quadruplets obtained in the flock during the period of observation, are tabulated below:—

TABLE I

Total No. of Does observed	Total No. of kiddings	Single Births		Twins		Triplets		Quadruplets	
		No.	Percentage to total kiddings	No.	Percentage to total kiddings	No.	Percentage to total kiddings	No.	Percentage to total kiddings
47	103	43	41.8%	51	49.5%	7	6.8%	2	1.9%

It will be seen from the above table that out of the total kiddings recorded, about 42% had been single births while about 50% were twins and the balance of 8% constitutes triplets and quadruplets. The incidence of single births has, therefore, been common to a considerable extent.

Out of the 47 does observed, 11 are the purchased ones which were received in milk *i.e.* at least after one kidding and hence data on first kidding are available for 36 does. Thus the data now presented comprise of 36 first or "Primary" kiddings and 67 "Secondary" kiddings. The details of the births classified under Primary and Secondary kiddings are furnished below:—

TABLE II

Total No. of kiddings	Primary Kiddings							
	Single Births		Twins		Triplets		Quadruplets	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
36	29	80.6%	7	19.4%				

Total No. of Kiddings	Secondary Kiddings							
	Single Births		Twins		Triplets		Quadruplets	
	No.	Percentage	No.	Percentage	No.	Percentage	No.	Percentage
67	14	20.9%	44	65.7%	7	10.4%	2	3.0%

The above table shows that the incidence of single births had been more common among the first kidders accounting for about 80% while

the twins have occurred only in about 20%, with no incidence of more than 2 kids at a birth. In the case of the secondary kidders multiple births had been more common accounting for a total of about 80% while single births have occurred only in about 20%.

For the Primary kidders the data on their age at first kidding are worth considering as a means of adjudging their physical condition and hence the age of the first kidders at the time of kidding are furnished below, classified as those which have given birth to singles and twins separately.

TABLE III

Particulars of Age of first kidders which have given birth to								
Single Kid					Twin Kids			
S. No.	No. of Doe	Date of Birth	Date of Kidding	Age at Kidding Y. M. D.	S. No.	No. of Doe	Date of Birth	Date of Kidding
1	13 T	?	1-2-52	...	1	12 S	?	3-2-52
2	14 T	?	9-4-52	...	2	22 T	15-5-52	23-4-53
3	16 T	10-8-51	28-2-53	1 6 19	3	23 T	15-5-52	7-5-53
4	17 S	12-9-51	27-2-53	1 5 16	4	25 T	23-5-52	24-6-53
5	18 T	5-10-51	20-2-53	1 4 16	5	26 T	29-5-52	16-5-53
6	19 T	3-2-52	23-2-53	1 0 21	6	50 S	10-11-53	9-10-54
7	20 T	3-2-52	9-3-53	1 1 7	7	58 S	1-1-54	6-2-55
8	21 T	14-2-52	24-2-53	1 0 11				
9	24 T	23-5-52	24-4-53	0 11 2				
10	29 T	5-9-52	10-11-53	1 2 6				
11	30 T	8-9-52	11-3-54	1 6 4				
12	31 T	29-9-52	1-4-54	1 6 4				
13	32 T	12-11-52	20-5-54	1 6 9				
14	33 T	13-12-52	12-8-54	1 8 0				
15	35 S	20-2-53	27-5-54	1 3 8				
16	36 S	23-2-53	27-11-54	1 9 5				
17	37 S	January 53	17-6-54	...				
18	38 Tr.	do.	28-5-54	...				
19	39 Tr.	do.	9-6-54	...				
20	41 T	7-4-53	14-5-54	1 1 8				
21	42 S	24-4-53	29-9-54	1 5 6				
22	43 T	7-5-53	6-6-54	1 1 0				
23	46 Tr.	10-8-53	15-11-54	1 3 6				
24	47 Tr.	1-10-53	27-9-54	0 11 27				
25	49 Tr.	28-10-53	15-11-54	1 0 19				
26	51 Tr.	17-12-53	15-12-54	0 11 29				
27	52 Tr.	do.	23-3-55	1 3 7				
28	54 T	24-12-53	31-3-55	1 3 8				
29	55 Tr.	29-12-53	28-11-54	0 11 0				

Average: 1 year 3 months 5 days.

Note:—Item Nos. 1, 2 and 17 to 19 were received with their dams as suckling kids. They are not reckoned for want of actual date of birth.

Remarks:—(1) The average age at kidding for those which have given birth to Single Kids is 1 year 3 months and 5 days while that of Twin kidders is one year.

With regard to the secondary kidders details regarding the interval preceding the kidding will be of interest and hence are furnished below separately for single births, twins, triplets and quadruplets.

TABLE IV

Single Births				Twins			
S. No.	Doe No.	Interval preceding M. D.		S. No.	Doe No.	Interval preceding M. D.	
1	21	8	23	1	1	6	26
2	3	5	18	2		5	26
3	17	10	6	3	2	6	12
4	4	5	17	4		6	26
5	—	6	12	5		6	6
6	6	12	21	6		6	26
7	7	10	24	7	12	6	27
8	—	7	3	8		6	17
9	—	8	5	9		6	24
10	22	8	5	10	11	6	25
10	27	6	29	11	21	10	1
12	38	8	14	12	17	12	0
	Average	9	7	13	4	7	4
	Maximum	12	21	14	5	7	19
	Minimum	5	17	15		6	21
				16	24	8	19
				17	6	16	13
				18		11	28
				19	16	12	11
				20		10	26
				21	8	8	5
				22		5	28
				23		5	28
				24	24	10	19
				25	9	9	5
				26	26	7	9
				27	27	6	6
				28	37	7	20
				29	28	6	12
				30	28	6	18
				31	28	6	28
				32	39	8	21
				33	13	7	5
				34	29	10	20
				35	35	5	25
				36	16	12	11
				37		10	26
				38	30	6	13
				39	14	7	6
						8	6
					Average		
					Maximum	16	13
					Minimum	5	25

Triplets				Quadruplets			
S. No.	Doe No.	Interval preceding M. D.		S. No.	Doe No.	Interval preceding M. D.	
1	12	8	4	1	27	5	13
2	—	6	29				
3	19	8	6				
4	4	5	18				
5	—	9	9				
6	24	8	6				
	Average	7	22				
	Maximum	9	9				
	Minimum	5	18				

To have a comparative picture of the dam—daughter performances with regard to the different classes of births, the origin of each doe now considered is furnished tracing from the parental generation of purchased does, in the following geneological tables. The birth of each doe is indicated according to single births etc., with the date of kidding and kidding intervals, wherever available.

GENEOLOGICAL TABLE I.

Doe. No. 1. (Purchased)

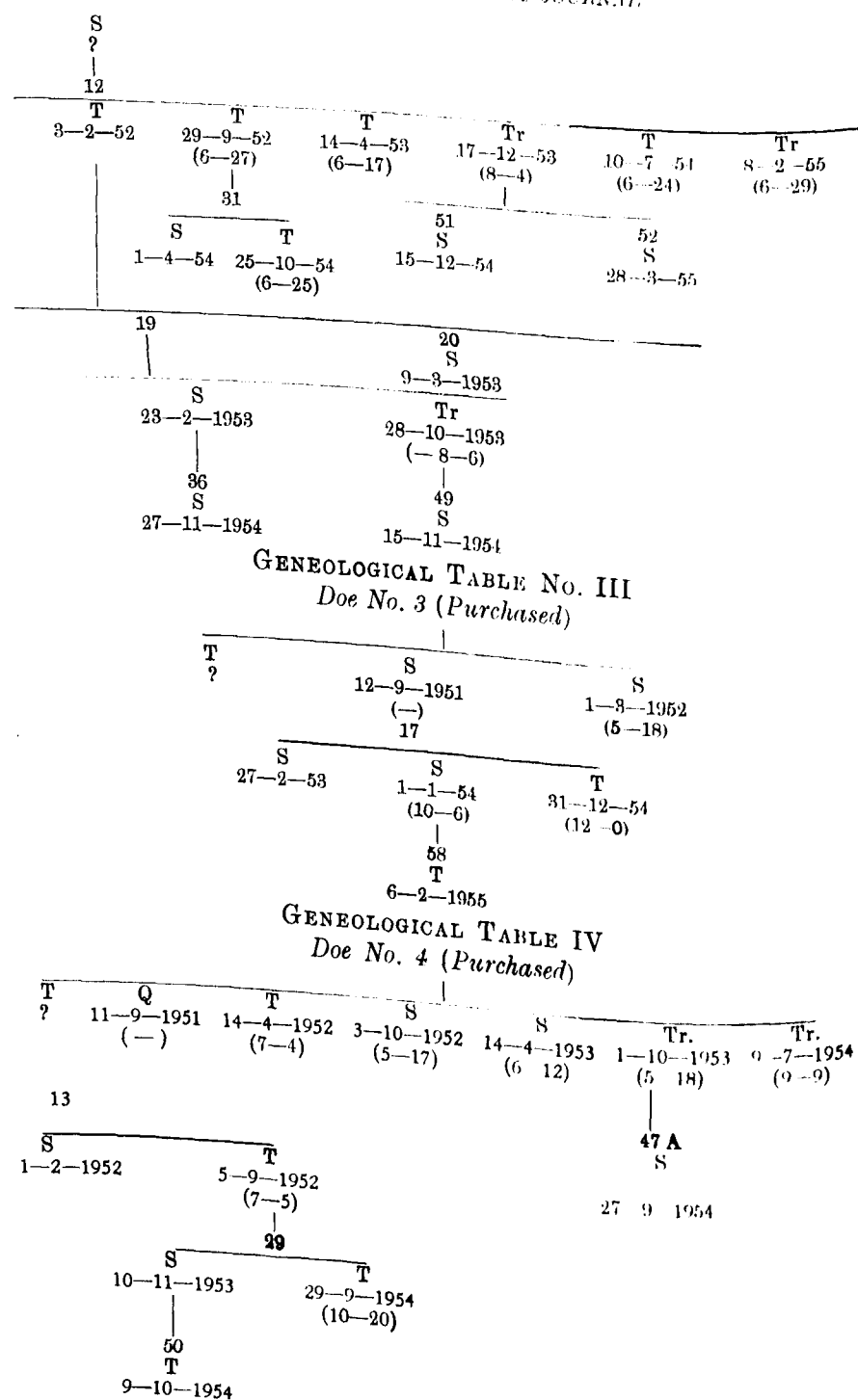
S	T	T	T
9	9-9-1951 (-)	7-4-1953 (0-6-29)	2-10-1953 (0-5-26)
		1	
		S	
		14-5-54	

GENEOLOGICAL TABLE II

Doe No. 2 (Purchased)

S
 ?

	T	T	T	T	T
	3-8-51	14-2-52 (6-12)	8-9-52 (6-26) 30	13-3-53 (6-6) ...	8-10-53 (6-26) ...
		21	11-3-54	23-9-54 (6-13)	
	S	T	S		
	24-2-53	24-12-53 (10-1)	16-9-54 (8-23)		
		54			
		S			
		31-3-55			



T
 ?
 14

T
 5-10-1951
 (--)
 18
 S
 20-2-53
 35

S
 9-4-52
 T
 14-11-52
 (7-6)

S
 27-5-54
 T
 21-11-54
 (5-25)

T
 23-5-1952
 (7-19)

S
 24-4-53
 42
 S
 29-9-54

Tr.
 29-12-53
 (8-6)
 55
 S
 28-11-54

T
 25
 T
 24-6-53
 T
 16-9-54
 (8-19)

T
 13-12-1952
 (6-21)
 33
 S
 12-8-1954

? ————— T ————— T ————— T ————— S
 10-8-1951 22-12-1952 19-12-1953 8-1-1955
 (—) (16-13) (11-28) (12-21)
 16
 S ————— T ————— T
 28-2-53 11-3-54 6-2-1955
 (12-11) (10-26)

? S S S S
 1-9-1951 24-7-1952 26-2-1953 30-10-1953
 (-) (10-24) (7-3) (8-5)

?

T 11-9-1951 (—)	T 15-5-1952 (8-5)	T 12-11-52 (5-28) 32 S	T 9-5-53 (5-28)
		22	23
		20-5-54	
T 23-4-53	S 27-12-53 (8-5)	T 7-5-53 43 S	T 25-3-54 (10-19)
		6-6-54	

GENEOLOGICAL TABLE NO. IX
Doe No. 9 (Purchased)

?	T	T
25-8-1951	(-)	29-5-1952
		(9-5)
		26
	T	T
14-5-1953		22-12-1953
		(7-9)

GENEOLOGICAL TABLE NO. X
Doe No. 27 (Purchased)

S	Tr	S	Q	T
?	10-8-1953	8-3-54	20-8-54	25-2-1955
37	(-)	(6-29)	(5-13)	(6-6)
	46			
	S			
	15-11-54			
	S	T		
17-6-54	5-2-1955			
	(7-20)			

GENEOLOGICAL TABLE XI
Doe No. 28 (Purchased)

Tr.	T	T	T	T
?	18-6-1953	29-12-1953	16-7-1954	13-2-1955
	(-)	(6-12)	(6-18)	(6-28)
38	39			
	S	T		
	9-6-1954	1-3-1955		
	(-)	(8-21)		
	S	S		
28-5-54	10-2-55			
(-)	(8-14)			

- Note :— (1) Only female progenies which have kidded are included.
- (2) The symbols used denote : S—Single Birth.
T—Twins ; Tr—Triplets and Q—Quadruplets.
- (3) The date below the symbol is the date of kidding and the figures in brackets are the kidding interval preceding that kidding.
- (4) The information ringed off and furnished as the first kidding data denotes that the kidding has occurred before the receipt of the doe on this farm.

*Discussion :—*A consideration of the flock as a whole gives rise to the impression that single births had been quite common accounting for about 42% of the total births in the flock as evidenced in Table No. I. As the first kidding is the result of the maiden attempt at production classifiable as "immatured performance" it is desirable to consider the data separately for the primary kidders and secondary kidders, and such a classified data are furnished in Table No. II.

From the data for the first kidders, it is apparent that single kidding is more common accounting for about 80% of the total births among them while twins have accounted for the remaining about 20% of the births. As the Twin births have occurred to a considerable degree, about 20% of the total, it is imperative to analyse further to see whether there had been any special features which could be attributed for the incidence of the Twin births in those individuals only. The factors which merit consideration are the "Physical state" of the individuals as well as their "genetical" make up." These data are furnished in Table No. III, a perusal of which reveals that the does which have given birth to twins are "early maturers", their average age at the time of kidding being 1 year, with a maximum of 1 year 1 month and 6 days and a minimum of 11 months, while the corresponding figures for the does which have given birth to single kids are 1 year 3 months and 5 days, and 1 year 8 months and 11 months respectively. The difference in the "age of maturity" of both the groups is statistically significant. Adverting to the consideration of "genetical" aspect doe No. 12 has given birth to Twins in its first kidding while its Dam (No. 2) has given only a single Kid. Nos. 19, 20, 31, 51, 52 are all daughters of this No. 12 but all have given birth to only single kids at the first kidding, so also its grand daughters 36 and 49. (Vide Geneological Table No. II.) No. 22 and 23 are the daughters of No. 8. The performance of No. 8 is not known but the daughter of No. 23 (No. 43) has given birth to a single kid only. (Vide Geneological Table No. VIII.) Number 25 is the daughter of No. 5. Though the mother of No. 25 (No. 5) has given birth to Twins all the sisters of No. 25, (Nos. 14, 18, 24, 33) including identical sister (No. 24) have given birth to single kids only and the daughters of the sisters (Nos. 35, 42 and 55) have given birth to single kids only. (Vide Geneological Table No. V.) Number 50 has given birth to Twins but its Dam (No. 29) and great Dam (No. 13) have given birth to single kids only. (Vide Geneological Table No. IV.) These data as well as all the details furnished in Geneological table Numbers I to XI tend to point out that there does not appear to be a genetical correlation in the matter of Twin births.

Now, let us, consider the secondary kidders wherein the single births had been comparatively less accounting for about 20%, a level at

which multiple births have occurred in the first kidders. The position is just the reverse of what had occurred among the first kidders. What are the factors which have given rise to single births among the secondary kidders? Is the kidding number and the consequent advanced age responsible for the single birth? This has to be ruled out since the single birth has occurred in all kiddings from the 2nd to 5th among various individuals. (Vide Geneological Table Nos. 1 to XI.) The next point to be considered is, therefore, the "Productive efficiency" as adjudged from the kidding interval and hence the data on the "Kidding interval" preceding the kidding under consideration is tabulated in Table No. IV classified according to single births etc. A perusal of this table reveals that the average "Kidding interval" works out to 9 months and 7 days in the case of Single kidders with a maximum of 12 months and 21 days and a minimum of 5 months and 17 days. The corresponding figures for the Twin kidders are 8 months and 6 days, 16 months and 13 days and 5 months and 25 days respectively while the figure for the Triplet kidders are 7 months and 22 days, 9 months and 9 days and 5 months and 18 days respectively. For the only quadruplet kidder, for which data is available, the interval works out to 5 months and 13 days. In other words the average interval for the single kidder is 9 months and 7 days, and that for the multiple kidder is 8 months and 3 days. The difference is statistically significant. These data are suggestive that the "delayed breeders" give rise, to single births while "early breeders" give birth to multiple kids. This inference tallies with that of the primary kidders also. As already discussed under the Primary kidders a perusal of the Geneological Tables I to XI does not appear to indicate any possible correlation.

From the foregoing it is apparent that the "early maturers" among the first kidders and "early breeders" among the secondary kidders are the probables giving birth to multiple kids. It is an established fact that "early maturity" as well as "early breeding" depends on a sound physical condition associated with the correlated factors. A mere blooming condition or a very good body weight alone is not the criterion, since it is known that "fatty animals" are poor breeders and hence body weights were not taken into account in these studies. Thus Twin births in goats appear to be more a "Somatic" factor than a "Genetical" factor and a sound reproductive physiological state of health of the individual is likely to result in more kids at a time.

Summary

(1) The results of 103 kiddings among Malabar Goats are discussed.

(2) The first kidders have given birth to multiple kids in about 20% of the births while the incidence of single births among Secondary kidders had been about 20% only.

(3) Analysis of physical data reveals that "Early Maturers" among the first kidders and "Early Breeders" among the Secondary kidders have given birth to multiple kids.

(4) Analysis of the Geneological tables of the individuals concerned does not appear to reveal any possible correlation of genetical factor to the birth of multiple kids.

(5) Conditions favouring a sound reproductive physiological state of health of the individual doe are probably the factors promoting the birth of multiple kids.

Acknowledgment

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TREATMENT OF CONTAGIOUS CAPRINE PLEURO-PNEUMONIA

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Introduction

To the goat-breeders the economic loss from Contagious Caprine Pleuro-Pneumonia (C. C. P. P.) is too well known to need any special emphasis. With the appearance of the disease in any flock of goats, there is a high morbidity followed by heavy mortality. In many flocks, it is reported, the entire goat population has been wiped out in a short period owing to this dreadful scourge. In the past various workers have tried different chemotherapeutic agents and antibiotics in the control of the disease, but the results obtained by the use of the former have been inconsistent, contradictory or unsatisfactory, but the results obtained by the use of the latter have given a disappointing result or a fair amount of success depending on the type of antibiotic(s) used. One of the authors (G. Biswal) used Terramycin in two Beetal Bucks (Buck No. 35 and Buck No. 44) of the fresh arrivals belonging to the Utkal Go-Mangal Samiti (U.G.S.) during the month of October, 1954, showing

clinical symptoms simulating that of C. C. P. P. with encouraging results. Terramycin therapy was adopted in these two bucks when Sulfamezathine 33% solution and Penicillin proved most effective. Being prompted by the above, the authors extended the scope of the trial of Terramycin to a quite sizeable number of experimental goats and they wish to record their findings in this paper. Subsequently they added Achromycin and Novarsenobillon (N. A. B.) to their experimental trial.

Review of Literature

Viswanathan *et al* (1947) stated that Steel, in 1889, without knowing the etiology of the disease, was probably the first to report heavy mortality in goats in the districts of Khandesh in the then British India. After nearly two and half decades, Walker (1914) reported the incidence of Pleuro-Pneumonia of goats in the Punjab. Subsequently the incidence of the disease has been reported from many parts of India.

Workers in the field have tried many chemotherapeutic agents mostly of arsenical preparations in the treatment of the disease in goats. Viswanathan *et al* (1947) reported that Gudachaff, in 1928, used Salvarsan in doses of 0.2 to 0.7 gm. according to body weight with good results. Novarsenol (Il'mov, 1938), Neosalvarsan, Sodium Cacodylate solution and Neoarsphenamine (Viswanathan *et al*, 1947), Novarsenobillon (Gopalkrishnan, 1946; Viswanathan *et al* 1947; and Manjrekar, 1950), Novarsenobillon in combination with sulfa products (Kulkarni, 1945—cited by Viswanathan *et al* and 1947), and Sulphanilamide (Rao, 1945) are reported to have been tried in cases of C.C.P.P. with a fair amount of success. Das (1946) tried N.A.B. in C.B.P.P. during 1944-46 in over 500 acute cases and is of opinion that this drug gives an encouraging result in that it converts an acute attack into a chronic one as a result of which the mortality rate is appreciably reduced, though the focus of infection continues to remain in the herd.

Hagan (1951) stated that sulfa drugs and penicillin have little effect, if any, on members of the pleuro-pneumonia group of organisms. In 1955, Manjrekar pointed out the disappointing result of N.A.B. in the naturally infected goats, and in the quest for finding a suitable curative agent, he used Synthomycetine (Messrs. Lepetit and Co.), Terramycin (Chas Pfizer and Co.), and Aurcomycin (Lederle) in 5, 5 and 2 goats, respectively with promising results, especially with the first two antibiotics.

Materials and Methods

A virulent strain of C. C. P. P. organism (G-9 of Mukteswar) used in this study was received from the Research Officer, General

Disease Investigation, Indian Veterinary Research Institute, Mukteswar, during March, 1955 when the latter came to Orissa to carry out the immunity test of the Bhanjanagar flock of cross-bred Beetal Goats. Since then, this strain has been maintained in Bennett's (1932) broth at the State Veterinary Research Laboratory, Cuttack by subculturing it at ten days interval and after every ten such serial tube passages the C. C. P. P. organism was passaged through a healthy goat and the organism was recovered from it at the height of the post-inoculation reaction.

Terramycin (Chas Pfizer & Co.) vials of 250 mg. intravenous (I/V); vials of 100 mg. intramuscular (I/M); bottle of 5000 mg. in oily suspension for subcutaneous (S/C); Achromycin (Lederle) vials of 250 mg. I/V; glucose ampoules of 25 c.c. of 25%; pyrogen-free distilled water ampoules of 10 c.c.; Novarsenobillon (M & B) tubes of 0.15 gm., 0.30 gm. and 0.45 gm. for I/V, were used.

Healthy cross-bred Beetal, local young castrated goats of one year old and local female goats of 2-4 years of age were used. The local goats were purchased from a flock where the disease had never been reported.

With strict precautions, mixtures of antibiotics (Terramycin I/V); Terramycin I/M; Achromycin I/V) were prepared in pyrogen-free distilled water. Then Terramycin I/V mixture was mixed with glucose solution according to the instructions given in the package slip. Similarly the oily suspension of Terramycin was handled under sterile precautions.

N. A. B. solution was made according to the instructions supplied along with package slip.

Materials (heart blood, exudates of local lesion and preescapular gland from experimental donors) were collected with Pasteur pipette and cultured on to the Bennett's broth, nutrient broth, plain agar plate, and blood agar plate under sterile precautions and they were incubated for 72 hours. After the end of this period of incubation, when no growth was seen in plain agar plate, blood agar plate and nutrient broth they were discarded as sterile. When there was opalescence in the Bennett's broth tubes, they were further tested by putting a few drops from these tubes onto bloodagar, plain agar plates, and nutrient broth just to be doubly convinced that opalescence was not due to contaminants. The tested culture was used in goats for experimental purpose.

Experimental Results

Group-I :—(a) Three healthy kids of local breed were given one c.c. of known virulent C.C.P.P. culture each, subcutaneously.

One of the kids, was treated with Terramycin 250 mg. I/V, simultaneously and followed by Terramycin I/M for two days. Except slight thickening at the site of C.C.P.P. culture inoculation, nothing of significance was seen.

The second kid was treated with Terramycin 250 mg, I/V, 24 hours after the culture was given and was subsequently treated with Terramycin 100 mg. I/V for two days. The result of this case was the same as that of the first one.

The third kid was kept under observation upto the 6th post-inoculation day. When the temperature of the kid was 106.8°F he was in a moribund state, Terramycin 500 mg. I/V was given. Subsequently it was given Terramycin 100 mg. I/M daily for the next two days. After 24 hours of the Terramycin I/V therapy, the temperature of the animal came down to normal and the animal appeared lively but the painful swelling persisted for 15 days.

These three kids were kept under close observation for over two months after which they were allowed to mix with the rest of the flock.

(b) *Controls*:—(i) One healthy local bred female milch goat was given one c.c. of known virulent C. C. P. P. culture S/C and was kept as an artificially infected control. She developed hot, painful swelling at the site of inoculation. There was profuse nasal discharge with a temperature of 104.6°F - 106.2°F on the 4th to 6th post-inoculation day. The animal was limping and on the 7th and 8th post-inoculation day, she was unable to get up. When she was in a moribund state *i.e.*, on the 8th post-inoculation day, she was sacrificed and materials were collected for other experimental work.

(ii) *Vaccinated*:—Eight months after vaccination with attenuated culture vaccine (Mukteswar - Generation - 261) four cross-bred Beetal were given one c.c. of known C. C. P. P. virulent culture each. Except slight swelling at the site of inoculation, nothing of significance could be observed.

Group 2:—One healthy kid was given 1½ c.c. of infective blood subcutaneously collected on the 4th post-inoculation day from the animal of Group - 1 - b (i) when her temperature was 104.6°F. The kid receiving infective blood had rise of temperature on the following day. On the 3rd post-inoculation day when the temperature of the infected kid was 104.0°F, it was given Terramycin 100 mg. I/V daily for 3 consecutive days. The temperature of the animal came down to normal and it became lively and started eating after the course of treatment. The swelling at the site of inoculation subsided nearly a week after. The animal was kept under observation for two months.

Group 3:—One healthy kid was given subcutaneously defatted milk collected from the infected animal of Group 1 - b (i) 1 c.c. each, on the 4th and 6th day of infection. There was no untoward effect.

Group 4:—(a) One healthy kid was given one c.c. of C. C. P. P. virulent culture S/C, and it was given N. A. B. 0.15 mg. 0.3 gm. and 0.45 gm. I/V on the 0, 3rd and 5th day, respectively. There was very hot, painful and diffuse swelling at the site of inoculation. The prescapular lymph gland on the side of inoculation was markedly swollen by the 5th post-inoculation day and the temperature of the animal was 106.2°F. It was dull and unable to move about. The knees and hocks were greatly swollen. The animal died on the 6th day.

(b) Another goat similarly infected was given a similar line of treatment with N. A. B. and when it showed no improvement and the temperature remained constant from 104°F to 105°F; it was given Terramycin 500 mg. I/V on the 5th day and 100 mg. I/M on the 6th day. The temperature of the animal came down to normal the following day. The swelling at the site of inoculation persisted and the animal died on the 6th day evening.

Group 5:—To one c.c. of virulent C. C. P. P. broth culture, 50 mg. Terramycin was added and the mixture was kept at room temperature for 1½ hours. Disease could not be produced when this mixture was given to a healthy goat.

Group 6:—Fourteen goats used in this group were given one c.c. of C. C. P. P. virulent culture each. The details of the experiment done and results obtained are described below.

(a) One healthy goat was given 100 mg., 50 mg., 50 mg., 50 mg., Terramycin S/C on the 2nd, 3rd., 4th and 5th post-inoculation day, respectively. In all it received 250 mg. After an apparent cure the animal died of C. C. P. P. on the 10th day.

(b) One healthy female goat was given 150 mg., 50 mg., on the 4th and 5th post-inoculation day, respectively. In all, she received 200 mg. After an apparent cure of 10 days the animal developed latent infection and died on the 16th day. Materials from this goat when given subsequently to another healthy goat produced the disease and killed it on the 4th day.

(c) Two goats were given 200 mg. Terramycin S/C each, per day, on the 2nd., 3rd. and 4th post-inoculation day. In all, each goat received 600 mg. Terramycin. The temperature came down after the first injection and remained within the normal range. Throughout the period of one and half months under observation, these animals did not show any clinical symptoms of the disease and were thus disposed of.

(d) Two goats were given 400 mg. Terramycin S/C each, per day on the zero day, and 3rd. day of infection. Each animal received 800 mg. Terramycin in all. There was no rise of temperature. The animals apparently remained healthy for 1½ months after which they were disposed of. Here the result more or less agrees with the findings of above (c of Group-6).

(e) Two goats were given 200 mg. Terramycin S/C each on the 2nd. day and 100 mg. each on the 3rd. day of post-infection. In all, each animal received 300 mg. Terramycin. The temperature of the animals came down after the first injection. But one of the goats again showed rise of temperature on the 11th day and died on the 12th day and when the remaining goat was challenged with virulent C. C. P. P. culture on the 18th day it died of disease on the 2nd. post-inoculation day.

(f) One female goat was given 100 mg., 50 mg., and 50 mg., on the 0, 2nd. and 43rd day, respectively. In all she received 200 mg. Terramycin S/C. The animal did not develop the disease and remained refractory to subsequent virulent inoculation done on the 18th, 31st. and 43rd day. She was kept under observation for 73 days and did not show any illness. She was kept along with the animals of a, b, c, and d of the above before C. C. P. P. culture was given to her.

(g) Two goats were given 100 mg. Terramycin S/C each, on the 3rd. day. The temperature of the goats came down after Terramycin injection but one died on the 4th day and another on the 5th day.

(h) One goat was given 200 mg. Terramycin S/C on 0 day. There was slight swelling at the site of inoculation. There was no rise of temperature. After an interval of 22 days when the animal was tested with C.C.P.P. virulent culture it died of the disease on the 3rd. post-inoculation day.

(i) One male goat was given 200 mg. Terramycin on the 1st day excluding 0 day. There was no rise of temperature nor any swelling at the site of inoculation. After 20 days when it was challenged with virulent C.C.P.P. culture it died of the disease on the 4th post-inoculation day. This more or less corroborates the observation obtained in the previous one.

(j) One goat was kept as infected control and allowed to die of the disease. After showing all classical symptoms of the disease, it died on the 4th day.

Group-7:—Seven goats were taken in this group using Achromycin. All the goats were given 1 c.c. of virulent C.C.P.P.

culture and then the antibiotic was given at different concentrations on the different post-infection periods.

Goat No. 1:—The goat was given Achromycin 250 mg. I/V on the 3rd. day of infection excluding 0 day. It did not get the disease and became all right.

Goat No. 2:—The goat was given Achromycin 250 mg. I/V on the 4th day of infection excluding 0 day. On the 8th day of infection, when fresh virulent material was given it did not come down with the disease. But 20 days after the first infection or 12 days after the 1st. test, virulent material was given and the animal reacted, got the disease and died.

Goat No. 3:—It was given Achromycin 250 mg. on the 0 day. It did not get the infection. Ten days after the treatment when it was challenged with virulent culture it reacted and got infection. Again it was treated with Achromycin 500 mg. after 2 days i.e. 11th and 12th day, even then the animal died of C.C.P.P. infection on the 12th day.

Goat No. 4:—The goat was given 250 mg. Achromycin I/V each, on the 3rd. and 4th post-inoculation day. Seven days after treatment i.e. on the 11th day of infection, when it was challenged with virulent culture the animal reacted came down with the disease and died of it.

Goat No. 5:—The animal was given Achromycin 500 mg. I/V on the 6th day of infection when it was *in extremis*. The temperature came down to normal the following day. It became lively. Four days, after treatment, when virulent culture was given it developed the disease and in spite of repeated high doses of Achromycin 500 mg. I/V each, on the 3rd, 4th and 8th day, the animal died of C.C.P.P. infection after an apparent cure of 10 days.

Goat No. 6:—It was given Achromycin 250 mg. I/V on the 1st. and 2nd and 3rd. day of infection. The animal did not develop the disease. Except slight swelling at the site of inoculation nothing of any significance was seen. Seven days after the last treatment when virulent culture was inoculated the animal developed the disease and died after 3 days' illness.

Goat No. 7:—It was given Achromycin 400 mg. I/V on the 8th day and 500 mg. I/V on the 9th day of infection, when the animal was *in extremis*. The animal died of the disease on the 9th day.

Group 8:—The *in vivo* test was preceded by the *in vitro* treatment with Achromycin.

Goat No. 1:—Two c.c. of 24 hours old C.C.P.P. culture were treated with 100 mg. of Achromycin kept at room temperature for 45 minutes and when given to a healthy susceptible goat did not produce the disease.

Goat No. 2:—Two c.c. of 48 hours old C.C.P.P. culture were treated with 100 mg. Achromycin kept at room temperature for 30 minutes and when given to the healthy susceptible goat did not produce the disease.

These two goats when given virulent culture 10 days after this experiment, died of C. C. P. P. after 3 days' illness and C. C. P. P. organisms were recovered from them.

General observation on the treatment of Achromycin:— It has been observed that when Achromycin given I/V quickly, the animal faints, as if it is going to die. Immediately after inoculation when the animal is allowed to get up, it walks in circle and falls down, and at times it staggers showing marked dilatation of the pupil.

These by-effects were, however, not seen in the animals of Terramycin treated group.

Discussion

Novarsenobillon is claimed to have a curative value in the treatment of C.C.P.P. (Gopalkrishnan, 1946; Viswanathan *et al.* 1947). In the present study (Group-4) this drug proved of no value in effecting cure to artificially infected goats, thus confirming the observation of Manjrekar (1955). It has further been observed that in spite of N.A.B. treatment on the 0, 3rd. and 5th day, there was persistent swelling of knee and hock joints and gradual increase in size of the swelling at the site of inoculation, in addition to rise of temperature. Viswanathan *et al.* (1947) stated that recovery was rare in those animals which received less than 0.1 to 1.5 gm. in 15 to 20 c.c. of distilled water given I/V. The goats in the present study (Group-4) were given rather higher dose than that suggested by Viswanathan *et al.* (1947), with no effect.

Terramycin has given very promising result in effecting cure in artificially infected goats (Group 1-a) in the present study. This corroborates the observation of Manjrekar (1955). The only drawback of intravenous or intramuscular injectable Terramycin is its cost, which is prohibitive taking into consideration the value of goats treated. Terramycin in oily suspension also, gives good results provided administered in it is adequate concentration, say, 600 mg. to 800 mg. (Group-6-c and d) in the early stage of the disease and is less expensive

and in due course, when available in plenty the price may be within the easy reach of the goat owners.

Terramycin in small doses of 100 mg. to 300 mg. does not appear to be effective even when given in early stages of disease, although it brings down the temperature of the infected animals and gives them an apparent cure of 4 to 22 days (Group-6-a, b, e, g, h & i). During this period of apparent cure when animals are infected subsequently they develop the disease and die (Group 6 - e, h & i). One animal, however (Group 6-f) remained refractory to subsequent repeated infection. The animal had probably acquired resistance to C.C.P.P. infection due to the recent in-contact infection.

Achromycin used in the present study appears to give a fair amount of success in effecting cure to the artificially infected goats, in the early stage of the disease (Group - 7, Goat No. 1, 4, No. 6). But its efficacy does not appear to be as good as that of Terramycin as deduced from the observations made in the third kid of Group 1 and Goat No. 7 of Group - 7.

Achromycin watery solution may be effective only for a few days to ward off the disease, but cannot induce any resistance to subsequent infection. (Group - 7 - Goat No. 2, No. 4, No. 6). Similarly it proves ineffective even at higher doses in animals infected in a convalescent stage (Group 7 - Goat No. 3, Goat No. 5) or in the animal *in extremis* (Group - 7 - Goat No. 7).

In his study Manjrekar (1955) used Synthomycetine, Terramycin and Aureomycin and claimed that Synthomycetine and Terramycin were the antibiotics of choice which might prove efficacious in the treatment of C.C.P.P. The present authors tried Terramycin and Achromycin in the treatment of goats artificially infected with C.C.P.P. and the results obtained, especially with Terramycin were highly encouraging. The side effects shown by animals treated with Achromycin were not seen in animals undergoing terramycin treatment.

This study further brings into light the *in-vitro* effect of the two antibiotics used. Disease could not be produced in animals when virulent culture treated with the antibiotics at a concentration of 50 mg/ml, and kept at room temperature varying from 30 to 45 minutes (Achromycin) to 90 minutes (Terramycin) was used. At this concentration the two antibiotics appear to kill the C.C.P.P. organisms.

In their study on the *in-vitro* effect of certain chemotherapeutic agents Dhanda and Sharma (1956) reported that NAB and sulfamezathine inhibited the growth of the C.C.P.P. organisms at concentration of 125 mg/ml and 33.3 mg/ml, respectively. But in the clinically

affected goats sulfamezathine (Biswal, 1954, unpublished data) did not prove of any avail and in the experimentally infected animals (present study) the administration of NAB yielded most disappointing results. In the *in-vitro* test of Dhanda and Sharma (1956), penicillin proved ineffective. In the experience of the present authors penicillin arouses equally the same doubt as to its efficacy.

The phase of experiment on the transmission carried out in goats shows that blood of the artificially infected goat was infective to healthy goat, (Group-2) whereas the milk of the infected goat did not appear to be infective to the healthy susceptible goat (Group 3)

Summary and Conclusion

- (1) The treatment against C.C.P.P. adopted by various workers has been reviewed. Thirty six goats were used in the present study.
- (2) NAB appears to be useless in the treatment C.C.P.P., whereas Achromycin and more especially Terramycin appear to be very promising in effecting a cure in affected animals when given in adequate doses at the early stage of disease.
- (3) Of the two antibiotics used, Terramycin did not produce any by-effects, in treated animals, whereas Achromycin did.
- (4) The blood of infected goat was infective to the healthy goat, whereas the milk of infected goat did not appear to be infective to the healthy susceptible goat.
- (5) A concentration of 50 mg ml of Terramycin and Achromycin appears to kill the C.C.P.P. organisms *in-vitro*.
- (6) If the goat is experimentally infected with the C.C.P.P. organism within a short time after Achromycin treatment against c. c. P. P., further treatment with the Achromycin even with high doses proved of no avail.

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THYROID THERAPY OF NON-SWEATING IN EQUINES

By

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Non-sweating is a condition in which the process of sweating is arrested in equines. The occurrence of this condition is seasonal, chiefly in the hot weather in tropical countries. Imported breeds (T. B.) are more susceptible than the local breeds of horses. The affected animal develops a dry and rough coat and on exercise fails to show visible sweating and the skin becomes hot. The animal is unable to do hard work and ultimately loses condition. A number of cases of non-sweating has been observed in hard worked race-horses and tonga ponies in Lahore. The animals developed this condition during the summer months and remained non-sweaters even during the winter months.

It was observed that the administration of a daily dose of 10 to 25 grams of iodinated casein (Protamone, containing 0.72% 1-thyroxine on a bioassay) for a period of about 4 to 8 days, cured the affected animals and the treated animals started sweating. There are indications that the condition originates from some endocrine disturbance in animals whose Heat-regulating mechanism is adversely affected as a result of overwork. Further work on the etiology of non-sweating and the mechanism of action of thyroid hormone is being continued.

Clinical Articles

CLINICAL TRIALS WITH 'HIBITANE' IN THE TREATMENT OF METRITIS AND ENDOMETRITIS IN COWS

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Recent investigations indicate that infertility in cows is widespread in many parts of the country. It is possible that malnutrition may be an important factor causing sexual disorders; but it is recognised by investigators and clinicians that infection of genital organs by pathogenic organisms is the chief cause of sterility in cattle and buffaloes. Unlike other diseases, metritis is caused by a variety of organisms influenced by numerous environmental conditions. There are no authentic statistical data available indicating precisely the monetary loss sustained by the dairy industry. However, this diseased condition in genital organs of dairy cattle is admittedly an important problem in the country.

In recent years, significant advances have been made in the use of chemotherapeutic agents and antibiotics in metritis. However, the success of the treatment depends largely on the selection of the drug based on bacteriological knowledge of the case. To evaluate the efficacy of 'Hibitane' pessaries in the treatment of bovine metritis and endometritis of different bacterial origin, clinical trials were conducted on 12 cases seen in the infirmaries of Bangalore. Before starting the treatment clinical materials such as, discharge from the genital tract were collected from each case for microscopic, cultural and biochemical tests to determine the pathogens involved. In eleven cases, different pathogenic bacteria were isolated but in one case the laboratory examination revealed no pathogenic organisms. However, *Trichomonas foetus* was not identified in any of the treated cases.

Results of treatment:—The only case, which was negative for bacterial infection of the genital organs, revealed no evidence of previous infection. It had a fall in the previous night. Next day the animal was admitted to the hospital with a history of abortion. One 'Hibitane' pessary was introduced into the uterus after removing the remnants of the placenta and the treatment was repeated after 48 hours. When examined one week after treatment the animal was healthy and showed no signs of uterine infection. Out of three brucellosis cases treated with 'Hibitane' (one pessary dissolved in four to six ounces of water) every 48 hours for eight days, two showed definite improvement.

The inflammation of the uterus was reduced to a great extent and there were no signs of discharge. However one case which was having putrid discharge, showed no evidence of improvement. This case did not respond well even to the treatment with antibiotics and sulphonamides subsequently. In this case in addition to *B. abortus* other pathogens were also noticed in the discharge.

It is interesting to note that all the three cases having *Streptococcus pyogenes* infection of the genital tract responded very well to the treatment with Hibitane pessaries. Each case required four pessaries to show beneficial results. One pessary was introduced each time at 48 hours' interval. Of the three cases one Scindhi cow, which was examined three months after treatment was found to be free from infection and was in calf.

In three metritis cases pathogenic staphylococci were isolated. The history of these cases showed that uterine infection resulted either from dystokia or retention of placenta. It is possible that pathogens might have gained entrance as a result of bad and unhygienic handling at the time of calving and after. The remnants of the placenta were removed and one 'Hibitane' pessary was introduced four times at an interval of 48 hours. The abnormal secretion from the genital tract was very much reduced, the swelling of the genital tract subsided and the condition of the animals improved. One case was not presented to hospital probably due to recovery, and the final response to treatment could not be assessed.

One cross-bred cow aged about five years was brought to hospital with a history of not conceiving in spite of regular heat periods, and of several abortions previously with slight vaginal discharge at irregular intervals. The discharge when examined showed *Escherchia coli* organisms. The opening of the os uterus was very narrow. 'Hibitane' (in solution) was tried three times at an interval of 48 hours. Three weeks later the owner reported the appearance of a slight discharge from the genital tract, and later on reported that the animal had failed to conceive in spite of three artificial inseminations within a period of three months. This may possibly have been due to abnormal development of the ovaries and the poor condition of the animal.

In one local buffalo (retention of placenta) one 'Hibitane' pessary was used daily for two days and the animal responded to treatment. The owner reported complete recovery.

Remarks:—Though the number of cases treated is too small to give a definite opinion on the usefulness of the product in the treatment of infection of the female genitalia, it could be seen from the clinical trials that the response to 'Hibitane' treatment is encouraging. It is

essential for evaluation that the treated animals and discharges, if any should be examined at least four or five weeks after treatment. Except in three cases (one staphylococcal and two streptococcal infections) which proved negative on bacteriological examination the others could not be examined. The results indicate that 'Hibitane' has a wide spectrum of antibacterial activity and does not exert any toxic effect on treated animals.

It is felt that one of the greatest advantages of 'Hibitane' is the prevention of sepsis of the female genitalia which usually follows difficult parturition or retention of the placenta. Such cases are commonly encountered in veterinary hospitals.

Recently I have advocated 'Hibitane' in the treatment of endometritides and metritis in mares with *Salmonella abortus equi* chemotherapeutic agent for the treatment of metritis and endometritis in large animals.

Acknowledgments

Grateful acknowledgments are made to Imperial Chemical Industries (India) Ltd., who generously provided Hibitane pessaries used in this study, to the authorities of Veterinary Hospitals in Bangalore, for their co-operation and to the Superintendent, Mysore Serum Institute, Hebbal, Bangalore, for his guidance.

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CASES OF IMPERFORATE ANUS IN A BUFFALO-CALF AND A PIGLET

By

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and

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The congenital malformations of rectum and anus are common in domestic animals. Normally both develop from two different embryological centres and then coalesce to form a single tube. A

deviation in development results in abnormalities. The three usual types of malformation are:—

1. Absence of anus.
2. Separation of rectum and anus by a partition.
3. Imperfect development of rectum and/or anus.

Two cases of abnormal development treated at the Kothari Veterinary Hospital, Mathura, are reported below:—

Case No. 1.—This was one of imperfect development of both anus and rectum in a buffalo-calf (Case No. 829 dated 9-8-56). The animal, ten hours old, was brought to the hospital with the history that it had not passed motions since birth.

On examination, absence of anus was revealed and the animal was found to strain much. A shrunken piece of skin was covering the anal region. Operation was decided upon.

Operative technique.—The site of operation was duly prepared and 6 c.cs. of 2.5% solution of Procaine Hydrochloride was injected in a fan shaped manner around the site. The shrunken piece of skin was caught in the centre with an artery forceps and stretched. A disc shaped piece of skin was removed. After removal a mass of fibrous tissue was not pass out. On further examination a mass of fibrous tissue was found underneath the wound. This was removed by blunt dissection and it revealed to be a case of Atresia Rectum also. The blind end of rectum was at a depth of 4". The attachments of ampulla were dissected for a distance of about 1". The ampulla was caught in the centre with a curved artery forceps, pulled out and a small incision was made first. Then a sound was passed through it to confirm that the ampulla being cut was the real cul-de-sac. Sound passed through easily. A circular opening was made. Using Nylon the edges of the wound were sutured by means of interrupted sutures. The line of sutures was painted with Tr. Iodine and the wound was dressed with Pulv. Sulphanilamide.

After treatment:—Since the meconium was not being passed out and the animal was straining, 1 oz. of Liquid Petrolatum was injected through the surgical opening. The animal was also drenched with the following mixture.

R

Castor oil—1 oz.
O1. Menth Pip—m-2
O1. Anisi—m-5
Ft. Haust

Next day when the calf was brought the perineal region was swollen. It was given Infra-red rays fomentation for 7 minutes and was painted with Tr. Iodine. The drench was repeated. The animal was brought the day after this. The swelling had subsided. On the 8th day the sutures were removed.

Case No. II.—This was one of Recto-vaginal Fistula cum Imperforate anus in a piglet (Case No. 1009 dated 5-9-56).

A 20 day old female piglet belonging to 18th Sikh Regiment was brought to the Hospital with the history that the animal had not passed motions since birth. When the temperature was taken per vagina it was noticed that the bulb of the thermometer was coated with faecal matter. It was concluded that it was a case of congenital Recto-Vaginal Fistula cum Imperforate anus. The skin of the perineal region was found bulging. It was decided to operate.

Operative technique:—The site of operation was prepared as usual and 6 c. cs. of 2.5% solution of Procaine Hydrochloride was injected around the area. The centre of the area was caught by an artery forceps and a circular piece of skin of about 2 cms. diameter was removed. Well formed hard masses of faeces started coming out. A sound passed through vagina was entering rectum freely. This confirmed the case to be one of Atresia Ani cum Recto-vaginal fistula.

Since the animal was straining much the animal was brought under general anaesthesia by giving into the ear vein 2 grains of Nembutal in 2 c. cs. of sterile distilled water and the fistulous opening was closed by means of continuous sutures using catgut No. 2/0. The mucosa of the rectum was sutured with the skin by means of interrupted sutures using Nylon. The line of sutures was painted with Tr. Iodine.

Post-operative treatment:—The animal was given one lac units of Penicillin intramuscularly and half a lac was applied topically. One ounce of Liq. Petrolatum was injected into the rectum by means of a long nozzled syringe. Two drachms of castor oil was given *per Os*.

The next day the perineal region was found swollen and the animal was constipated. Temperature was 101° F. Infra-red rays fomentation was given and the sutures were painted with Tr. Iodine. Penicillin injections and oral administration of castor oil were repeated. Owner was advised to foment the area in the evening.

On the day after, this swelling was much reduced. The temperature was normal. The owner also reported that no stercoral

matter was coming through the vagina. One lac units of Penicillin was given intramuscularly. After further five days the sutures were removed. Fistula was found to have healed. The animal was defecating normally.

Acknowledgment

Thanks are due to the Principal of the College for his invaluable advice and guidance in the compilation of this article.

News and Views

Shri C. Seetharaman, B.Sc., G.M.V.C., B.V.Sc., M.Sc. (Vety.), Head of Division of Biological Products, Indian Veterinary Research Institute, Izatnagar left Delhi on 30-1-57 for Japan and Thailand on a study tour of six weeks in connection with the manufacture of Rinderpest Lapinised and Lapinised Avianised Vaccines. It is hoped that his tour will prove very helpful in connection with the Rinderpest Eradication Plan which is already in operation in this country. It may further be added that Shri C. Seetharaman visited U. K., and U. S. A., during 1954 to study the working of various Biological Production Laboratories.

We wish him all success!

We are happy to note that **Mr. S. Damodaran**, G.M.V.C., B.V.Sc., of the Madras Veterinary College, took his M.Sc., degree of the Madras University in October 1956 in Animal Pathology. The subject of his thesis was, "Studies on Genital Pathology of the Female Buffalo (*Bos Bubalis*)". This work was done at the Indian Veterinary Research Institute, Izatnagar, with the aid of a Research Fellowship in Pathology granted by the I. C. A. R. New Delhi.

Where Dogs Help!—"What are the different types of work that dogs have been taught to do in recent years?" Lt. Col. J. Y. Baldwin poses this question in the *Sport & Pastime* and answers it himself. "Leading the blind, guarding, patrolling, rescue, policing, tracking, sentry, mine protecting and message carrying. Then, of course, we have the ordinary dog that guards our house. He is not considered as a working dog. He is just a member of the family".

A Rare Specimen of Indian Fruit.—Kurushetra, January 14. "Gristika", a rare specimen of Indian fruit, which, if eaten once, obviates the necessity of food for a person for at least two months, was

displayed here to-day by Vaidratna Kaviraj Pratap Singh while presiding over the Ayurvedic Conference being held here.

Kaviraj Pratap Singh said that the fruit which tasted like potato was used by 'rishis' and sadhus in order to practise uninterrupted penance for months together.

The fruit tree had a natural growth and was found in abundance in Almora district, the Kaviraj said. He said that the fruit could also be cultivated and an average tree could yield five maunds of fruit at a time. He had planted the specimen of the fruit tree in the Moghul Gardens of the Rashtrapati Bhavan as an experiment, he said.

Production of Fodder.—Indore, January 8:—The Ninth All-India Cattle Breeders Conference suggested that ten percent of cultivable land should be reserved for fodder production and the ceiling on land should be so fixed as to assure that existing pastures were not interfered with.

Special Officer for Cattle Colony.—Madras, January 8. The Government of Madras have ordered the appointment of a Special Officer for Cattle Colonisation Scheme.

In October last, the Government had ordered the creation of the post of a Milk Commissioner for this State and directed that he should function as a separate head of a Department and implement the scheme sponsored by the Madras Government for the establishment of a Cattle Colony near the City.

The Government have now sanctioned the temporary creation of the post of a "Special Officer for the Cattle Colonisation Scheme" in the Office of the Director of Animal Husbandry from the date of the actual appointment until February 18 or till the necessity for the post ceases, whichever is earlier.

Dr. Panjabarao Deshmukh, the Union Minister for Agriculture, presiding over a Conference of State Ministers of Agriculture and Animal Husbandry on 28th December 1956 at New Delhi, made a very significant statement in saying that "the posts of Directors of Agriculture and Veterinary Services should invariably be filled by technical Officers and the tendency in some States to appoint non-technical administrative officers to these posts should be discouraged". We hope the suggestion will receive the attention it deserves.

Antibiotics Aid Fisheries.—An antibiotic preparation used by the United States Poultry Industry is expected to solve spoilage problems in the fishing industry.

The antibiotic recommended is a product of the American Cyanamid Company, one of the larger manufacturing chemical organisations of the United States. A formulation called "Acronize" has been recommended for use. Acronize is based on a food-grade of the antibiotic chlortetracycline. It defers bacterial action, the cause of spoilage in fish, meats and other foods.

Its use, experts believe, would allow fishing fleets to range much farther at sea and bring capacity loads back to port without the sizable spoilage losses of the past. Spoilage between landing and consumption would also be sharply reduced. *Evening News*, Bombay, 29-12-56.

All-India Cattle and Poultry Show.—Laxmibai Nagar, Jan. 10:—The eight-day Cattle and Poultry Show organised by the All-India Cattle Show Committee at Laxmibai Nagar (Indore) concluded this evening with the Maharani of Indore giving away cash prizes worth over Rs. 20,000 in addition to over 90 silver trophies and a large number of miniature cups and certificates to winners who came from all over the country.

Ramjilal, a cattle breeder from Dadri, bagged the highest total of cash prizes amounting to Rs. 3,500 for the best private animal exhibited in the Show.

The milk yield competition organised by the Committee was contested by 25 cows. "Chitrakala" a Sahiwal cow of the Military Dairy Farm, Meerut, yielding 40 pounds of milk daily was adjudged as the winner.

The Supreme Championship Cup was awarded to a cow of the Tharparkar breed from the National Dairy Research Institute, Karnal. *Hindu*, January 14, 1956.

The Mysore State Ophthalmological Society under the inspiring leadership and guidance of Dr. B. K. Narayana Rao and Dr. M. S. Mehkri has embarked on a great humanitarian work in opening and running relief camps for treatment of eye diseases in rural areas. Here is what they do:—"When a request for a rural ophthalmic relief camp is received by the Society from any local body, the Society sends about five to seven members to the area with complete equipment for diagnosis, operations and treatment. Each member foots his own bill for his travel, boarding and lodging. The local committee in charge of the camp arranges for the free boarding and lodging of the patients.

The specialist members from the Society issue a call to medical practitioners in the area where the camp is held, and get a ready

response from such men, who assist at the Relief Camp in various ways. At each camp there are two operation theatres, one for ordinary and one for septic cases."

* * * *

So far they have run nearly a dozen camps, examined 12,543 patients and conducted 2424 major operations. Refraction and other sight tests number 2498. All honour to these two stalwarts of the medical profession.

It was the experience of the specialists, who have participated in these rural camps that certain types of diseases were more prevalent in certain areas. Investigation as to their causes, and the reasons for their concentration could greatly help effective preventive measures.

* * * *

The 18th All-India Ophthalmic Conference is to meet at Bangalore for three days from 21st February 1957, when over 200 delegates from outside the Mysore State and Ophthalmic Surgeons from Poland, Egypt, Japan, Mexico, United Kingdom and the U.S.A., are expected to attend. That is how the other professions are on the march!

Block Development Corner

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

PIG BREEDING AS A SUBSIDIARY INDUSTRY TO AGRICULTURE

By

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Introduction

I am afraid I am writing on an unorthodox subject. But I take shelter under the fact that Times are fast changing and there may be people who think that no industry is too low for honest human endeavour.

The importance of pig breeding as a national industry has not been sufficiently realised in India. It is evidently due to the fact that pig is considered to be a very filthy animal, not fit to be touched even by the people. Even the meat eating section of the Indians, detest taking pork or bacon, excepting very low class of people. This prejudice

is the natural outcome of the filthiness of the indigenous pig and the insanitary way in which it is maintained by a class of people, who are by themselves very unclean and poor. This is a state of affairs, which has been brought about by environments, habits and customs of people. Pig is taken for granted as a born scavenger. This is not true. It all depends on the way you bring him up and train him. Hunted from street to street and out of the village, with no proper place to shelter under, no land to forage even and with no food offered to it, the pig in India naturally takes to eat the refuse of the village and falls a prey to scavenging.

Meat shortage during War years, made people to think about rearing of pigs on approved lines, as is done in the West. In spite of such strong prejudice, judging from enquiries received from time to time, it is clear that there are people who would like to try pig-rearing as a subsidiary occupation to agriculture. The following points aim at helping such people with necessary details.

Stock raising.—There are two methods of raising the required stock. One is grading up the local pigs with pedigree boars of foreign countries and the other purchasing a pair or two of improved pigs of foreign countries and multiplying from them. The first one is a long process and considering the prolificacy of the pigs, the second method is preferable. Either the Berkshire Blacks or Yorkshire White Pigs are advocated. Though the latter is said to not thrive well in India, it must be conceded that it has not been tried on a sufficiently large scale so far. It may be that White pigs brought up under sanitary conditions, may serve to wear down the prejudice against this industry in India. Where conditions are favourable, this industry could be tried on a co-operative basis at village level. The necessary pure-bred stock may be got through some of the Missionary Agricultural Farms, who readily lend a helping hand in such matters.

On a conservative estimate, a sow is expected to average 7 to 8 piglings in a litter. Allowing for mortality, only 12 piglings could be expected in two litters in a year from each sow. It may be possible to have only one farrowing in the first year, but in subsequent years two litters could be got with ease. It is essential that a market should be created in advance before venturing on this trade in India. The failures so far have been mainly attributed to lack of a market. But there are quite a number of places where this industry is thriving. In South Kanara, for instance, this is more or less a Cottage Industry with a large section of the people. In pre-war times the cost of a Berkshire or Yorkshire boar was quoted at Rs. 200 to Rs. 250 and that of a young sow at Rs. 150 to Rs. 200. The cost of feeding an adult pig then was about Rs. 6 per month and that of a pigling was about Rs. 4 per month.

The piglings are ready for sale at 6 months of age at probably As. 8/- a pound now of live-weight and they approximately weigh 120 lbs each at that age. I have merely thrown out some points to stimulate thought in this direction. Men with more practical experience in the line may come out with their suggestions. Similarly also, articles on Duck-rearing, Raising of Rabbits, Guinea-pigs, Guinea-fowls, Pigeons, Turkeys etc., would be welcome under this section to be of use to National Extension Scheme Workers.

ROLE OF VACCINES IN VETERINARY PREVENTIVE MEDICINE

By

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True art of medicine is not to cure disease but to prevent it. The object of Veterinary Preventive Medicine is to fortify the animal's powers of resistance, prevent the cause or causes of disease and prolong the useful span of life of an animal. It comprises of proper housing, proper nutrition, proper animal management and proper measures to combat infectious diseases.

Infectious diseases are caused by germs called bacteria and virus. Bacteria can be identified under a microscope while the virus is so minute that it is beyond the range of microscopic vision.

The following table gives the more common afflictions both bacterial and viral in different species of livestock :—

Nature of affliction.	Names of diseases occurring in			
	Cattle	Sheep	Fowls	Dogs
Bacterial	Black-quarter Haemorrhagic Septicaemia; Anthrax; Scours; Contagious Abortin.	Anthrax; Enterotoxaemia; Tetanus.		
Viral	Rinderpest, Foot & Mouth Rabies, Pox.	Sheep-pox.	Ranikhet; Fowl-pox.	Distemper; Rabies.

The losses sustained annually either due to mortality or by affecting seriously the productive capacity viz. meat, milk or egg yield, draught capacity and breeding efficiency, easily run into crores of rupees.

It will thus be seen that to the extent this loss is minimised to that extent it will be a distinct contribution to the development of livestock and in turn to the building up of national wealth.

We shall now see how very useful these vaccines are in trying to achieve this object.

Vaccines are biological products produced out of the germs responsible for the disease itself. It is fairly well understood that after an attack of Small-pox, Measles or Typhoid a second attack is very rare. People once affected develop a state of resistance against that particular disease for a long time and sometimes for life time. This state of resistance or immunity as it is technically called is due to the presence in the blood and tissues, of certain chemical substances called anti-bodies which develop in the system as a result of infection by the germ. This state of resistance is 'specific' or in other words the immunity developed against one germ will not be useful in preventing infection from an entirely different germ.

It should now be clear that the germs which produce a specific disease can also persuade the system to produce anti-bodies against that particular disease. It is this property of the bacteria and viruses that is exploited in the manufacture of vaccines.

It may be mentioned here that all acts of responsive co-operation on the part of the individual go a long way to build up that resistance. It is here that the other aspects of Preventive Medicine like proper housing, nutrition and animal management come in to play their part.

Production of Vaccines

1. *Bacterial*.—It consists in growing the germ in a suitable artificial nutrient medium in flasks under regulated conditions and after obtaining the optimum growth either kill it or reduce its virulence. This is achieved by subjecting the growth either to heat or chemical treatment. In the latter method chemicals like Formalin, Phenol, etc., are used.

If the same disease can be caused by different strains of the same germ, then best results are obtained by making use of all the responsible strains in the manufacture of the vaccine. A vaccine thus produced is called a Polyvalent Vaccine.

2. *Viral*.—Unlike bacteria, virus for its growth requires contact with living cells. They are usually propagated in live animals. The virus is subjected to a series of passages in suitable animals until it loses its virulence and gets attenuated for the original host in which it caused the disease. Further when fluids or extracts of tissues, rich in

virus from that 'passage-host' are injected into the original host it induces production of anti-bodies.

Thus in the case of Rinderpest, goats are used to attenuate the virus; growing (embryonating) eggs for Fowl-pox and Ranikhet Viruses and calves for Small-pox Virus. The essential principle viz. making the germ weak in its capacity to produce the disease but preserve in it the quality of inciting formation of anti-bodies, remains the same as in bacterial vaccines.

Improved Techniques in Vaccine Production

Constant research is going on to improve the efficacy of the vaccines.

Bacterial:—Newer bacterial vaccines called Adjuvant Vaccines are giving promising experimental results for certain bacterial diseases like Black-quarter and Haemorrhagic Septicaemia. These Adjuvant Vaccines are ordinary vaccines which carry with them a chemical substance or substance in a fixed proportion. The commoner among such substances are Alum, Calcium-Chloride, Lanolin, etc. These substances though unrelated to the vaccines increase their potency. Hence these have been called non-specific stimulants.

Viral:—It has already been indicated that virus vaccines are fluids or extracts of tissues obtained after the passage of virus into suitable animal hosts. Keeping quality of these fluids or tissue extracts as such is very poor and their transport is naturally not easy. To overcome these difficulties a method called 'Freeze Drying' of vaccines has been highly developed. In this method the material is rendered powdery by drying under vacuum at a very low temperature. The powdered material is then put in ampoules and sealed. It is easier to keep, transport and use. Freeze-dried Vaccine material is dissolved in sterile saline before use.

Other points that make vaccination successful

To achieve the best results vaccination should be carried out at the right time. Factors that are conducive to the outbreak and spread of diseases should receive careful study. In the case of seasonal outbreaks of diseases like Haemorrhagic Septicaemia, vaccination should be done well ahead.

The technique of administering the vaccine is as important as the product itself. Faulty technique may lead to wrong assessment of the vaccine itself which is not fair.

This should give you a rough idea of how vaccines are produced and how they act.

I. C. A. R.

Farm News Releases

Keeping sheep healthy. Things to avoid.—Sheep are subject to ailments, parasites and diseases like other farm animals. These can be prevented to a great extent by taking certain precautions.

Sheep fall ill if grazed on land where there is water stagnation or grazed on rank or lush grass. Allowing them to drink stagnating water and bedding them on filthy, wet ground also upset the health of sheep. A sudden change from a dry pasture to an abundant green grazing will also cause sheep losses. Overstocking sheep in a limited area not only will result in the destruction of the useful grass, but land will be fouled with dung and urine. On such lands, external and internal parasites or wet and unhealthy conditions will give rise to cold, cough, pneumonia and diarrhoea.

Sheep bred and reared in a particular area develop a natural resistance to the ill-effects of parasites or diseases of the area. When rearing a new breed or changing the sheep to a new area, this point also must be remembered.—No. 257.

* * * *

Wounds in sheep. Treatment recommended.—The skin of sheep being thin, they commonly get wounds, especially when the grazing area is bushy and full of thorns.

The first step to take in such cases is to control the bleeding. Next, the wound should be cleaned by water with some antiseptic like potassium permanganate or phenyl lotion. The affected part should then be covered by a dry dressing powder if the hurt is fresh.

If pus is formed in the wound, it will have to be cleaned every day and treated with sweet or coconut oil containing zinc oxide, boric acid and a small quantity of iodoform. If the wound is big, it should be bandaged.

Neglect leads to complications.—No. 259.

Association News

THE BOMBAY VETERINARY MEDICAL ASSOCIATION

**Proceedings of the 32nd Annual Conference
held at the Bombay Veterinary College, Parel, Bombay-12,
on the 17th and 18th November, 1956.**

1st Day: 17th November, 1956.

The Chief Guest Shri Salebhoy Abdul Kader, Mayor of Bombay, punctually arrived at 4-30 p.m. and was received by the President of the Association Dr. D. S. Laud and Dr. F. S. Khambatta, Chairman of the Reception Committee. Dr. D. S. Laud, introduced to the Chief Guest the Secretaries of the Association, Drs. K. V. Divekar and V. G. Khare, the Treasurer Dr. S. V. Sakhadeo, Dr. S. R. Chadha, the Director of Veterinary Services, Bombay State and members of the Reception Committee and the Managing Committee of the Bombay Veterinary Medical Association.

A group photo with the Chief Guest was taken after which he was conducted to the amphitheatre of the College where the function was arranged. The Conference was largely attended.

Dr. F. S. Khambatta, Chairman of the Reception Committee and Principal of the Bombay Veterinary College, welcoming the Chief Guest and members attending the function, said, that he was very happy to have Shri Salebhoy Abdul Kader in their midst and to preside over the deliberations. Shri Salebhoy Abdul Kader, Dr. Khambatta said is a man of eminence in Bombay, having joined the Indian National Congress and the Bombay Corporation as early as 1930. Having joined the Municipal Corporation, he had worked in many of its Committees like the Schools Committee, Standing Committee, Markets and Garden Committee etc. He is an eminent social worker and takes keen interest in labour welfare. He is associated with the Government, in his capacity as a member of the Bombay Housing Board, member of the Milk Consumers Advisory Committee and member of the Central Board of Film Censors, Government of India. Recently he had been abroad to Saudia Arabia with a view to enquire into the difficulties of Indian Pilgrims to Haj.

Dr. Khambatta concluded his welcome speech by saying that it was in the fitness of things that such an eminent person as the Chief Guest, should preside over today's function.

Messages received on the occasion were read by Dr. V. G. Khare, Secretary, Bombay Veterinary Medical Association. Messages from the following persons, were amongst the prominent ones:—

- (1) Shri Mustafa Faki, Minister of Agriculture, Bombay.
- (2) „ M. M. Naik Nimbalkar, Minister of Public Works, Bombay.
- (3) „ B. G. Ghade, Minister of Forests, Bombay.
- (4) „ G. D. Tapase, Minister of Local Self Govt. and Fisheries, Bombay.
- (5) Dr. John Mathai, Vice-Chancellor, University of Bombay.
- (6) Rao Bahadur, V. R. Phadke, Ex-President, Bombay Veterinary Medical Association.
- (7) Rao Sahib T. Vinayaka Mudaliar, Editor, *Indian Veterinary Journal*, Madras.
- (8) Dr. H. G. Alfs, F.A.O. Expert on Animal and Food Production.
- (9) Shri D. N. Khurody, Milk Commissioner, Bombay.

The Secretary of the Bombay Veterinary Medical Association, Dr. K. V. Divekar, then read his annual report, briefly describing the activities and achievements of the Association, during the previous year.

The President of the Bombay Veterinary Medical Association Dr. D. S. Laud, then gave his Presidential speech. He discussed at length the advisability of amalgamating the Livestock Section of the Agricultural Department back with the Veterinary Department. He said that such a state of affairs existed in the rest of the Indian Union. He wondered why the State of Bombay alone should be singled out as an exception. He however hoped that ere long the position would be set at right and the Livestock Section restored to its right parents.

Dr. Laud deplored the poor scales of pay of Veterinary Officers obtaining in the Bombay State Veterinary Services and the Bombay Municipal Corporation. He suggested that the pay scales should considerably be improved to have more efficient service from its officers. He recommended that the pay scales in Bombay should be at least on par with those obtaining for similar other officers in Uttar Pradesh or Hyderabad (now Andhra Pradesh).

Dr. Laud also acquainted the house with the present state of affairs of the Bandra Slaughter House. He suggested that the present Slaughter House be shifted either to Trombay or some other place.

Dr. Laud after welcoming the Chief Guest, offered flowers in the Indian style and requested him to address the gathering.

The Chief Guest rose amidst cheers to address the audience.

In his opening address Shri Salebhoy reviewed the position of Livestock in Indian economy and endorsed that no pains should be spared to develop and improve the Indian Livestock by planned and systematised animal management and sound breeding policy.

He suggested that Veterinary Education should be reoriented so that it could be properly utilised to meet the requirements of the major rural projects and eradication of diseases which would need more and more persons imbued with the faith and philosophy of land transformation through better animal husbandry.

He said that there was a great dearth of qualified Veterinary personnel in the country. Veterinary Education in other countries was on par with Medical, Legal and Engineering education and a Veterinarian in the field of Public Health, disease control and research works shoulder to shoulder with medical men. He questioned why this should not be in this country.

Shri Kader, therefore expressed his surprise that there is no statutory Veterinary Council in India to control the Veterinary profession.

He also deplored the fact that the horse, which is a means of transport in a vast country, like ours, should be neglected and the horse breeding industry be allowed to degenerate. He made a strong plea for efforts to give an impetus to the horse breeding industry.

In reply to the President's suggestion about the Slaughter House, Shri Kader, disclosed that an ambitious scheme for the construction of a modern and up-to-date Slaughter House for Bombay City was to be implemented at Deonar. The scheme which was expected to cost one crore of rupees, would be equipped with cold storage installations, waste elimination plants and latest equipment and machinery for processing the by-products.

The Mayor requested the Veterinary profession to help the Corporation in the matter of seizure and destruction of stray dogs in the City. He said that nearly 12,000 dogs are caught every year and nearly 10,000 of them are destroyed. The present method of catching dogs and putting them to sleep was by no means humane. Numerous complaints from sentimental public have been received in the matter. He enquired whether the Veterinary profession suggested the castration of all male stray dogs, so as to prevent this indiscriminate propagation, and also to make them docile and less harmful to the public.

At the end of the speech the Chief Guest thanked the Association for inviting him for the occasion and expressed his appreciation on the working of the Association and wished it all luck.

After the address of the Chief Guest, Dr. Chadha, Director of Veterinary Services, Bombay State, in proposing a vote of thanks, assured the Mayor, full co-operation in the activities of the Corporation to improve public health of City.

The Session then broke for light refreshments arranged on the lawns of the College ground. The Chief Guest, the delegates, the invitees and the College students participated in the function. In the evening a film show was arranged in the amphitheatre for the benefit of the delegates and College students.

Four films from the Imperial Chemical Industries *viz.* (1) Making of good hay (2) Liver-fluke in Great Britain (3) A. I. in Great Britain and (4) Defeat diphtheria and three from Messrs. Burmah Shell, *viz.* (1) Malaria (2) Lord Shiv Danced and (3) Rival World were shown on the occasion.

With a vote of thanks the day's deliberation came to a close.

2nd day: 18th November, 1956.

The Session started at 9 a.m. with Dr. S. R. Chadha, in the chair. The following papers were read:—(1) Indications for use of Stilboestrol in Cows and Buffaloes, (2) Aneurysm of the Middle Uterine Artery in buffaloes and (3) Infertility in Buffaloes as a result of abscesses in the Vaginal Passage by Shri C. R. Sane, Cattle Sterility Officer, Bombay, and (4) A Metastasis of Horn Cancer to Parotid Lymph Node by Shri B. L. Purohit, Professor of Pathology, Bombay Veterinary College.

A lively discussion on all the papers ensued. The Chairman Dr. S. R. Chadha summed up the deliberations by requesting members to contribute more professional papers for such occasions. The Session then broke up for lunch and reassembled at 2-30 p.m. for the business session.

At the business session Dr. D. S. Laud, President of the B.V.M.A., presided.

Dr. K. V. Divekar, Secretary, B.V.M.A. read out the minutes of the last annual meeting held on 11th and 12th June, 1955 which was unanimously adopted.

The following resolutions were unanimously passed:—

1. Resolved to request the Government of Bombay and the Bombay University to take urgent steps to affiliate the Bombay

Veterinary College, on a permanent basis and institute Post-Graduate Degree Courses, in all branches of Veterinary Science.

2. In view of the formation of a bigger bilingual Bombay State, including Vidarbha, Marathwada, Saurashtra and Kutch, wherein the activities of the Animal Husbandry Department have been co-ordinated with the Veterinary Department, it was resolved to request the Government of Bombay to transfer the Animal Husbandry activities of the parent Bombay State to the Veterinary Department, which alone is basically competent to tackle the problems of Animal health, breeding and diseases.

It was also resolved that a Sub-Committee of the following persons should go into details about the above resolution and report its findings to the Managing Committee within a fortnight, so as to enable the latter to take further steps.

Members of the Sub-Committee:—

- | | |
|--------------------------------------|---------------------------|
| 1. Dr. K. R. Alur— <i>Convener</i> . | 5. Dr. S. G. Kshirasagar. |
| 2. „ C. R. Sane. | 6. „ K. V. Divekar. |
| 3. „ M. R. Marathe. | 7. „ C. S. Balakrishnan. |
| 4. „ F. S. Khamabatta. | |

3. Resolved to recommend to Government that a Veterinary Officer, when he is not provided with Government quarters, be paid a house rent allowance of ten percent of his pay, instead of the flat rate of Rs. 10/-.

4. Resolved to request the Bombay Municipal Corporation authorities to raise the pay scales of the Veterinary staff, serving under them and bring the same on par with the pay scales of Government Veterinary Officers stationed in Bombay.

5. Resolved to request the Director of Veterinary Services, to see his way to arrange to keep the out-patient department of the Bai Sakarbai Hospital attached to the Bombay Veterinary College, closed on Sundays (except for urgent and emergent cases) as is done with all Veterinary institutions, Medical dispensaries and Hospitals in the entire State. It was also resolved that Veterinary Institutions which cannot be closed on Sundays due to Bazaar day falling on a Sunday, should be given the facility of closing the institution on any other day as an alternative.

6. Resolved that the Bulletin Committee appointed by the Managing Committee during last year, be requested to continue and to take urgent steps to publish the Bulletin at an early date. An amount of Rs. 300/- be kept at the disposal of the Editor of the Bulletin for

meeting the expenditure. It was also resolved to have the bulletin every quarter.

7. Resolved that a sum of Rs. 1000/- from the opening balance in the Bank for the year, be set aside as a Reserve Fund, in the form of National Plan Loan or Savings Cash Certificates.

8. Resolved to request Government to favourably consider the question of fixing the pay of old entrants upon the revision of pay scales recently introduced.

9. Resolved that the Bombay Municipal Corporation authorities be requested to adopt some humane method of catching stray dogs and castrate the male dogs, if necessary so as to prevent their indiscriminate breeding.

10. Resolved that the action taken by the Secretaries in registering the Association with the Charity Commission under the Public Trust Act, be approved.

11. Resolved that the action taken by the secretaries in appointing Shri G. N. Joshi, as an Auditor for auditing the accounts of the Association for the year 1953 to 1955 and the payment of fees at the rate of Rs. 25/- per year, be approved.

12. Resolved that the appointment of Shri G. N. Joshi, as an Auditor for the year 1956 and for the payment of his fees of Rs. 25/- for the year be approved.

13. Resolved that the Director of Veterinary Services, Bombay State, Poona, be requested to allow the Divisional Veterinary Officers to convene Conferences of Veterinary Officers in their divisions at least twice a year, so as to enable the Veterinary Officers to exchange their views and discuss professional matters.

14. Resolved that the President and Secretary of the D.J.C.C. be requested to expedite in the matter of settling the accounts at an early date and convene a final meeting for the purpose, since the matter is pending for a long time.

15. Resolved that Dr. S. R. Rao, Parasitologist, Bombay Veterinary College, though a non-veterinarian, be enrolled as a member of the Association, as a special case.

After passing the resolutions the house took up the question of election of office-bearers for the ensuing year. The following were unanimously elected:—

- | | |
|--------------------|---------------------------------------|
| <i>President</i> | ... Dr. D. S. Laud. |
| <i>Secretaries</i> | ... Drs. K. V. Divekar & V. G. Khare. |

Treasurer	...	Dr. S. V. Sakhadeo.
Members	...	1. Dr. S. K. Deshpande.
	...	2. " M. Y. Bhatvadkar.
	...	3. " S. R. Nadgir.
	...	4. " M. N. Mannavi.
	...	5. " C. S. Balakrishnan.

After a vote of thanks to the Chair and Vande Mataram, the session came to a close.

K. V. DIVEKAR,
Hon. Secretary.

Review

The Physiology and Bio-Chemistry of Lactation.—By S. J. Folley, Head of the Physiology Department, National Institute for Research in Dairying, Shinfield, Reading, Berks. Published by Oliver and Boyd. Sh. 18/6.

The subject matter of this book is the series of lectures delivered by the author at the College de France, where he was invited as a visiting Professor. This field of work had occupied the Physiology Department of the National Institute for Dairying for many years and Dr. Folley has offered in this book an up-to-date, critical and authoritative review of present knowledge of the complex physiological and bio-chemical processes involved in the growth and function of the mammary gland. A full list of references is appended, and there are many excellent illustrations.

The book will be found useful for students of Veterinary Science and Animal Husbandry, and very valuable for those doing post-graduate teaching and research in the subject of Lactation.

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I, T. Vinayaka Mudaliar, hereby declare that the particulars given above are true to the best of my knowledge and belief.

T. VINAYAKA MUDALIAR,
Publisher and Editor.

Dated 1st March 1957.

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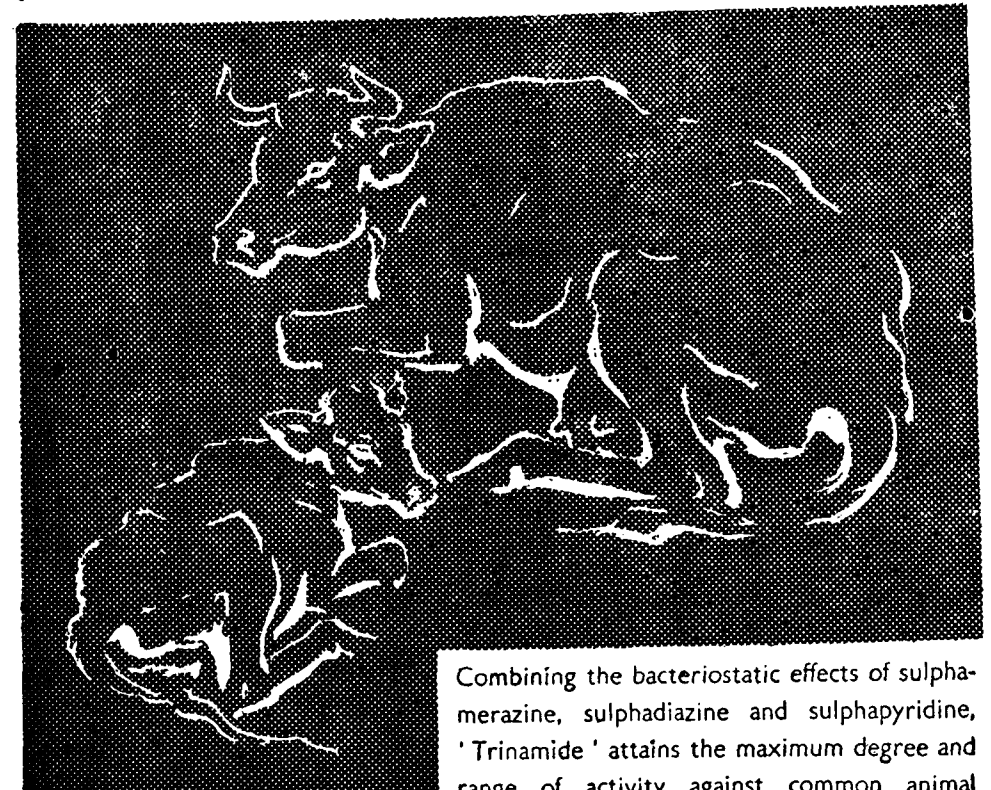
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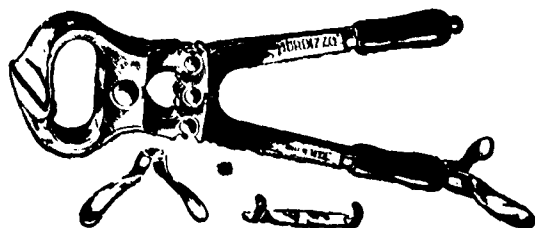
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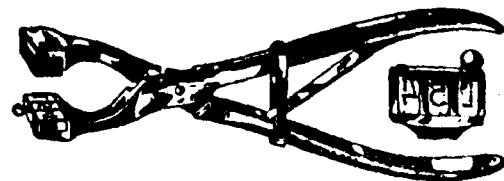
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