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(The Journal of the All-India Veterinary Association)

A Bi-Monthly Record of
Veterinary Science

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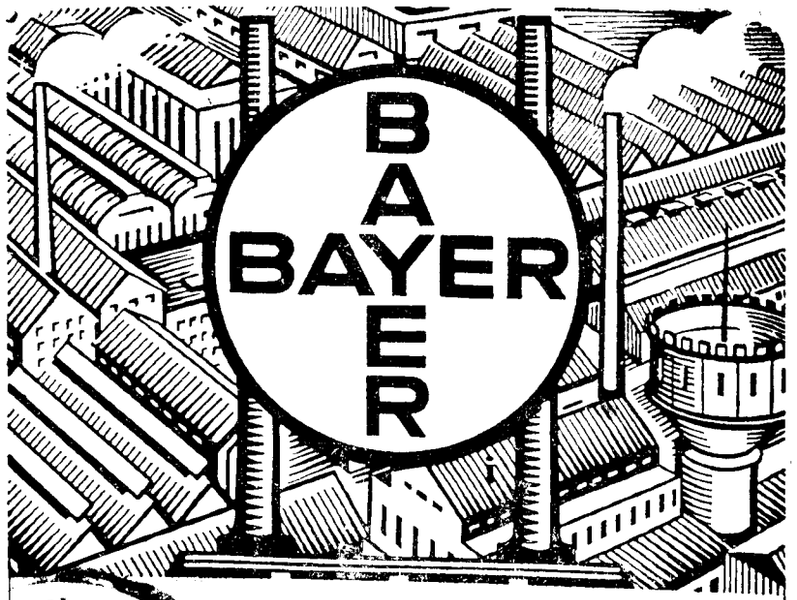

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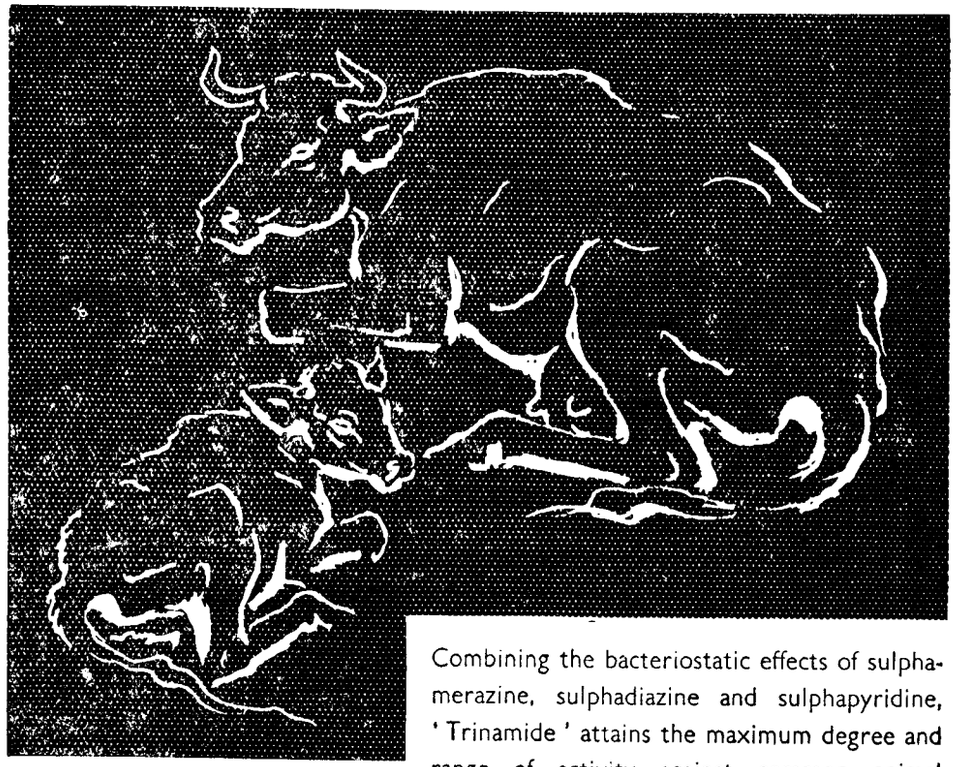

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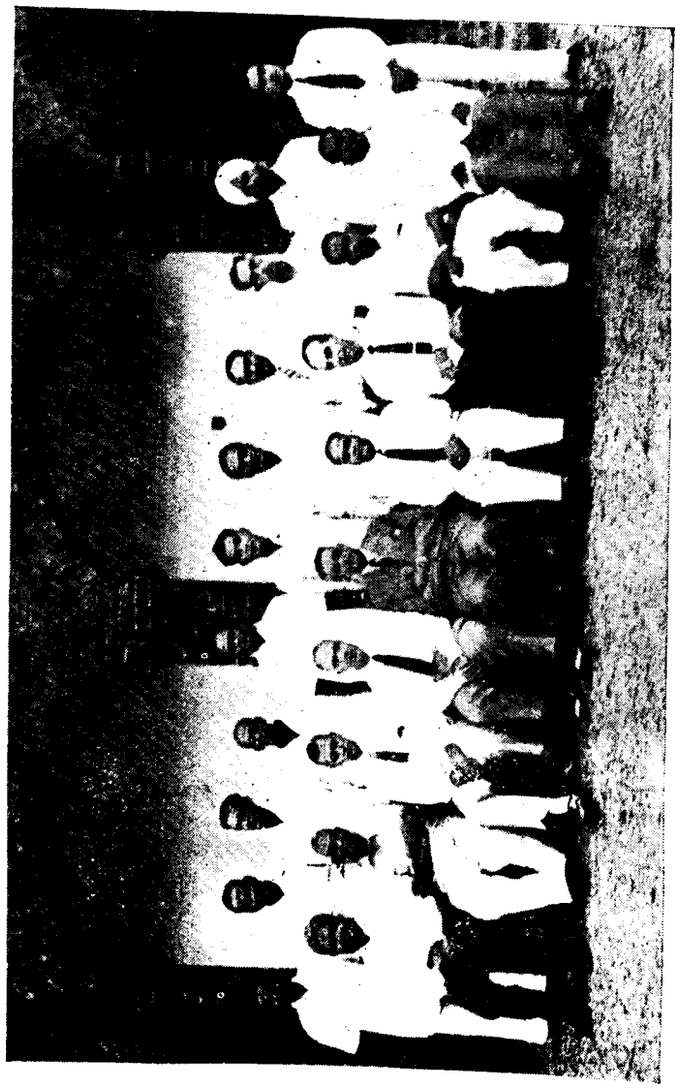

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THE

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Editorial

BLOCK DEVELOPMENT SCHEMES

There is a plethora of names to-day in our land for the several development schemes of rural India. Some are known as Community Projects, others as National Extension Schemes and some others as Block Development Centres and still some more as Rural Welfare centres, etc. In the ultimate analysis, the object of all these several schemes is the same, ***viz.*** to bring about a rapid development of rural India and uplift the common man from the "morass of fear and suffering and make him a king in his own right"—to use the language of Pandit Jawaharlal Nehru.

Then, why this multiplicity of names and even of control and direction? Some are under one Department and a few others under other Departments. We wish a suitable nomenclature is decided upon for the whole of India, for all such schemes, to avoid confusion of thoughts, ideas and even clashing of interests. It must be an inspiring name for service and sacrifice and must be self-explanatory.

In our last issue we published an article on "Co-operative Extension Work in U.S.A." by Mr. G. C. Juneja, Deputy Director, Department of Animal Husbandry, Uttar Pradesh. It is a very lucid and clear exposition of the National Extension Scheme that is working in that land. We commend it to all workers engaged on similar work in this country.

The 'Land Grant' is nothing new to India. The idea was well known and widely practised in this land in olden days. Such Land-grants or Inams or Endowments, were made to temples, Universities, Gurukulams, Institutions and even to

individuals. As a result, all these flourished in a manner that made it possible to develop that great culture of India, which even to-day evokes the admiration of the world. But,

> The old order changeth, yielding place to new,
> And God fulfills himself in many ways,
> Lest one good custom should corrupt the world.

India had to lie low for sometime and now she is up again and expects her sons and daughters to revive her past glory and even excel it, if possible. It is this spirit of dedicated service in the cause of the mother-land that should inspire the workers in all these centres of National Extension Schemes.

We draw particular attention to the care bestowed on the qualifications, training and selection of suitable personnel for all such items of work in America; and also the recruitment of women workers for home economics and to work with boys and girls in 4-H Clubs. Progressive farmers, their wives, daughters, etc., make a free gift of their services, on an average for about 15 days in a year and even they have to undergo training before being allowed to identify themselves with the N. E. Schemes.

Mr. Juneja's article is quite timely as we find more and more Development Centres are coming into existence every day. These Centres have begun to subscribe for this journal and we feel we must cater to their needs also. We therefore propose to reserve a small corner of this journal—The Block Development Corner—and invite contributions to that section. The articles must be extremely concise, precise and purposeful and easily intelligible to village level workers and rural folk. We invite articles on Animal Husbandry matters to that section, more particularly from workers in that field. Short reports on the plan of work proposed and pursued at State-level will be helpful to exchange notes between workers in several States. The Farm News Releases of the I.C.A.R. will be clubbed with this section.

We have made a beginning in this New Year issue itself and we seek the co-operation of all to make this section a success. To the extent this co-operation is forthcoming, this section will be kept open, in spite of great pressure on our space.

INDIGENOUS DRUGS IN VETERINARY MEDICINE

A vigorous plea for research into Indigenous Drugs employed in Veterinary practice, is made out in an article that is appearing in this issue by Mr. Ajit Singh and Mr. J. D. Kohli of the Central Drug Research Institute, Lucknow.

We agree when they say " Indian *masses* have been slow to adopt modern Veterinary system of medicine. No doubt poverty and illiteracy are very largely responsible for such apathy of the common man towards modern Veterinary Medicine, but one important reason has been a strong belief of the Indian Farmer in the old system of medicine which has been considered satisfactory. The generations old prescriptions of decoctions and infusions (karhas of country medicines) known to the village elders and experts have a strong hold on rural India and are still practised largely in the villages. There is a clear indication to probe into this wide field and search out whatever is good and of proven utility for introducing the same into the modern Veterinary medicine". Not merely on grounds of conservatism of the Indian ryot that research into indigenous drugs is called for, but even on grounds of economy, as has been rightly pointed out by the authors. At present " the cost of treatment sometimes exceeds even the value of the animal. Surely, the masses cannot afford such treatment any they would rather forego the animal and let it die than pay for the costly treatment." This is a tragic fact within the common experience of many practitioners. Can the poor Indian ryot—why even a middle class man—afford to pay for the Antibiotics of the present day which are at times "necessary and indispensable". The authors therefore plead that " the only way in which drugs can be made cheap and brought within the means of the masses is to utilise the local resources and substitute the expensive imported preparations by indigenous products".

They also point out " the considerable progress made in pharmacological research into indigenous drugs employed in human medicine" under the illustrious leadership of Col. R. N. Chopra and Dr. B. Mukerji. Several Schools and Colleges of

Indian Medicine have come into existence and several of the men passing out of such institutions are making very successful practitioners. And now, what of the Veterinary Medicine ? Here is again another field for young and purposeful Veterinary Graduates to turn their attention to. Here is again another field for men at the helm of affairs to plan for an ambitious programme of research at all Veterinary Colleges and Research Institutes under the Second Five Year plan. We wish the subject receives the attention it deserves. There should be a comprehensive and sustained effort in this direction. Fitful, inadequate and incomplete efforts go only to discredit the entire system of Indian Medicine. None outside a bedlam can ever think of replacing entirely the allopathic system of medicine. Let us have the best from every system and at comparatively lesser price to suit the economic condition of the people of this land.

The authors have given a very useful list of plants used in Indian Medicine ; but they must be made available in some form or other in the market for members of the profession to prescribe. As and when such drugs pass the test and leave the portals of a Research Institute, they must be properly publicised. A Veterinary Materia Medica of all such drugs should also appear as early as possible. We know all these will be done ; but what is needed is 'speed' on the part of all concerned more particularly on the part of the Government, whose wheels seem to be set only for a certain rate of progression in spite of gigantic planning and still more gigantic allocation of funds. Unless they move, the Officers can't move. We appeal that definite steps should be taken at every State-level to bring this Indian System of Veterinary Medicine into its own.

EPIZOOTIC LYMPHANGITIS

We draw attention to an article on 'Epizootic Lymphangitis' by Major Sunder Singh that is appearing in this issue. It is based on a wealth of experience that does not ordinarily occur to a practitioner in the field, with regard to this disease.

The atypical cases described, starting with only a pin-point lesion on the conjunctiva, preceded by mere watering of the eye, should put the practitioners on the guard to be watchful. The old practice of suspecting this disease only in cases of 'Corded lymphatics' needs revision. The concurrent infection of Strangles is sometimes reported in such cases and that has been the experience of Major Sunder Singh also. A good photograph of the infection in and around the eye would have been helpful. Major Sunder Singh has done well in recording his experience with this disease and we expect he will give us in due course, the benefit of his 'Follow-up' report on his E. L. branded cases.

MEMOIR

G. RAMANUJACHARI, B.SC., G.M.V.C., B.V.SC.,
Professor of Parasitology, Madras Veterinary College.

We deeply regret to record the sad and sudden demise of Sri G. Ramanujachari of *Leuchemia* on Saturday the 10th December 1955 at his residence in Triplicane. He was 42 years of age and leaves behind a young widow with three daughters. A promising young life has been cut off in the middle of its career. He was a regular contributor to our Journal and has so far published about 20 papers. He was not a little instrumental in establishing the Post-graduate course in Veterinary Parasitology in the Madras Veterinary College.

We offer our heartfelt condolences to the members of the bereaved family.

Original Articles

STUDIES ON THE IN-VITRO EFFECT OF CERTAIN CHEMOTHERAPEUTIC AGENTS ON THE ORGANISM OF CONTAGIOUS CAPRINE PLEURO-PNEUMONIA

By

M. R. Dhanda, L.V.P., M.S. (Michigan), Dip. Bact. (London).,

and

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Indian Veterinary Research Institute, Mukteswar-Kumaon, U. P.

In the widening field of the application of various antibiotics and other chemotherapeutic agents for the treatment of bacterial rickettsial and viral diseases, the study of the effect of some of these agents on contagious caprine pleuro-pneumonia (C. C. P. P.) organism was considered necessary. This study was felt all the more important since reference to the literature available revealed that information on the subject was rather meagre.

Contagious caprine pleuro-pneumonia is a greatly dreaded scourage to goat industry in the country. Every year flocks of goats are wiped off in various parts of India. Control of this disease would, no doubt, depend on the evolution of an efficacious vaccine (work on this is in progress at this Institute) but effective treatment of the affected animals has obviously got its own importance. It was in search of the latter that investigation was taken up to study at first the in-vitro effect of some of the antibiotics and chemo-therapeutic agents on contagious caprine pleuro-pneumonia organism.

Review of Literature

As has been indicated, there is paucity of literature on the effect of antibiotics and sulfonamides on C. C. P. P. organism. Hagan (1951) stated that sulfa drugs and penicillin has little effect if any on members of the pleuro-pneumonia group of organism. (Apart from this no reference could be found in the literature available regarding the activity of antibiotics on the organism). Of other chemotherapeutic agents arsenical preparations have been tried by various authors for the treatment of the disease in goats. Novarsenol (Il' inov, 1938), Neo—salvarsan (Viswanathan *et al*, 1947) novarsenobillon (Viswanathan *et al*, 1947, Gopalakrishnan, 1946, and Manjrekar, 1950) are reported to have been tried in cases of contagious caprine pleuro-pleumonia with encouraging results.

Regarding the treatment of contagious bovine pleuro-pneumonia (C. B. P. P.), Malfroy (1940) reported that all affected animals recovered when treated in good time with M & B 693. Gargadennec (1940), summarising results of treatment of C. B. P. P., however, reported comparatively much better results with novarsenobenzol than with lysococcine (Sulfanilamide in acetylmethylamine solvent) and M & B 693. Salvarsan, 0.6 to 65 g per 5 kg. body weight given in two injections at 5–6 day interval was found to be effective against C. B. P. P. by Chen (1945). Mornet *et al* (1949), studying the in-vitro effect of antibiotics on contagious bovine pleuro-pneumonia organism, found that up to 30 mg. of penicillin per ml. of the medium used had no untoward effect on the organism (10,000 Oxford units Penicillin = 6 mg. sodium penicillin G). Regarding streptomycin, the authors observed that the antibiotic, in concentration of 0·02 mg. per ml. and upwards, exerted bactericidal effect on C. B. P. P. organism.

Neo-arsphenamine and acetarsan showed beneficial effects in the treatment of sheep agalactiae (Bridre *et al*, 1928) and in pleuro-pneumonia of cattle (Witt, 1925). Findlay *et al.*, (1940) who studied the effect of various chemotherapeutic agents on pleuro-pneumonia like organism (P. P. L. O.), yet another member of Pleuro-pneumonia group of organisms isolated from rodents, found that sulfanilamide and sulfapyridine had no action on the organism whereas neoarsphenamine and acetarsan showed slight activities in preventing the development of symptoms in mice. Powell and Rice (1944) showed that administration of penicillin by different routes had no chemotherapeutic value on the treatment of arthritic rats infected with pleuro-pneumonia like organisms. Melen (1952) studied the susceptibillity of P. P. L. O. to the in-vitro action of antibiotics and got similar results with regard to penicillin. He found that minium inhibitary concentration of streptomycin was 5–10 ug/ml. and that of chloroamphenicol was 2·5 to 10 ug/ml.

Material and Method

The virulent strain of contagious caprine pleuro-pneumonia organism used in this study was isolated from a natural outbreak of the disease in the field some years ago which has since been maintained in Bennett's (1932) broth by subculturing at ten days intervals : after every ten such serial tube passages the strain being passaged through healthy goats and recovered at the height of the post inoculation reaction.

The following antibiotics and chemotherapeutic agents were employed to study their in-vitro action on the virulent strain of the organism.

(*a*) Penicillin-sodium G.
(*b*) Dihydro-streptomycin (Eli Lilly and Company, U.S.)
(*c*) Chloromycetin.
(*d*) Novarsenobillon (Neo-arsphenamine, B. P. (May & Baker)
(*e*) M & B 693 (Soluble).
(*f*) Sulfamezathine (33⅓% solution, I. C. P. U. K.)
(*g*) Soluseptasine. (May & Baker).

Under sterile precautions solutions of different suitable concentrations of the agents were prepared in distilled water. In the case of Chloromycetin, stock solution of the antibiotic was prepared by dissolving the contents (250 mg) of a " Kapseal " in 5 ml. of a mixture of 3 ml. of distilled water and 2 ml. of 70% alcohol by the application of slight heat. The action of the various drugs was studied in tubes containing 4·5 ml. of Bennett's broth. To each tube 0·5 ml of a suitable solution of drug was added such that the desired concentration was obtained. The tubes were inoculated with five drops of 1 : 100 dilution of 48 hour old C. C. P. P. culture by Pasteur pipette (delivering 15 to 20 drops to a ml.) keeping a positive control tube of the broth without any drug as well as one uninoculated tube of the treated broth to serve as negative control. The Benett's broth tubes were incubated at 37°C, with the plugs paraffined, to prevent evaporation during incubation period.

Test for growth:—The tubes were carefully examined every 24 hours for evidence of growth normally manifested by slight but distinct opalescence, well appreciated in diffuse transmitted light by comparing with the positive and negative controls.

At the end of the 5th day of incubation a few drops from the tubes showing growth were tested on blood agar, plain agar and in plain broth to check that the opalescence was not due to contaminants. A few drops of the broth from tubes with no visible growth were inoculated into untreated Bennett's broth in order to examine whether the lack of growth of C. C. P. P. organism was due to bacteriostatic or bactericidal action of the agent.

Results

Susceptibility of the contagious caprine pleuro-pneumonia organism to the antibiotics and the other chemotherapeutic agents has been tabulated in Tables I to. VII.

It would be observed that penicillin did not have inhibitory effect on the growth even in as high a concentration as 100 international Units per ml.

While allowing growth in a concentration of 6·25 ug/ml. dihydrostreptomycin was completely inhibitory in a concentration of 12·5 ug/ml. This inhibition of growth was due to bactericidal effect of the drug, since no growth occurred in untreated Bennett's broth tubes inoculated with 0·5 ml. of the broth showing the inhibition. Similarly minimum inhibitory concentration of Chloromycetin was found to be 12·5 ug/ml. and the action was bactericidal in nature.

Out of the chemotherapeutic agents Novarsenobillon in a concentration of 125 ug/ml. completely inhibited the growth. Sulfamezathine proved inhibitory in concentration of 33·3 mg./ml. whereas 16·6 ug./ml. and the lower concentration failed to check the growth. M & B 693 as well as Soluseptasine in the concentrations indicated in table No. V and VII showed no inhibitory effect.

Discussion

Ineffectiveness of penicillin to inhibit the growth of contagious caprine pleuro-pneumonia organism is in conformity with the results reported by Melen (1952) regarding the in-vitro action of penicillin on pleuro-pneumonia-like organism of human origin, which grew even in a concentration of 800 International units per ml. According to Powell and Rice (1944) also, penicillin proved ineffective in the treatment of arthritic rats infected with pleuro-pneumonia-like organisms and Mornet et al (1949) got similar results in their work on the in-vitro action of the antibiotic on contagious bovine pleuro-pneumonia organism. Dihydrostreptomycin was found to be inhibitory in concentration of 12·5 ug per ml. and above, whereas Melen (1952) working on human strains of pleuro-pneumonia-like organisms found that minimum inhibitory concentration of dihdrostreptomycin was 20 to 80 ug/ml and that of streptomycin was 5 to 10 ug./ml. Mornet *et al* (1949) reported that streptomycin in a concentration of 0·02 mg/ml. i. e. 20 ug./ml.) exerted inhibitory action on the growth of contagious bovine pleuro-pneumonia organism. Inhibitory concentration of chloromycetin found in this investigation was almost similar to that reported by Melen (1952) for pleuro-pneumonia-like organism. Lack of inhibitory action of penicillin on the growth of the goat pleuro-pneumonia organism might prove to be of considerable help in the laboratory to get rid of some of the Gram fast contaminants. *e. g.* in isolating the organism from contaminated material, in cultivating the organism on developing chick embryo and also in purifying contaminated cultures of the organism. It may, however be brought out that it is not possible at this stage to state the effect penicillin will have on the virulence or some other characters of the organism.

TABLE I

Susceptibility of C.C.P.P. Organism to In-Vitro action of Penicillin.

Incubation period in hours.	Concentration of Penicil in per ml. of Bennetts' broth.															Positive control.	Negative control.
	100 i.u.*			50 i.u.			25 i.u.			12·5 i.u.			6·25 i.u.				
	NUMBER OF TRIALS																
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
24 hours	±	+	±	±	±	+	+	+	+	+	+	+	+	+±	+±	++	—
48 hours	+	+	+	+	+	+	++	+±	+±	+±	+±	+±	+±	++	++	+++	=
72 hours	+±	+±	+±	++	+±	+±	+±	++	++	++	++	++	++	++	++	+++	—
96 hours	++	++	+±	+±	++	++	++	++	++	++	++	++	++	++±	++±	+++	—
120 hours	++	++	++	++	++	++	++	++±	++	++±	+++	++±	+++	+++	+++	+++	—

* i.u. — International unit.

TABLE II

Susceptibility of C.C.P.P. Organism to In-Vitro action of Dihydrostreptomycin.

Incubation period in hours.	Concentration of Dihydro-Streptomycin per milli litre of Bennett's both.																		Positive control.	Negative control.
	10 ug.			50 ug.			25 u.g.			12·5 u.g.			6·25 u.g.			3·12 u g.			1·56 u.g.				
	NUMBER OF TRIALS																						
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
24 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	±	+	+	±	+	+	+	=
48 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	±	+	±	+	+	+	+	+	+	+	=
72 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	+	+	+	+	+	+	+	—
96 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	+	+	+	+	+	+	+	—
120 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	+	+	+	+	+	+	+	—

TABLE III

Susceptibility of C.C.P.P. Organism to In-Vitro Action of Chloromycetin.

Incubation period in hours.	Concentration of Chloromycetin per ml. of Bennetts' broth																		Control	Negative control
	50 ug.			25 ug.			12.5 ug.			6.25 ug.			3.12 ug.			1.56 ug.			0.78 ug.			0.39 ug.				
	NUMBER OF TRIAL																									
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
24 hours	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	±	±	+	+	+	+	+	++	—
48 hours	—	—	—	—	—	—	—	—	—	—	+	=	—	—	±	±	+	+	+	+	+	+	+	+	+++	—
72 hours	—	—	—	—	—	—	—	—	—	±	+	±	±	+	+±	++	++	++	++	++	++	++	++	++	++	+++	—
96 hours	—	—	—	—	—	—	—	—	—	+	+	+	+	+	++	++	++	++	++	++	++	++	++	++±	+++	—
120 hours	—	—	—	—	—	—	—	—	—	+	+	+	+	+	++	++	++	++	++	++	++	++	++	++	+++	—

TABLE IV

Susceptibility of C.C.P.P. Organism to In-Vitro Action of Novarsenobillon (N.A.B.).

Incubation period in hours.	Concentration of N.A.B. per ml. of Bennetts broth.															Control	Negative control.
	1000 ug.			50 ug.			250 ug.			125 ug.			62.5 ug.			31.25 ug.				
	NUMBER OF TRIALS																			
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
24 hours	—	—	—	—	—	—	—	—	—	—	—	—	±	±	—	±	+	+	++	=
48 hours	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	+±	++	++	+++	=
72 hours	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	++	++	++	+++	—
96 hours	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	++	++	++	+++	—
120 hours	—	—	—	—	—	—	—	—	—	—	—	—	+	+	+	++	++	++	+++	—

TABLE V

Susceptibility of C.C.P.P. Organism to In-vitro Action of M. & B. 693

Incubation period in hours.	Concentration of M & B 693 per Milli litre of Bennetts' broth.																		Control.	Negative Control.
	2000 ug.			1000 ug.			500 ug.			250 ug.			125 ug.			62·5 ug.			31·25 ug.				
	NUMBER OF TRIALS																			
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3		
24 hours	Contaminated	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	++	++	—
48 hours		++	+	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	±	++	++	=
72 hours		++	++	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	++	++	++	—
96 hours		++	++	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	++	++	++	—
120 hours		++	++	++	++	++	+	+	+	+	+	+	+	+	+	+	+	+	++	++	++	—

TABLE VI

Susceptibility of C.C.P.P. organism to In-vitro action of Sulfamezathine.

Incubation period in hours.	Concentration of Sulphamezathine (Active principle) per milli litre of Bennetts' broth.												Positive control	Negative control
	..33·3 mg.		16·6 mg.		8·3 mg.		4·15 mg.		2·08 mg.		1·04 mg.			
	NUMBER OF TRIALS													
	1	2	1	2	1	2	1	2	1	2	1	2		
24 hours	—	—	±	±	+	+	+	+	+	+±	+±	+±	++	—
48 hours	—	—	+	±	+	+	+±	+±	++	++	++	++	+++	=
72 hours	—	—	+	+	+±	+±	++	++	++	++	++	++	+++	—
96 hours	—	—	+±	+±	++	++	++	++±	+++	+++	+++	+++	+++	—
120 hours	—	—	++	++	+++	+++	+++	+++	+++	+++	+++	+++	+++	—

TABLE VII

Susceptibility of C.C.P.P. organism to In-vitro action of Soluseptasine.

Incubation period in hours.	Concentration of Soluseptasine (Active principle) per milli litre of Benetts' broth										Positive control	Negative control
	100 mg.		40 mg.		20 mg.		10 mg.		5 mg.			
	NUMBER OF TRIALS											
	1	2	1	2	1	2	1	2	1	2		
24 hours	±	±	±	+	+	+±	+±	+±	+±	+±	+±	—
48 hours	+	+	+	+±	+±	++	+±	++	++	++	++±	—
72 hours	+±	++	++	++	++	++	++	++±	++	++±	+++	—
96 hours	++	++	++	++	++	++±	++±	+++	+++	++±	+++	—
120 hours	++	++	++	++	++±	+++	+++	+++	+++	+++	+++	—

\+ = Visible growth of the organism.
— = No visible growth of the organism.

Leberman *et al* (1950) reported that non-inhibitory concentration of aureomycin and chloramphenicol enhanced the growth of pleuro-pneumonia-like organism. In this study however, as would be evident from table III, no such growth stimulating effect of the non-inhibitory concentration of chloromycetin was observed and this is in conformity with the findings of Melen (1952).

Minimum inhibitory concentration of Novarsenobillon-(neo-arsphenamine) was 125 ug/ml. of the broth and sulfamezahine inhibited the growth in a concentration of 33·3 mg/ml. It may be pointed out here that Novarsenobillon and other arsenical novarsenol, neo-salarsan, novarsenobenzol, salvarsan, neo-arsphenamine and acetarsan have given encouraging results in the treatment of conditions like Contagious Caprine Pleuro-pneumonia, Contagious bovine pleuro-pneumonia, agalactia of sheep and in some of the other infection caused by pleuro-pneumonia-like organisms, (Viswanathan *et al*, 1947 ; Gopalakrishnan, 1946 ; Manjrekar, 1950 ; Ill, inov, 1938 ; Gargadennec, 1940 ; Chen, 1945 ; Bridre *et al*, 1928 ; Witt, 1925 ; Findlay *et al*, 1940) Sulfamezathine, no doubt, inhibited the growth of Contagious Caprine Pleuro-pneumonia organism, but it will have to be verified if blood levels of 33·3 mg/ml. (inhibitory concentration of the drug) can be safely tolerated by the affected goats.

Summary

Susceptibility of a virulent strain of contagious carpine pleuropneumonia organism to in-vitro action of penicillin, dihydrostreptomycin, chloromycetin, Novarsenobillon (N. A. B.), Sulfamezathine, M & B 693 and soluseptosine has been studied. Bennett's broth was used as culture medium for these studies.

1. Penicillin proved ineffective even in concentration of 100 international units per ml. of the medium.
2. Minimum inhibitory concentration of dihydrostreptomycin and of chloromycetin was 12·5 ug/ml.
3. Novarsenobillon inhibited the growth of the organism in concentration of 125 ug/ml.
4. Minimum inhibitory concentration of sulfamezathine was 33·3 mg/ml. of the medium.
5. Soluseptasine and M & B 693 proved ineffective in the concentrations tried.

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MICROORGANISMS IN THE BUFFALO RUMEN

By

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The distinguished Dutch microscopist, Antoni van Leeuwenhock (1722) discovered living protozoa in the intestine of a frog. After a lapse of more than a century, Gruby and Delafond (1843) observed a variety of protozoa in the rumen of cattle and the caecum of horses. This gave an impetus to investigators like Stein (1858), Schuberg (1888) Fiorentini (1890) Eberlain (1890), Sharp (1914), Kofoid & Swezy (1915) and several others who identified and classified these rumen and caecum organisms into several families and genera. However, these investigators have considered these microflora and microfauna as parasitic in nature. It was Cleveland (1923) who pointed out that the termites feed upon wood by virtue of their intestinal microorganisms such as Calonymha grassii, Colotermes grassii, Dinenympha gracilis, Ditrichomornas termitis etc, which convert the wood substances into useful materials for the benefit of the termite. The very great economic

importance of these organisms in the rumen of cattle has now been well established by the brilliant investigations of Baker, Huffman, Phillipson, Hastings, Hungate and several others. During 1950-53, Bloch and Associates, as well as Hale and Garricus, working with radio active sodium sulphate isotopes demonstrated that the tagged sulphur was rapidly transferred into the sulphur containing amino acids of the rumen bacteria. These amino acids were further traced to the mammary tissues where they were duly transformed into the milk casein. This is indeed a conclusive proof of the role of microorganisms in the rumen. However, no literature is available regarding these organisms in the rumen of buffalo. In this article the preliminary findings are presented with phomicrographs of various types (Fig. 1).

Methods

Samples were taken from the contents of rumen, abomasum, deodenum, jejunum, ileum caecum and colon of more than one hundred buffaloes of different ages which were slaughtered on different days in the local slaughter-house. These samples were examined within half an hour after collection. Several staining techniques were employed in order to appraise fairly accurately the rumen microorganisms and the following were finally adopted. (1) The smears were air dried and fixed with methyl alcohol, stained with Haematoxylin and eosin, dehydrated with acetone and xylol series (acetone 95 cc, Xylol 5 cc; Acetone 70 cc, and Xylol 30 cc; acetone 30 cc, and Xylol 70 cc ; Xylol pure). (11) Kofoid modification of Iodine-Eosin:- Eosin, saturated in physiologic saline 2 cc., Iodine solution (physiologic saline 100 cc, potassium iodide 5 grams, Iodine to saturate) 1 cc., and physiologic saline, 2 cc. A drop of rumen liquid was placed on a clean slide and near it a drop of iodine-eosin stain was placed and both covered with a cover-slip. The protozoa appear yellow or brown and the bacteria pink. This is a quick method of examining. (111) Grams stain. (IV) Casatres-Gill or Plimmer and Paine (1921) method modified by Thacher (1926) and Loffler's Method for flagella and cilia. (V) Nigrosine or collargal for counting the microorganisms. The contents of the various parts of the digestive tract were taken in muslin cloth and the liquid sqeezed out into a clean sterile beaker. Wenyon's 'Protozoology' (1926) and several other literature were used for identification.

Results

The rumen of buffalo appear to contain more varieties than what is normally observed in cattle, sheep or goat. There is also individual variation in the sense that all the varieties are not found in the same individual, however, there are some varieties which are common in all the individuals. There is also variation in the dimensions of these

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By

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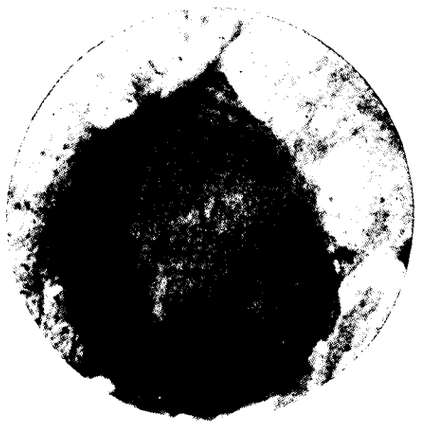

Fig. 1

A very large Ciliate—202 by 176 microns.

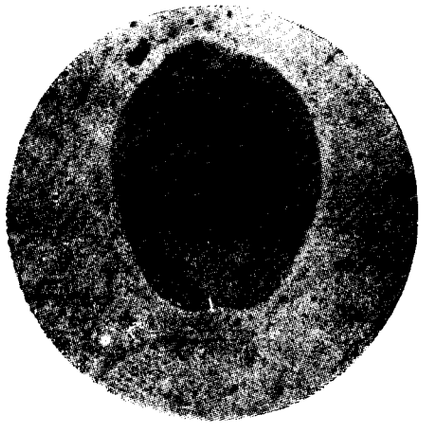

Fig. 2

Oval-Shaped Ciliate—128 by 92 microns.

Fig. 3

A very Common Ciliate—70 by 40 microns
A few rods are also seen.

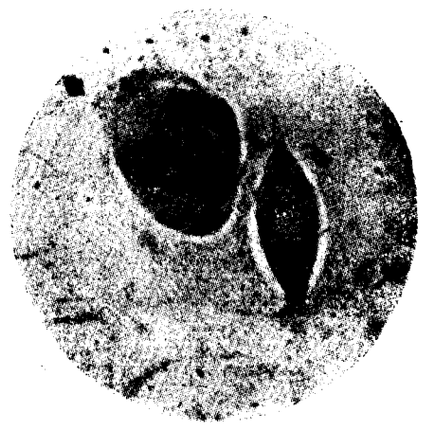

Fig. 4

A large Ciliate— 106 by 80 microns.

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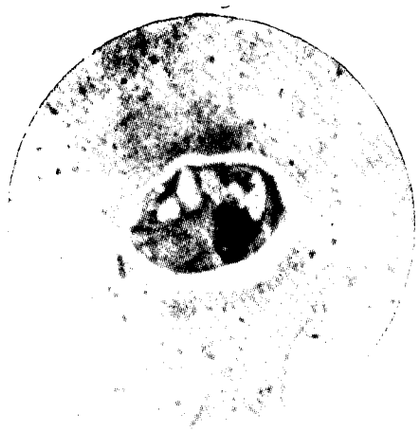

Fig. 5

A very Common Ciliate 66 by 30 microns.

Fig. 6

An organism with a spindle-shape body, elongated anterior—15 by 12 microns with a long tail 60 microns in length—Lachrymariaolor Butchli. Few samples had this organism.

Fig. 7

Club-shaped organism 78 by 19 microns.

Fig. 8

A large Cigar-shaped bacterium 22 by 4 microns with smaller rods.

organisms especially the protozoal variety. In the following table the microflora and microfauna of the buffalo digestive tract are presented. In protozoa only the genera is indicated but not the species since it is possible for other investigators to go into more minute details and establish the particular species of the buffalo rumen.

Microorganisms in different parts of the digestive tract of the Buffalo.

Protozoa & Bacteria	Rumen	Abomasum	Deodenum	Jejunum	Ileum	Caecum	Colon
Protozoa.							
Blepharoconus (Gassowsky) ...	×	—	—	—	—	—	—
Blepharosphaera (Bundle) ...	××	—	—	—	—	—	—
Butschlia (Schuberg) ...	×××	—	—	—	—	—	—
Callimastix (Braune) ...	×	—	—	—	—	—	—
Dasytricha (Schuberg) ...	××	—	—	—	—	—	—
Diploidinium (Schuberg) ...	××	—	—	—	—	—	—
Entodinium (Stein) ...	×××	—	—	—	—	—	—
Entotrichomastix (Kofoid) ...	××	—	—	—	—	—	—
Microsporidia (Leger) ...	×	—	—	—	—	—	—
Paraisotrichopsis (Gassowsky) ...	××	—	—	—	—	—	—
Prorodonopsis (Gassowsky) ..	×	—	—	—	—	—	—
Selenomastix (Woodcock) ...	××	—	—	—	—	—	—
UNIDENTIFIED ...	×××	×	×	×	×	×	×
Bacteria.							
Planosarcina ...	×	—	—	—	—	—	—
Micrococci motile ..	×	—	—	—	—	—	—
GX very large round coccoid ...	×	×	×	×	×	×	×
—— —— ovoid —— ...	×	×	×	×	×	×	×
GX. Thick square-end rods ...	××	—	—	—	—	—	—
GN. large cigar-shape rods ...	×××	×	—	—	—	—	—
GN. short rods in groups of 4 ...	×	—	—	—	—	—	—
GN. rods like coliform ...	×	×	×	×	×	×	×
UNIDENTIFIED ...	×	×	×	×	×	×	×

Rating : X few ; XX moderate ; XXX many.
GX Gram positive ; GN Gram negative.

The protozoal organisms listed in the above table are ciliates of different genera observed in various rumen samples of buffaloes. The actual number of these species varied rather widely and in no single sample all these varieties were found. It is interesting to note that the total number as well as the varieties of organisms observed in the buffalo rumen are far greater than what has been reported in the cattle rumen. This is understandable in the sense that the buffaloes have greater access to dirty and stagnant water which harbour more microorganisms and therefore greater opportunity to injest more microflora and

microfauna than the cattle. The presence of these protozoal organisms in the rumen of the buffalo and their absence in the rest of the digestive tract indicates that the fate of these organisms is identical with those of the cattle rumen organisms. Since there is nothing in the literature regarding the buffalo rumen organisms it would be interesting to know what role similar organisms in the cattle rumen play.

Schwarz (1925) observed that one-third of protein in feed is converted into the protein of the microorganisms in the rumen of cattle and that these organisms were not parasitic but in some way assisted greatly the mechanical action of mixing and macerating the rumen contents. Ferber (1928) and Ferber and Winogradowa-Federowa (1929) regarded the rumen protozoa as symbionts and that the protein which was built up in their bodies were utilized by the host animal after their destruction in the omasum. Huffman (1941) observed adverse effects in cows whose rumen contents were completely removed through a rumen fistula and continued feeding of the same ration, however, the animals recovered quickly when once they were given fresh rumen contents of normal animals. Hastings (1944) in his masterly review of the significance of rumen organisms in cattle pointed out that ruminants thrive on the microflora and microfauna which are constantly removed to the true stomach where under acidic conditions they are killed and digested. Baker (1939) noted the disorganization of the protozoa during which the cytoplasm shrink and the nucleus looses its shape. Phillipson (1946) observed that variations in the type of rumen organisms might be due to variations in the feedstuff. Hibbs (1948) artificially produced the rumen organisms in young calves by feeding them with rumen materials of adult animals and observed that such of those calves which had earlier rumen organisms looked better than those which were maintained as controls. Pounden (1950) believes that the fate of rumen organisms varies between complete destruction and utilization as well as a free passage for some of them through the digestive tract. Recent experiments of Warner *et al* (1955) indicate that dry feed and hay feed have different effects on the microflora and microfauna of the rumen.

The story of the rumen bacterial flora is somewhat spectacular. Mangold (1933), Pochon (1935), McAnally & Phillipson (1944) and Hungate (1944) believed that the rumen bacterial flora in cattle, considerably aided in the cellulose digestion, which as per Hale, Duncan and Huffman (1947) was complete in 12 hours. McNaught and Owne (1949) reported that iron in feed was essential for the growth of the rumen bacteria and others have also found that cobalt is also essential for the growth of the bacteria. The synthesis of vitamin B was first pointed out by Bechdel *et al.* (1928). Carrol and Hungate (1950) demonstrated that the amount of propionic, butyric and acetic acids

produced by the microbial fermentation is capable of answering 70 percent of the energy requirements of the host. An interesting experiment was conducted by Emery, Smith, Salsbury and Huffman (1955) very recently. They incubated fresh rumen liquid anaerobically with added substate and radioactive inorganic sulphate as tracer. They observed that the grain microbiota incorporated greater amounts of sulphate than the so called hay microorganisms. The microradioautographs taken by these investigators indicate that only a few organisms have the capacity to synthesize the sulphur containing amino acids and that all the microorganisms are not gifted with this faculty. The recent work of Gibbons and Doetsch (1955) indicates that the rumen bacterial flora possess the power to hydrolze the polysaccha rides in the rumen. Bryant *et al* (1955) report that low facultative anaerobes, streptococci, coliforms, cellulolytic bacteria and lactate fermenting bacteria were observed in the rumen of a one-week old calf.

Conclusion

This report records for the first time several varieties of protozoal organisms as well as different groups of bacteria, in the rumen of the Buffalo. Most of them are similar to the ones observed by numerous investigators in the rumen of cattle, sheep and goats However, whether the functions of these microorganisms in the rumen of buffaloes are identical with those of the cattle rumen micro-organisms is a problem to be investigated.

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General Articles

EQUINE CRYPTOCOCCOSIS (EPIZOOTIC LYMPHANGITIS)

By

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Introduction

This article is intended to record the clinical experience gained in dealing with the cases of cryptococcus infections, commonly described as Epizootic Lymphangitis, in horses and mules of the Remount Depot, at Saharanpur.

This disease occurred amongst army horses and mules that were employed in great numbers during the World War II in the Middle East and eastern countries, more particularly in Egypt, Burma and India. The control of the disease was based on the then accepted policy of wholesale destruction of all affected animals whether diagnosed clinically or by laboratory methods. Very large percentage of army equine population was destroyed thus bringing the outbreak of the disease to a clinical end in 1946.

However again in 1948 the disease broke out amongst the horses and mules of the Depot and ever since cases of the disease have occurred and still continue to occur.

Nature of Disease

The disease has been described by Hutyra, Marek and Manninger as " Epizootic Lymphangitis is a chronic disease of solipeds–manifested by purulent inflammation of the cutaneous and subcutaneous lymphatic vessels and regional lymph glands ". Wooldridge says " Epizootic Lymphangitis is a chronic contagious disease characterised by inflammation and suppuration of the subcutaneous lymph vessels ". Gaiger and Davies (1949) in describing the lesions of the disease say, " The lymph vessels may become inflammed and prominent and a series of nodules appear along their course. "

The symptoms and clinical lesions of the disease observed in the cases that have occurred in the Remount Depot, though conforming to some extent to the existing conception of the disease, did not show fairly constant train of clinical signs as described in the text books.

The variety of clinical lesions observed are described below :-

Clinical Signs

For the sake of descriptive convenience and from the point of view of severity of infection the cases are described as atypical and typical cases. No constitutional symptons were noticed.

(a) Atypical Cases

These are the vast majority of cases in which one or both eyes were affected.

In early cases discharge at first watery, later becoming purulent from one or both the eyes and collecting at the nasal canthus is seen. Some swelling of the eyelids is generally present. In others there are no visible clinical signs except a slight mucopurulent discharge from one or both eyes.

Later, in a number of cases, a papule of the size of a mosquito bite appeared on the conjunctiva and or on the membrana nictitans. This turned into small button like growths with an ulcerated surface discharging thick mucopurulent discharge. In other cases a flat granulation or an ulcer with pussy discharge appears on the conjunctiva and or on membrana nictitans. By this time there is a diffused swelling of the eyelids thus closing the whole eye. In most cases a series of very small abscesses burst on the skin surface of the eyelids, completely closing the eye. The lachrymal duct of the affected side is generally found to be occluded.

The associated lesions that develop later in severe eye cases, are the enlargement and suppuration of submaxillary lymph glands and

abscess formation in the temporal region below the base of the ears and behind the mandibular articulation. In no cases cording or nodular erruption of the regional lymph vessels was observed.

In a few cases, lesions in the nostril started as small pimples which eventually coalesced forming well defined circular ulcers of the size of an eight anna piece with raised edges and punched out appearance discharging thick purulent discharge. While in still few cases no ulceration was noticed but the thick pussy discharge probably from ulcers higher up in the nasal passage was found to contain numerous *Cryptococcus Farciminosis*.

Wounds with very little discharge and situated about the head and neck regions having a punched out appearance with raised edges are very suspicious. Smears made out from whatever slight discharge or from the lymph there may be on the wound or by rubbing the slide directly on the wound have been microscopically examined to contain *Cryptococcus Farciminosis*. There is a tendency for active granulation in such wounds necessitating the frequent use of caustics or surgical removal in cases where button like growths had formed. No cording of regional lymphatics was noticed.

In a solitary case of an otherwise clean wound resulting from a burst abscess on the inside of fore arm above the knee of a young stock horse, *Cryptococcus Farciminosis*, in the smears made out by rubbing a slide on the surface of the wound were microscopically detected daily for a period of over two weeks. There were no cording of lymphatics. at all.

(b) Typical Cases

Typical cases of Epizootic Lymphangitis showing clinical lesions as described in the text books *e.g.* cording of lymphatics and abscess formation thereon have been very few and far between, almost insignificant in number in comparison to the atypical cases. In two cases (Young stock horses No. 477 and 505) undergoing treatment for strangles with submaxillary abscesses, *Cryptococcus Farciminosis* were found in pus smears made out from the secondary strangles-abscess on the throat just behind the angle of the jaw. The wounds resulting from bursting of these abscesses had a clearly punched out appearance with raised edges. In both the cases cording of the lymphatics along the jugular furrow of the affected, side, with pea sized nodules (enlarged lymph nodes) spread out at an interval of ½" to 1" and extending from the original wound to the brisket developed after four weeks of the detection of *Cryptococcus Farciminosis* in pus smears.

About four weeks later a second similar parallel cording of the lymphatics about 1" to 1½" above the original cording along the neck, with small abscesses thereon developed in one case.

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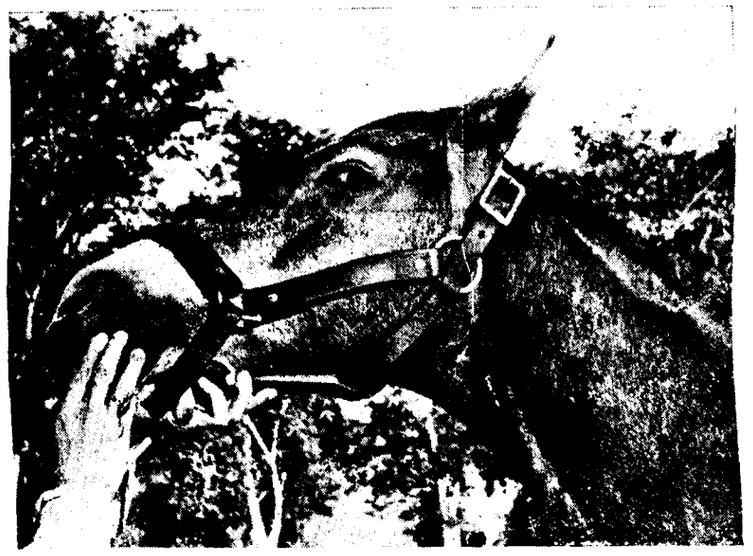
Equine Cryptococcosis (Epizootic Lymphangitis)

By
Major Sundar Singh, L.V.P., B.V.Sc.

Y. S. Horse No. 477 showing original lesions (white scars) cording and nodulation of the lymphatics along the Jugular furrow and enlarged posterior cervical lymph gland.

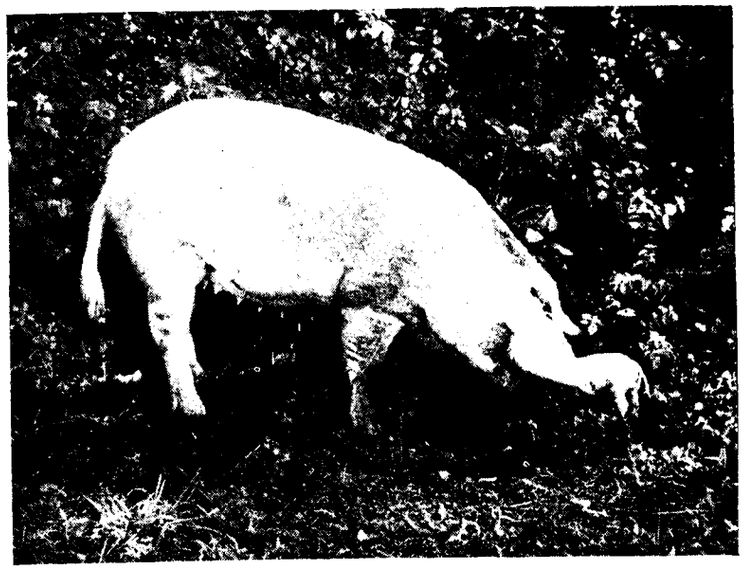


Y. S. Horse No. 505 showing original and healed-up lesions and double cording of the lymphatics along the Jugular furrow.

Exploratory Laparotomy in Porcine Surgery

By

M. N. Menon, B.V.SC., M.R.C.V.S.



[*Vide article page* 295]

Birth of a Monster

By

A. M. Basu, G.V.SC.

[*Vide article page* 303]

Freak of Nature

(Dicephalous Monstracity)

By

R. S. Jothi

[*Vide article page* 30

Secondary small abscesses that developed on these corded lymphatics were either opened up or burst of their own and healed up slowly with common antiseptic dressings.

In both the cases the posterior cervical lymph glands of the affected side became inflamed and enlarged to the size of an hen's egg. Though the glands were hot and painful but they did not suppurate and eventually became almost normal in about 10-12 weeks time.

In another type of the disease, submaxillary glands supported in the first instance and later abscesses developed in temporal and throat regions. The pus smears from all the abscesses from the very first day of their opening up were examined to contain teaming *Cryptococcus Farciminosis.*

In yet another case in which the nasal discharge was found to be microscopically positive for *Cryptococcus Farciminosis* and so also the pus from submaxillary abscesses ; Pneumonia supervened resulting in the death of the animal.

Pathological Findings :—The pathological findings together with a brief description of lesions in two animals (Mule No 583 destroyed on account of this disease and Mule No. 688 that died of this disease) are recorded below:- (a) During the treatment for Strangles for which Mule No. 583 was originally admitted, it was noticed that ulceration had developed about the lower third of the nasal cavity causing respiratory distress. This was cleared surgically by trephining the cavity. The excessive soft granular tissue reappeared as a tumour like mass. Microscopic examination of a smear from it, revealed numerous *Cryptococcus Farciminosis.* Later abscesses in the submaxillary and temporal regions and persistent button like growths developed in the conjunctiva ; discharge from all of which was positive for *Cryptococcus Farciminosis.*

As the disease defied all surgical and medical treatment it was destroyed on 28-7-54. Postmortem examination revealed a mass of soft tissue extending from the middle of the nasal passage into the maxillary sinuses, numerous small supporting foci spread throughout the lung parenchyma and enlarged caseated submaxillary lymph glands.

Specimens preserved in 10% formal saline were sent for histopathological examination. The laboratory report from the Indian Veterinary Research Institute Mukteswar, Kumaon, received through O.C., No. 1. Command Veterinary Laboratory, Lucknow, to whom the specimen were sent in the first instance runs as follows :—

(i) " Nasal tumour referred to comprises of normal healthy unbroken skin on the surface below which are found a dense mass of fibrous tissue and healthy muscles of the

part. There are areas of large round cell infiltration in some parts. The lesion is not a neoplasm but is perhaps a chronic inflammatory tissue.

(ii) *Piece of Lung.* Lung shows interstitial changes and suppurating foci in which are found lemon seed shaped organisms which are morphologically indistinguishable from *Cryptococcus Farciminosis.*

(iii) *Sub-Maxillary Lymph Glands* :—The medullary portion shows cheesy necrosis and histopathological examination reveals the typical features of infection with *Cryptococci.* When examined for organism numerous *Cryptococcus Farciminosis* in typical shape and forms were found. There is a great amount of dissociation of cells and fibres and the interstices contained innumerable organisms. Numerous epitheloid cells and a few giant cells where also found in the lesions.

Unfortunately this wonderful specimen has not been received in a well preserved state due to improper fixation.

This is definitely a case of pulmonary and glandular cryptococcosis."

(*b*) In the second case (Young Stock Mule No. 688) which clinically showed only eye lesions, enlarged sub-maxillary lymph glands and later threw abscesses, in temporal region (both sides) the postmortem examination revealed Pneumonic patches and extensive but very small nodular areas. Piece of lung and submaxillary lymph glands preserved in 10% formaline saline were sent for histopathological examination. The report received from the Indian Veterinary Research Institute, Mukteswar Kumaon, through O.C., No. I. Command Veterinary Labortary, Lucknow, reads as follows :—

" The histopathological examination of the submaxillary lymph-node has revealed intense infiltration of the endothelial cells into the medulla of the node ; most of the endothelial cells are showing the phagocytosed cryptococci morphologically indistinguishable from those of Epizootic Lymphangitis. Multi-nucleated cells loaded with the organisms were also detected. At places the loaded endothelial cells have completely degenerated liberating the cryptococci. The lymph nodules in the cortex are showing development of reaction centres producing the large lymphocytes and endothelian cells.

The lung is showing interstitial Pneumonia characterised by leukocytic infiltration, congestion and haemorrhage. Focal areas of endothelial infiltration with many of the cells showing the cryptococci

were noticed in the sections. In addition, the sections showed focal eosinophilic infiltration, particularly in the pleural layer, and sclerotic changes in some of the blood vessels ; no parasites could however be detected."

Susceptibility

The disease is not confined to any particular breed of equines. Almost all breeds of equines held in the Depot have in varying proportions suffered from the disease as would be evident from the following table. However the disease is now most commonly met with in young stock Indian horses and in small numbers in mules.

Cases of Epizootic Lymphangitis

Breed	*Horses*	*Mules*
Indian	89	193
Australian	40	*
South African	*	70
American	*	5

* No imported animals of these breeds are held in the Depot.

None of the 200 odd bullocks in the Depot, has contracted the disease.

Natural infection in all probability occurs by direct contacts and indirectly by dust kicked up by animals at liberty in paddocks. The period of incubation appears to be long one with the seat of predilection being the eyes and the abscesses and wounds about head and neck regions.

Seasonal Occurrence

A study of 185 cases of Epizootic Lymphangitis in the Depot goes to show that a comparative large number of animals were admitted during winter months. A month wise admission of these cases is as shown below :—

Jan.	...	28	Feb.	...	39	Mar.	...	16
Apr.	...	9	May.	...	8	Jun.	...	4
Jul.	...	8	Aug.	...	7	Sep.	...	12
Oct.	...	19	Nov.	...	16	Dec.	...	19
Total.	...	64		...	70		...	51=185

Of this number 176 were eye cases 9 non-eye cases.

Age Factor

A study of 123 cases in horses and 267 cases in mules that occured from January '49 to 15 August '54 reveals that 101 horses and 141 mules upto the age of 6 years were admitted for the disease. A total of 74 horses and 113 mules below 4 years of age were admitted for Epizootic Lymphangitis.

During the course of 1952 to 1954 more cases occurred in the horses and mules upto the age of 4 years *i.e.* in young stock.

The statement of yearly admissions by ages for horses and mules is tabulated below :—

Statement Showing Yearly Admissions by Ages of Horses

Year	AGES IN YEARS 1	2	3	4	5	6	7	8	9	10	Over 10 Years	Total
	No. OF ADMISSIONS											
1948—49	—	1	13	6	3	1	—	—	—	—	—	24
1949—50	—	—	2	—	1	1	—	—	—	—	—	4
1950—51	—	—	1	—	—	1	—	—	—	—	—	2
1951—52	—	—	—	—	5	8	7	7	3	—	1	31
1952—53	7	7	2	1	2	2	—	—	—	—	2	23
1953—54	21	10	2	1	—	1	2	—	—	—	—	37
1954—55	1	1	—	—	—	—	—	—	—	—	—	2
Total	29	19	20	8	11	14	9	7	3	—	3	123
	= 101										= 22	

Statement showing yearly admissions by ages of mules

Year	AGES IN YEARS 1	2	3	4	5	6	7	8	9	10	Over 10 Years	Total
	No. OF ADMISSIONS											
1948—49	—	14	32	13	7	7	22	8	5	5	9	122
1949—50	—	—	—	1	5	2	7	6	9	6	7	43
1950—51	—	—	—	—	—	—	1	—	1	—	—	2
1951—52	1	—	1	2	5	1	5	3	5	5	18	46
1952—53	3	12	1	1	—	2	—	—	—	1	2	22
1953—54	27	4	—	—	—	—	—	—	—	—	—	31
1954—55	—	—	—	—	—	—	—	1	—	—	—	1
Total	31	30	34	17	17	12	35	18	20	17	36	267
	= 141										= 126	

Diagnosis

This is made by microscopical examination of the stained smears from the suspected discharges from eyes, abscesses and/or wounds locally and is cross checked with the findings of the Command Veterinary Laboratory, Lucknow, to whom both stained and unstained smears are sent. Tissues specimens, if any, are examined at the Indian Veterinary Research Institute Izatnagar, under arrangements of Command Veterinary Laboratory, Lucknow.

The slides are stained as below :—

1. Make thin even smears.
2. Fix over flame.
3. Stain with crystal violet solution (1%) ½ minute.
4. Drain off stain and wash with water (tap or distilled).
5. Pour over alkalinised iodine – ½ minute. The smear should now appear coffee coloured.
6. Drain off and wash.
7. Decolourise with acidulted spirit 15 seconds (now thin smears should have lost the violet colour, thick portions may still be violet coloured).
8. Wash with water.
9. Counterstain with Eosin Solution ½ minute.
10. Wash, dry and examine.

Cryptococcus Farciminosis appear as violet bodies in an Eosin pink background.

The smears are made by rubbing, on a clean slide, a cotton wool swab which is inserted into the inner canthus of the eye or is rubbed well into the ulcerated surface of the button like growth in the eye or the surface of the suspected wound for mopping up the discharge or lymph therefrom. In fresh cases *Cryptococcus Farciminosis* in teaming numbers and in group of 8–10 or even more are easily seen in pus/discharge smears, whereas in older cases, a careful search is very necessary to find the organisms.

It has been noticed that negative findings continuously for about a week is not enough to exclude the possibility of *Cryptococcus Farciminosis* infection. In quite a few cases smears have been examined with negative results for about 4–6 weeks after which it was again found to be positive. There is often a wide margin especially in old standing cases when the organisms may or may not be seen in the smears.

In order to check the possibility of spread of infection from the apparently cured cases that have been consistently examined with negative microscopical findings for about 6-8 weeks, they are further segregated for a period of 4 to 6 months. During this segregation period animals are examined weekly and any discharges from eyes or newly acquired wounds etc are regularly examined microscopically. Occasional checks from otherwise healthy looking eyes are also made.

Course

It has been observed that some cases that were microscopically positive for *Cryptococcus Farciminosis* from eye-discharges become clear in less than 5 days time while others gave inermittent positive microscopic examination results for more than 7 months before clearing up/death/destruction.

So far only two young stock horses (Nos. 375 and 389) and a young stock Mule (No. 522) that had cleared up earlier and were undergoing 6 months segregation for Epizootic Lymphangitis before being discharged as cured were found positive from scanty muco purulent discharge from eyes after about 2 months segregation. There were no other visible clinical signs. The eyes cleared up in about 5 days time and were examined twice weekly with consistent negative results for more than 8 weeks.

It has been observed that cases which do not clear up within 5-6 months keep on giving intermittent positive results whether from the scanty/copious eye discharges or catarrhal nasal discharges or from lesions in the nasal cavity that are not visible on physical examination. The number of minimum and maximum days an animal has taken before becoming clinically clear of the infection is tabulated below :—

No. of days positive.

No. Animal	Maximum Days	Minimum Days	Average
48	117	9	37
6	216	41	78
55	146	7	44
11	71	4	21
2	51	18	39
4	38	9	16
13	79	9	37

Relationship/co-existence of infection with Strangles

Of the 74 young stock horses and 113 young stock mules below 4 years of age admitted for Epizootic Lymphangitis 44 young stock horses and 33 young stock mules were also cases of Strangles either running concurrent infections *i.e.* detected as Epizootic Lymphangitis cases from Strangles abscess not yet cured or got Epizootic Lymphangitis infection within 6 months of the cure from Strangles.

It has also been observed that although the purulent discharge from the original submaxillary Strangles abscess was examined with negative results for Epizootic Lymphangitis on several occasions, yet secondary small abscesses that developed in the region of throat and behind the angle of jaw were found positive for Epizootic Lymphangitis on the very day these small abscesses were opened up/burst. All Strangles cases are treated in a Veterinary Hospital exclusively meant for this disease.

Treatment

The policy of wholesale destruction has been stopped. Instead trials with various medicaments were made.

Various lines of both local and general treatments have been tried out with varying degrees of success. But of all these, the surgical removal of the lesion followed by a course/courses of five-48 hourly spaced intravenous injections of Lugol's Iodine solution has given comparatively better results over others. As such this is the routine treatment low being adopted in the Depot. The dosage is as follows :—

1 Course
- 1st day-6 ozs, of Lugols Iodine Solution containing approx : 15 grs, of Iodine.
- 3rd day ... 8 Ozs.
- 5th day ... 10 Ozs.
- 7th day ... 12 Ozs.
- 9th day ... 12 Ozs.

In some old obstinate cases 6 to 8 such courses at an interval of 3–4 weeks were given to animals which failed to respond to the usual 2-3 courses.

This treatment has resulted in clinical cures upto about 80% although in some cases it has taken almost 8–10 months before organisms could not be found in pus/discharge smears.

Surgical removal of the ulcers and button like growth on the conjunctiva or total excision of membrana nictitans where this had a button like ulcerated growth has proved effective in many cases.

Of 233 cases of Epizootic Lymphangitis in Horses and Mules treated since 1950, 4 Horses/Mules were destroyed as incurable and 6 horses and mules died of this disease.

The results achieved with various lines of treatment adopted at one time or the other in the Depot are summarised below :—

Number of days under Treatment.

No. Animals	Maximum Days	Minimum Days	Average	Treatment Tired
48	117	9	37	Mercury lotion 1-10000 (local eye wash)
6	216	41	78	Silver Nitrate 1/2% (local)
70	146	7	44	Iodine I/V. (Intravenous)
11	71	4	21	Penicillin eye ointment
2	51	18	39	Lugol's Iodine alone into eye
4	38	9	16	Aureomycine Eye Ointment
16	61	29	38	Mercuric Iodine Intravenous
13	79	9	37	No treatment

All clinically cured animals are branded on near thigh with the letters 'E.L.' This is an indication to the Veterinary authorities to be vigilant that the animal so branded has suffered from Epizootic Lymphangitis.

Acknowledgement

The author wishes to express his gratitude to the Director of Remount Veterinary and Farms Corps, Army Headquarters, New Delhi, for his permission to publish the article; to the Director I.V.R.I. and O.C., No. I. Command Veterinary Laboratory for kindly undertaking examination of the specimens, and slides and to Risaldar Major L. R. Gulhati R.V.F.C., V.A.S., in subcharge of the Veterinary Hospital of the Remount Depot for his assistance.

A PLEA FOR RESEARCH INTO INDIGENOUS DRUGS EMPLOYED IN VETERINARY PRACTICE

By

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and

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There is a wide field for research in the domain of indigenous drugs employed in Veterinary practice, but, unfortunately, the subject has not received much attention and as such the field remains totally unexplored. In contrast to this, considerable progress has been made in pharmacological research into indigenous drugs employed in human medicine and several fruitful results have been recorded. This achievement has been the result of efforts of a number of workers and institutions under the leadership of Col. R. N. Chopra and Dr. B. Mukerji.

No doubt there are many remedies common to human and animal diseases, but since some of the diseases of livestock differ amongst different species and from those of man, and, further, because the literature points to a number of drugs specifically employed in animals only, there is therefore, a wide field for exploration which properly falls within the realm of the veterinarian. Systematically planned research into this field holds out a great promise which may lead to valuable additions to the Veterinary Materia Medica. In the following pages the authors have made an attempt to stress the need and importance for research into this hitherto unexplored field.

Economic Aspects :—India has huge population of livestock. The people here keep both useful as well as useless animals. This is due to religious prejudice against destroying cattle even though they may be useless. When we look at the figures of our livestock population, they are quite impressive but staggeringly large for our resources. The total livestock population of India at present is stated to be over 264 million which includes 136 million cattle, 40 million buffaloes, 84 million sheep and goats and over three million horses, ponies, donkeys, etc. The magnitude of the problem of maintaining the health and improving the breeds of our livestock can thus be well imagined. However, the country at present is not in a position to feed all these animals properly, let alone the problem of treatment of the sick animals with costly medicines.

* Indian Council of Agricultural Research Fellow on deputation.

The larger animals require much higher doses as compared to human beings. It has been observed that if proper treatment is given to a sick animal, the cost of treatment sometimes exceeds even the value of the animal. Surely, the masses cannot afford such treatment and they would rather forego the animal and let it die than pay for the costly treatment. The annual budgets of most Veterinary hospitals and dispensaries are so meagre that they are quite inadequate to meet even the cost for such common medicines as magnesia and phenyle, not to speak of expensive medicines such as the antibiotics, etc. which are at times necessary and indispensable.

India is an agricultural country and her livestock is the backbone of agriculture. The country so much depends upon her milching stock and bullocks that she can ill-afford to let her fine breeds of cattle deteriorate for want of proper treatment of their simple ailments. We shall have to find a way out by devising expedients for effecting economy so that these remedies may be available to all the sick animals. This is possible only if the price of drugs can be considerably reduced. The only way in which drugs can be made cheap and brought within the means of the masses is to utilise the local resources, and substitute the expensive imported preparations by indigenous products. Attention to this subject is of the utmost importance because economy and low cost of advice and treatment are essential for any plan of Veterinary relief to succeed in this country.

Ancient Veterinary Medicine:—India as the history records has preserved her systems of medicine in the face or foreign competition under adverse circumstances. This itself speaks of the usefulness of the systems. The science of animal treatment has been known since the remote past. There was an independent Veterinary branch of Ayurveda (Pashu chikitsa). There were several original and authentic authors of ancient Indian Veterinary Science. The names of *Salihotra* as the authority on horses and *Palkapya* on elephants stand pre-eminent. The exact period when they lived and flourished is difficult to determine but it is evident that they lived in a very remote age and their works are older than the Ramayana in the early epic period. Earlier to this in the Vedic period, the "Atharva Veda", which includes a treatise on medicine, also furnishes some information on Veterinary Science of that period. Later on, during the age of the Sutras and the Puranas, several Puranas as *Matsya, Bramananda* and the *Linga Purana*, etc. provide much useful information on Veterinary matter. The collection of ancient Indian Veterinary literature and systematic search for such works would be of very great interest and advantage to Veterinary profession.

The people of India in the past were definitely more fond of animals. The cow was considered to be sacred. Horses, camels and elephants were used as means of transport. They also formed an important part of the defence organisations. There are more than 2000 remedies of vegetable origin mentioned in the literature. Plants affecting milk yield in milching stock as well as the health and strength of farm animals have been mentioned. It is recognised that some of the horse dealers from generations possess recipes of certain *Kushtas* and *Mashalas* which are claimed to have specific action against various diseases. They know of certain arsenic preparations for improving debilitated conditions and promoting shining appearance to coat of the animals. Some of them prescribe medicines to dissolve splints and cure spavin in horses. Similarly they can make *Majoons* and *Khamiras* which are fermented medicines and such biochemical preparations are considered to be specific in their action for certain diseases. There is thus a valuable treasure of information which can be explored by diving deep into ancient Veterinary literature.

Indian masses have been slow to adopt modern Veterinary system of medicine. No doubt poverty and illiteracy are very largely responsible for such apathy of the common man towards modern Veterinary medicine but one important reason has been a strong belief of the Indian farmer in the old system of medicine which has been considered to be satisfactory. The generations old prescriptions of decoctions and infusions (Karhas of country medicines) known to the village elders and experts have a strong hold on rural India and are still practised largely in the villages. There is a clear indication to probe into this wide field and search out whatever is good and of proven utility for introducing the same into the modern Veterinary medicine.

All these recipes and remedies being individual secret remedies would remain untouched by the sceptic minded modern scientist unless investigated and scrutinized by well planned and properly controlled experiments. Moreover, there is no doubt that during the long period of stagnation in the indigenous system of medicine that followed foreign rule, there has been a decline in the standard of the practitioners. A lot of unauthentic claims based on inadequate observation have crept in and these systems are at present in a state of confusion. What is necessary is to sift out the mass of information that is available and put these claims to the test of experimental observation and verify what is true and what is untrue. It will be a great service to the science and through the science to the country, as such work would lead to revival of our past achievements in the field of Veterinary medicine and at the same time tend to bring Veterinary relief within the means of the masses.

Mode of approach to the problem:—It will be evident from the above that there is a variety of indications for which the plants have been employed in indigenous Veterinary medicine. Further a large number of plants are known to be responsible for accidental poisoning among the livestock. This wide field of plants and herbs thus provide a fertile line of research. For purposes of discussion, the plants may be grouped under the following headings:—

I. Indigenous drugs with alleged medicinal properties.
II. Substitutes for well-known foreign drugs.
III. Plants affecting the milk yield of animals.
IV. Poisonous plants to livestock.

I. The number of plants with medicinal properties mentioned in the literature is quite numerous. The need for investigation of these claims has been indicated above. In the table below a few plants which merit investigation and verification according to the opinion of the authors are given.

Name of the plant	Local Name	Indications
1. *Aesculus indica*, Colebr. (Indian Horse chestnut)	Bankhor	Fruits used for colic in horses.
2. *Lonicera glauca* Hook	Shea, shewa.	Seeds used for colic in horses.
3. *Paramignya longispina* Hook		Fruits used for colic in horses.
4. *Actinodaphne hook ri* Meissn.	Pisa (Bombay)	Leaves used for urinary disorders in cattle. Seeds used for sprain of tendons.
5. *Arisaema speciosum* Mart	Kiralu	Root given for colic in sheep. Tubers kill worms which infest cattle.
6. *Arisaema tortuosum* Schott Melet	Kirakal	Seeds given with salt for colic in sheep.
7. *Delphinium brunonianum* Royle	Spet	Juice from the leaves destroys ticks in animals.
8. *Delphinium coeruleum* Jacq	Dakhangu	Kills maggots in wounds.
9. *Croton caudatus* Geisel Croton Monogr	Naubhantur	Leaves used as Poultice in sprains.
10. *Paramingya monophylla* Wight	Kurviwageti	Roots employed for Haematuria in cattle.
11. *Tephrosia vogelli* Hook		Leaves are said to be an effective insecticide against the ticks & fleas. In dry state well powered they are used as a flea powder. It has been suggested that the plant might be used as a commercial dip for livestock.

Name of the plant	Local Name	Indications
12. *Ruphor a ymi lia* Linn.		The plant yields a green essential oil which is used as a spray to keep off flies & mosquitoes & as a vermifuge for dogs.
13. *Trichosanthes palmata* Roxb.	Lalindrayan, Makal.	Roots are considered useful for inflammation of lungs in cattle.
14. *Sterculis ure* Roxb.	Gulu, Kabru.	It yields a gum called Katira which is a substitute for tragacanth. The leaves & tender branches steeped in water yields a mucilaginous extract, which is largely employed in pleuropneumonia of cattle.
15. *Sida humlis* Wild	Kbarenti	In Coimbatore Distt., its leaves are ground up with cumin seeds, onions & the succulent portion of aloes leaves mixed with buffalo butter milk & given to cattle suffering from Rinderpest.
16. *Sida Spinosa* Linn.	Bariara	The root is general tonic; diaphoretic and is used for debility & other cattle diseases.
17. *Balanites roxburghii* Planch	Hingan, Hingu	The bark is given to cattle as an anthelmintic. The unripe fruits are strong cathartic & anthelmintic. The seeds are expectorant.
18. *Boerhaavia diffusa* Linn. (Hog weed).	San, Thikri	It is given to cattle in Bengal as a medicinal food and is supposed to increase the quantity of milk. The root is used as laxative, diuretic, anthelmintic & expectorant. Useful in dropsical swellings & asthma.
19. *Beognia rex*. Putz		The juice is poisonous to leeches and may therefore be used to kill them when found in the nostrils of animals.
20. *Allium sativum* Linn.	Garlic	Besides other medicinal properties it is reported to be antituberculous & to prevent anthrax in cattle.
21. *Indigofera tinctoria* Linn.	Nil, Wasma.	Used externally in form of paint & ointment on sores of horses and cattle and over the abdomen in Tympanitis and retention of urine. It also promotes growth of hair. Internally as an infusion of the root as antidote in case of poisoning by arsenic and in nervous disorders.
22. *Amygdalus persica* Linn.	Aru	Docoction of leaves cure foot rot in sheep.
23. *Prangos pabularia* Lindl.	Komal	Destroys snails in water and as such prophylactic for liver, fluke disease.

Name of the plant	Local Name	Indications
24. *Anagallis arvensis* Linn.	Jonkhmari	Expels leeches from nostrils of animals.
25. *Semecarpus anacardium* Linn. (Marking nut).	Bheela, Bhilawa	Stimulant and narcotic. Used in *masalas* of elephants, given in large doses it renders the animals furious.
26. *Cucumis pseudo-colocynthis* Royle.	Indrayan, Bishumbhi	Substitute for colocynth. Given to horses as purgative.
27. *Inula racemosa* Hook.	Rasan	Mild tonic, expectorant & diuretic Given in digestive and respiratory troubles.
28. *Leea robusta*, Roxb.		Soft and fleshy root applied externally as anodyne and internally in diarrhoea and dysentery in cattle.
29. *Moringa pterygosperma* (Horse radish tree)		Juice of the bark is used for mange of horses. Root bark forms a rubefacient plaster.
30. *Oroxylum indicum*, Vent.	Sauna Tetpalang	Root bark ground up and mixed with turmeric applied to sore back of horses and bullock.

II. Substitutes for well-known foreign drugs

The old available literature on indigenous system of medicine and the present researches into Indian medicinal plants have shown that the costly foreign pharmaceuticals can be replaced by cheaper country medicines. A great many of the maladies of animals for which drugs are used are of a minor nature. Many of the crude drugs available as country medicines if intelligently used are very nearly as efficacious as their refined preparations. Substitutions by such cheap products is bound to bring down cost of the treatment to a minimum. Crude vegetable purgatives are very often as effective as their finished products e. g. Aloes as a purgative for equines is, if not more, as effective than its crystalline active principle, aloin. The powdered areca nut as a purgative and vermifuge for dogs is just as effective as its alkaloid, arecoline, if adequate dose is given. The total alkaloids of ipecacuanha may even be better than its chief alkaloid, emetine in canines as emetic, expectorant and in the treatment of dysentery and intestinal form of distemper. Crude preparations from the bark of *Hollarrhena antidysenterica* may be equally beneficial as the purified, conessine, in cattle dysentery. Such examples can be multiplied and a list of some of the well known substitutes of medicinal plants follows :—

Medicine	*Official Plant*	*Indian Substitute*
Asafaetida	*Ferula foetida, Regel Ferula, rubricaulis Bois*	*Ferula narthex Bois*
Gentian	*Gentiana lutea* Linn	*Picrorhiza kurroa* Royle.
Jalap	*Ipomoea purga* Hayne *Ipomoea orizabensis* Pellet.	*Ipomoea turpethum* R. Br.
Lobelia	*Lobelia inflate* Linn	*Lobelia nicotionifolia* Heyme.
Rhubarb	*Rheum palmatum* Linn	*Rheum emodi* Wall *Rheum webbianum* Royle.
Catechu	*Uncaria gambier* (Hunter) Roxb.	*Acacia Catechu* Wild
Squill	*Urginea maritima* Linn	*Urginea indica* Kenth
Quassia	*Picraena excelsa* Liol.	*Picraena quassioides* Benth.

There will be an immense economic benefit if the substitutes already known are put into practice. What is necessary is to lay down pharmacognostic and pharmacopeial standards to assure uniformly dependable results and avoid disappointments and failures through use of spurious and sub-standard preparations. Great efforts would be necessary to explore many more, indigenous substitutes of which there is a large scope in the country like India, having all sorts of soils and temperatures, suitable for the growth of all kinds of plants.

III. Plants affecting milk-yield in animals

Amonst the vegetation of India there are some plants which affect the milk-yield in milching stock either favourably or adversely. These are respectively called galactagogues and antigalactagogues. There are other plants which spoil the quality of milk by changing its colour, odour or taste thus rendering it unpalatable, because when consumed by the animal, these plants are excreted into the milk. In this connection numerous examples come to mind but a few of them are cited here. The cotton seeds (Gossypium – sp) and the mustard seed cake (Brassica sp.) are well known for their properties to improve the yield or quality of milk and are commonly fed to cattle in India. Similarly *Safedzira* (*Cuminum cyminum*) is also considered to increase the volume of milk. Cows eating a sufficient quantity of an aromatic herbage like *violets* or *banafsha* (viola sp.) are believed to yield milk with a pleasing fragrant odour and beneficial qualities, imparted by the flowers which have medicinal properties. The grasses like *cynodon dactylon* (Khabbar, Dhub) and *Dactyloctenium aegyptiacum* (maddana) are known for their fattening and milk improving qualities. *Heracleum sp* in Himachal Pradesh is believed to increase milk of goats. *Calendula*

officinalis (Zergul) when browsed by cows is considered to increase the quantity of milk. *Terminalia bellerica* (Baheri) leaves are considered to be the best fodder for milching cows. *Amaranthus spinosus* (cholai) is given to cows as lactagogue.

Many plants on the other hand adversely influence the quality and quantity of milk of animals. Some well known examples of the plants, the toxic constituent of which may render the milk deleterious, may be mentioned. All purgatives of anthracene group such as aloes, senna, podophyllum, and rhubarb are excreted in milk and are liable to produce purgation when such milk is consumed. Species of the genera strychnos, Atropa, Nicotiana and colchicum are excreted in milk. There are many other plants which are alleged to affect the milk in different ways and these merit investigation. *Achillea millefolium* Linn (milfoil, yarrow) imparts a bitter taste and strong odour to the dairy products. *Caltha palustris* Linn (marsh marigold), species of *Equisetum* (horse tail) and leaves of oaks (Quercus sp) reduce the volume of milk production or cause it to stop altogether in cows eating these herbs. The milk of cows eating *oxalis acetosella* Linn (common wood sorrels) of the temperate Himalayas is with difficulty converted into butter. *Jasmine sambac* (motia) and *Piper betel* (Pan are also known as lactifuge. The flowers of the former and leaves of the latter, when bruised and applied to the mammary glands arrest milk secretion. The subject of plants affecting the quality or quantity of milk yield of domestic animals occupy a prominent place in the economy of a nation. Our knowledge of Indian plants capable of producing such effects is meagre but the above instances are sufficient to show that the research can profitably be taken up in this direction.

IV. Plants poisonous to livestock

Poisoning of livestock in India is very common. It takes a heavy death toll annually. On the whole, our knowledge in connection with the poisoning of livestock in this country is very meagre and no definite figures are available of the loss suffered by our cattle population through poisonous plants but we believe that it must be enormous. Some idea of the possible damage caused in this way can be obtained by quoting an example of two states in America, Montana and Colorado, which have a total area of about less than one-sixth than that of India. In these states the loss inflicted to the livestock industry through plant poisoning is approximately 200 million dollars annually. Surely the loss in our country would be much more. This can be imagined by taking in view the areas compared and also the fact that knowledge of the poisonous plants in U. S. is well advanced and the active preventive measures are in vogue. It has been recorded that there are in India about 700 poisonous species belonging to over 90

families of flowering plants. Some of these grow unchecked as poisonous weeds in fields and forests, which the animals may pick up while grazing. The animals normally discard poisonous plants, guided largely by their instincts but in times of fodder famine and drought conditions, they may be compelled to browse on anything to which they find access. The significance of the problem of investigating the poisonous plants is thus very clear and the knowledge thus gained would go a long way in protection of our livestock. Besides this there is another aspect. These poisonous plants may possess medicinal properties and these life killers may be used to advantage to treat ailments among animal as a result of these investigations.

Conclusion

From the brief survey of the field for research on Indigenous drugs as applied to Veterinary Science, it is evident that there is wide scope of work in this rather untrodden field. As much ground has already been covered in the employment of indigenous drugs in human medicine and as indigenous drug research in India is well established, it would not be difficult to make a beginning in this type of study in Veterinary centres of teaching and research. The approach and methodology of work are more or less the same both in the field of human and cattle treatment. In experiments designed to study the action of a drug on biological tissues, small animals are used. A Veterinary Science student should be expected to understand their biology just as well as medical men. A team work is essential for any progress in indigenous drug research as Botanists, Chemists, Pharmacologists and Microbiologists have to join hands in solving a problem. All such scientific help is now available in Veterinary training institutes or can be made available without much difficulty. Post-graduate training is now possible in some of the top ranking Indian Institutions such as the Central Drug Research Institute, the Haffkine Institute and the School of Tropical Medicine, Calcutta. The time is ripe for Veterinary Science Graduates to try their hands in Veterinary Pharmacology and delve in to the rich source of indigenous Indian material for the treatment of cattle diseases. This would help in maintaining and stimulating the cattle wealth of the country.

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INHERITANCE OF IMMUNITY IN ANIMALS

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Practical knowledge of heredity preceeds the dawn of history. It has been known from time immemorial that certain individuals are better able to resist infectious diseases than others. Long before the birth of genetics as a branch of science, the influence of inheritance on morbidity and mortality had been observed by the medical profession. But with the discovery of specific micro-organims as the causal agents of certain specific diseases, the older ideas of inheritance of disease were largely disproved. Rapaid developments in bacteriology and serology and successful production of artificial immunity against certain infectious diseases greatly diminished the importance of the influence of inheritance upon medicine. Later on, with the advent of genetics as science the specific influence of heredity upon certain disease processes was observed and this specificity was related to certain specific genes. The scientists, being convinced that the development of resistance against disease was a matter of inheritance, started thinking of the possibility of producing disease resistant strains of animals. With this realisation, a feverish search started for various heritable morbid conditions in animals and man which has helped in finding out the causes of a wide variety of diseases and anatomical defects.

With further advancement in the knowledge of heredity, the idea of the effect of inheritance on disease became less controversial being based on sufficient substantial evidence. It was, therefore, inevitable that the phenomenon of resistance to disease should create a genetic problem of increasing concern. It received further support from the success achieved in producing disease resistant varieties by plant breeders, who observed that the problem of protection of plants against various plant scourges could be tackled only by evolving resistant strains as the medicinal treatment of sick individuals of low value was uneconomical. Extension of the science of genetics to the field of microbiology has progressed rapidly during the past few decades. It has proved of immense help in the studies of microbial reproduction and variation and has provided useful material for further investigations. The coincidental discovery of blood groups with the birth of genetics brought serology into the realm of genetics. In view of these important implications there is little wonder that the significance of the influence of heredity on medicine and disease was recognised so rapidly and this realisation has opened a promising field for the attempts to exploit the science of genetics in producing disease resistant strains of animals. Any attempt to deal adequately in a few pages all the striking and manifold current advances in the inheritance of resistence against disease would be impossible and only a brief mention will be made of a few important points in this connection.

Susceptibility and Resistance

The fact is apparent that during an epidemic certain individuals are better able to resist infection and to escape the attack of disease than others, who though equally exposed contract the disease early and die. Within any population, individuals will be found in varying numbers that possess varying degree of susceptibility. A new disease takes a heavy toll of lives at its outbreak when the more susceptibles are attacked and succumb early, leaving behind the more resistant ones, some of which may contract the disease later if the infection is highly virulent. When the animals within a species are exposed to pathogenic micro-organisms, the disease reactions vary from those causing death of the individuals to those having no effect at all. Between these two extremes of no effect and death, various degrees of morbidity are commonly found. Such individuals can be classified into three categories, viz. those dying of the disease are considered to be completely susceptible ; those which show no effect are completely resistant and others, which survive after showing various degrees of disease, as partially resistant.

Genetic or innate immunity may be due to differences in species races or individuals. In species immunity, animals of certain species

are insusceptible to certain disease organisms due to physiological incompatibility between the host and parasite, when cultural conditions in the body of the host are unsuitable for its survival and multiplication. From the point of view of producing disease resistant breeds, species immunity is not expected to contribute very much as such inter-species hybrid offspring are usually sterile. So genetic methods cannot generally be applied for species immunity. In racial immunity, certain races are believed to possess resistance, complete or partial, against certain diseases. Sometimes immune races develop spontaneously and naturally. At other times they have to be produced by proper selection and hybridisation within a species, which appears to be the most promising procedure for the development of disease resistant breeds of animals. Individual immunity is only relative and seldom absolute. Various degrees of resistance are to be found varying from almost completely resistant individuals to highly susceptible ones.

Although our knowledge of many materials of interest as regards host resistance and disease reactions is only fragmentary, critical evidence has been produced by animal experimentation to show that inherited constitution plays an important part in the differences in resistance to infectious diseases. In certain other morbid conditions which arise directly as a result of inheritance, the particular gene or group of genes bring about the morbidity or mortality of the affected individual as contrasted with a healthy host with normal alleles. In each case of these heritable diseases, the morbid gene which produced the condition has its allele a normal gene, by virtue of which the individual is free from the effects of the disease. Thus, whereas the morbid genes produce the diseased condition, the healthy individual is protected against such a condition by the presence of normal alleles of such morbid genes.

Although the production of an infectious disease requires the presence of a pathogen—bacteria, viruses or protozoa—, the host-gene-complex and the environment are no less important, the latter may accentuate the disease or counteract its effect according to whether it is favourable or unfavourable for the pathogen or the host. Thus the disease reactions vary according to the variability in all the three factors and the prophylaxis and control of disease involves a thorough understanding of these attributes. As susceptibility and disease resistance are related to the inter-action of pathogen, environment and host, in a disease control programme all the three factors have to be studied.

Effect of Host Genotype

The interest in the study of inheritance of disease resistance grew with the general shift of emphasis in the field of animal diseases from

treatment towards prevention and control. The important role of genetic constitution in resistance against morbidity and mortality in infectious diseases has now been universally accepted. The power of resistance, which varies in different individuals, is inherent in the organism and is due to the action of genes for resistance in the individul. To make it a permanent attribute, this power of resistance can be made homozygous by in-breeding and proper selection. Workers on disease resistance are generally agreed that the resistant strains retain this quality through many generations.

Besides the infectious diseases, a large number of morbid conditions are attributable to host genes alone. The morbid gene or genes affect the development of the individual resulting in some serious defect or even death. These abnormal genes may be either lethal which cause death in the early stage of development or sub-lethal causing phenotypical defect in the adult. A few representative examples of disease conditions caused by lethal or sub-lethal genes, are short spine, impacted molars and cotaract in cattle, atresia coli in horse, creeper in chickens, cleft palate and hairless-ness in pigs, ataxia in rabbits and dwarfism in rats These examples form only a small portion of a large number of such pathological conditions. In some cases, the pathological condition is caused by a single gene; in others, the pathological syndrome is the result of action of a group of genes. In a few cases, these morbid genes are dominant but in the majority of cases they are recessive to their normal alleles and produce the apparent defect in their homozygous state. All these pathological genes have normal genes as their alleles. An individual with normal genotype is free from such pathological conditions although the resistance is considered rather graded and not complete immunity, as it can be altered to a certain extent by alteration in the environment.

Effects of Environment

Various effects of environmental interactions in causing diseases have been known to occur in different individuals. Effects of heat and cold, food deficiency due to lack of certain vitamins or other essential ingredients and effects of certain poisons or endotoxins may cause particular diseases. But here also there is abundant evidence to suggest that the expression of morbid condition is influenced by the gene complex of the host as the individuals vary significantly in their reaction to the environmental changes. Family differences are to be found in different individuals in their reaction to environmental factors, thus showing inheritance as the cause of such differences. So in a constant environment, when a fixed dose of pathogen of known virulence is used the variations in the reaction of the host are chiefly due to hereditary factors. It holds out a hope of

evolving disease resistant lines of animals by selective breeding. This is of some significance to the practical animal breeder, although the relative importance of host genotype versus pathogen and environment in resistance against disease remains at present largely in the field of speculation.

Effect of Pathogen

At the present time, challenging the experimental animals, which are being bred for disease resistance, with the varying doses of the virulent organism concerned, to find out the degree of resistance has become a common practice. Within a species, besides the resistance of the host, the effect of the dose of the pathogen and its virulence account for the intensity of the symptoms in disease studies. This would of course imply that the resistance and susceptibility of an individual to an infectious disease bear a close relation to virulence and dosage of the pathogen.

Like all living things in nature, pathogenic micro-organisms also multiply without change but occasionally they produce mutant varieties quite different from the parent organisms. These changes may be quantitative or qualitative. The bulk of evidence at present seems to indicate that mutations do occur in the pathogen, giving rise spontaneously to new races differing in morphology or virulence or both. These variants are permanent and resemble mutants observed in other living beings. These hereditary modifications are very important from the disease point of view and their consequences to epidemic disease are striking. The epidemic may decline when less virulent or a virulent type of organisms are increased and may flare up by the increase of super virulent type capable of overcoming the resitance of the host. Thus an endemic may change to an epidemic. The inherited resistance of a percentage of certain micro-organisms to the effects of antibiotics is also mutative in nature. This resistance to certain drugs and other environmental stimuli is specific.

Heredity and Disease

Among the more significant developments in the control of disease is a wider recognition of the role of heredity and a greater appreciation of the fact that variations in susceptibility and resistance are attributable to genetic factors besides the environment and the pathogen. The criteria of resistance and susceptibility vary from one individual to another. Some individuals are completely refractory, some may contract the disease but recover fully, while in others the difference between resistance and susceptibility is merely a time difference between infection and death. Those cases of resistance which escape with only sub-

clinical or abortive infections are also ordinarily included under natural immunity.

An interesting approach to the application of current knowledge of heredity to the problem of resistance against disease has been made by evolving resistant strains in plants. Strain differences have proved to be of vital importance in the control of certain plant diseases. Similarly in animals, hereditary element has been recognised as of great significance in the causation and severity of certain diseases. In some diseases like tuberculosis, heredity appears to determine to a great extent both morbidity and mortality for this disease. In some cases, a single gene pair determines the susceptibility or resistance; in others several pairs of genes are responsibile. Hereditary predisposition has been attributed to several pathological conditions and diseases of man and animals, among which may be mentioned tuberculosis, brucellosis, leprosy, diptheria, scarlet fever, diabetes, appendicitis, udder infections and bacterial septicaemia in cattle and occlusion of vagina in mice, etc. Genetic specificity in the etiology of certain morbid conditions and independent hereditary transmission of factors playing a determining role in such conditions has been shown to occur. The specifity of genetic constitution is shown by the fact that the genes responsible for resistance against different diseases are not identical but in some instances there is a high correlation in breed or strain differences for resistance against one disease with those against the other which would mean that in some cases the same genes are effective for resistance against more than one disease.

Hereditary Mechanism for Resistance

A serious gap in a discussion of the influence of inheritance on resistance against disease will be an omission of any reference to the mechanism of resistance, which is of sufficient complexity and importance to deserve treatment here. Although there is wide agreement regarding the hereditary nature of resistance controlled by the gene complex, there is difference of opinion as to the nature of mechanism through which the genes act to determine the susceptibility or resistance of the individual. Though considerable progress in the study of the mechanism of immunity and infection has been made, the complete picture is by no means clear.

The problem of resistance to disease is complicated not only my many different types of diseases but also by the variety of mechanisms involved by which host resistance is brought about. In addition to the anatomical defence mechanisms, such as epithelial covering and fascia, etc., the physiological mechanisms of defence, such as flushing action of tears and urine, cilliary action of certain mucous membranes, increased or

decreased capillary permeability and the action of endocrine secretions are also of great significance. But in current investigations, main emphasis has been laid on the humoral and cellular mechanisms through which a host may resist invasion by a parasite.

Various suggestions have been made as to the mechanisms on which inherited resistance depends. Humoral mechanisms are considered important. Resistance has been attributed to either natural presence of antibodies in the system or to the ability to develop them quickly in the early stages of the disease. Bactericidal power of blood and serum, the complement activity in certain animals and bactericidal action of certain secretions of the body such as saliva, nasal secretion, gastric juice, bile, urino-genital secretions and skin secretions, have been attributed to inherent differences in resistance in the individuals. Besides the humoral, more emphasis has been laid on the cellular mechanisms for resistance. Phagocytes, total number of leucocytes and lymphocytes have been variously shown to be directly correlated with the degree of natural resistance. In some cases hereditary mechanism involved in resistance against the diseases has been described as the power to mobilise phagocytes during an attack of disease. Body temperature of the individuals in health and disease has been suggested as the factor to differentiate between susceptibility and resistance against diseases. Higher body temperature has been correlated with the increase in resistance. In some cases, lack of suitable receptors on the part of the body cells of the individual has also been presumed to be the cause of refractoriness from the disease.

In closing this subject it will perhaps be appropriate to mention that the defensive power of the individual against the invasion and propagation of the pathogen as well as the reactions of the host to the disease-producing mechanisms of the pathogen are both contributory factors towards the degree of resistance against disease. In developing a better understanding of the natural mechanisms of host resistance, it would seem that comparison between host reactions to virulent and avirulent strains of pathogen would be most desirable. Similarly, comparative studies on the reactions of a susceptible and a resistant individual to a virulent organism would also help in the clarification of this complex problem.

HAEMORRHAGIC SEPTICAEMIA—SOME UNUSUAL ASPECTS OF THE DISEASE

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Outbreaks of H. S. normally occur during the monsoons. In the year 1952-53 at the Aarey Milk Colony there was incidence of H. S. throughout from June'52 to January'53. Bhonsale (1951) has recorded an outbreak of H. S. in the month of March. Kulkarni (1951) has recorded an outbreak of H. S in December. It was difficult to trace the source of infection in these outbreaks. It this connection the recent findings of Ochi (1954) and Vittoz are interesting to note. They claim that H. S. can no longer be considered a true epidemic but rather a facultative disease due to normal bacterical flora of the respiratory tract rendered pathogenic by sudden change in their environments. A recent publication by the Government of Pakistan (1949) states " It is now accepted that healthy carriers do exist from which infection starts and spreads from animal to animal. The part played by climatic and other environmental factors, in the appearance and disappearance of Pasteurellosis is decisive. The progress of an epidemic is conditioned by an accumulation of carriers and of susceptible animals whose resistance has been lowered through external factors viz transit by rail, atmospheric temperature etc."

The unusual aspects of the disease noted by me at the Aarey Milk Colony, are as under :—

(1). In the oedematous form of H. S., there is usually swelling on the throat, lower maxillae and sometimes on the dewlap. I have seen two buffaloes in which the swelling was on the left hock and gaskin in one case and on the right fore-arm in the other. There was no swelling at the usual places of throat and cheek. The temperature was 104·6° F. The buffaloes were dull and anxious looking. Respiratory symptoms were absent. Exudate smears from the swelling in one case proved positive for H. S. at the Bombay Veterinary College Laboratory. In the absence of any respiratory symptoms, the swellings at the fore-arm and gaskin could have been mistaken as due to a contusion or a sprain. Smith (1947) has recorded an outbreak of H. S. in which the swelling of the genetalia was noticed in the absence of swelling at the usual places.

(2), During the months from August'54 to October'54 there were eight sudden deaths at Calf Farm each at an interval of a week or so. The average age of the affected buffalo calves was between 7 to 12

months. Usually the calf was seen hale and hearty the previous evening and was found dead the following morning. In two instances the calves had gone out for grazing and were found dead in the field.

Post-mortem findings :—Post mortem examinations were held on all the 8 calves. Sudden death in calves lead one to suspect Anthrax. Eversion of rectum, swelling and protrusion of tongue and bleeding from the rectum and the nostrils were noticed. The carcases were bloated. These postmortem changes were seen in all the 8 calves. There was no oedematous swelling on the throat, maxillae or dewlap in any case. Blood smears from the tip of ear were examined and found negative for Anthrax. The carcase was then opened and post mortem examination held. Sero-gelatinous exudate under the skin was noticed. The lungs were congested. Endo-carditis and myo-carditis was seen. Liver was slightly swollen. Spleen was swollen and there were pin point haemorrhages. There were dark brown haemorrhagic patches on the pleura and peritoneum. The Omasum was of a dark brown colour. Abomasum was highly inflamed. The intestines were highly inflamed and there were multiple haemorrhagic patches throughout. The contents of the intestines were bloody. Kidneys were congested. Similar P.M. lesions were seen in all cases.

Pathological investigations :—Peripheral blood smears, heart blood and impression smears from liver and spleen were collected and sent to the Bombay Veterinary College Laboratory for investigation. The blood smears were negative for any disease. Biological tests, however, proved positive for H. S. in two cases.

The sporadic sudden deaths, absence of oedematous swelling on the throat, maxillae or dewlap, eversion of rectum and bleeding from nostrils and rectum were suggestive of Anthrax. But the Biological test proved positive for H. S. The deaths were due to an intestinal from of H. S. A similar outbreak had been reported by Iyengar (1952).

(3). In the pectoral form of H. S. there is high temperature (104°F to 107°F.), laboured breathing, blood-shot eyes etc. I have seen some cases in which the temperature was from 102°.6 F to 103.2°F. Laboured breathing, mucoid secretion from nose and lachrymation were the only symptoms noticed. As there were symptoms of Broncho-pneumonia good response was obtained to treatment of Penicillin and Sulpha-pyridine therapy. When, however, the disease attacked the more susceptible animals and the organisms gained virulence, the temperature showed the usual rise of 104°F to 106°F. and death occurred in 24 to 48 hours. Biological test proved positive for H. S.

Conclusions :—1. H. S. can occur in any month of the year when there is a presence of healthy carriers and of susceptible animals in a herd. 2. Sudden and sporadic deaths do occur in H. S. as in Anthrax. 3. Although the usual seats of predilection for oedematous swelling are the throat, maxillae and the dewlap, it may sometimes be seen at other places, also. 4. In the beginning of an outbreak of H.S., high temperature may not be present.

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A NOTE ON THE DURATION OF IMMUNITY IN DAY OLD CHICKS VACCINATED AGAINST NEWCASTLE DISEASE WITH ADRI VACCINE

By

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There is a dearth of information in relevant literature regarding the duration of immunity in day old chicks vaccinated against Newcastle Disease (ND). Certain commercial manufacturers who utilize the Blacksburg (Mild) Strain of ND virus (B1) by the aerosol method have presumed that it would last for an indefinite period. It has been recommended however, a second dose of the vaccine be given at some period before 15 weeks of age (1).

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* This vaccine is made by incorporating formalized Newcastle disease virus in an adjuvant composed of falba and mineral oil. It was introduced into Canada by the Animal Diseases Research Institute of Canada.

In the previous work by the author (2) an attempt was made to immunize day-old chicks against Hertford-shire Strain (Asiatic) ND virus, using the ADRI vaccine, a formaline inactivated adjuvant vaccine inoculated intramuscularly. The immunity response was assessed by HI and SN tests, and challenged by exposure to the Herts Strain. The vaccinated chickens were found solidly immune to challenge at four weeks of age with maximal HI and SN titers. To get more information about the type and length of immunity evoked by this procedure further tests were attempted and are detailed hereunder.

Experimental Procedure

Two groups of 200 baby chicks each, receiving 0·5 c.c. and 0·2 c.c. of ADRI vaccine respectively when two days of age, were raised in isolation. An equal number of chickens selected at random from each lot were subjected to weekly HI tests for assessing their immune status. Further confirmatory challenge tests were carried out when the level of HI positive titres were lowered from the previous records (2). The results of these are furnished in Table I and Table II with a graphical interpretation of the immunity response covering all experiments (2).

Discussion

From the previous work (2) it would seem that the day-old vaccination of baby chicks confers a solid protection at 4 weeks with a high level of circulating antibodies and is capable of inducing a durable immunity. It is therefore a matter of interest to note that in subsequent tests the HI titers started falling below the positive percentage level at 10 weeks, while a similar breakdown occurred to challenge at 12 weeks when a test was carried out. (No challenge test could be done at 11 weeks owing to circumstance beyond control). The data however, shows evidence of a substantial immunity from 4 to 9 weeks which is but short lived. Hence it appears obvious that a second dose of the vaccine should be administered *between 8 and 10* weeks after the primary vaccination, to avoid the residual antibodies in a declining immunity from militating against the second attempt (3), and to give a continuous protection. This would cause an anamnestic response and raise the antibody level without an apparent reaction, a procedure most suited for revaccination with the highly potent Mukteswar attenuated ND vaccine of Asiatic origin, within the Indian union.

Since it is well established that vaccination of chickens at 6 weeks of age, confers a lifetime immunity (4) the presently experienced phenomenon of a rapid fall in antibody level in early vaccinated chicks in this work, may appear paradoxical. It appears to indicate that the pattern of immunity response may be attributed to the

TABLE I

The Immunity Response in 2-day-old vaccinated chicks with formalin inactivated adjuvant vaccine (ADRI) challenged with Herts ND Virus.

	Dose of Vaccine	No. of Chicks Bled	Interval after Vaccination	HI Titer Distribution in Power of HI Units										Challenge		SN Titer
				0	5	10	20	40	80	160	320	640	Percent Positive	Survival Ratio	Percent Survivors	
ADRI Vaccine	0·5 cc	10	4 weeks	—	—	—	—	—	—	—	—	10	100	10/10	100	10^{-3}
Groups	0·2 cc	10	,,	1	—	—	—	—	1	—	3	5	90	10/10	100	10^{-4}
Controls	—	10	,,	9	1	—	—	—	—	—	—	—	0	0/10	0	10^{-8}, 10^{-9}
ADRI Vaccine	0·5 cc	10	5 weeks	—	—	—	—	—	—	—	—	10	100	10/10	100	10^{-3}
Groups	0·2 cc	10	,,	—	—	—	—	—	1	1	2	6	100	10/10	100	10^{-4}
Controls	—	10	,,	8	—	2	—	—	—	—	—	—	0	0/10	0	10^{-8}, 10^{-9}
ADRI Vaccine	0·5 cc	10	6 weeks	—	—	—	—	—	—	—	—	10	100	10/10	100	10^{-3}
Groups	0·2 cc	10	,,	—	—	—	—	—	—	—	1	9	100	10/10	100	10^{-3}
Controls	—	10	,,	8	1	1	—	—	—	—	—	—	0	0	0	10^{-8}, 10^{-9}
ADRI Vaccine	0·5 cc	10	7 weeks	—	—	—	—	—	—	—	—	10	100	—	—	—
Groups	0·2 cc	10	,,	—	—	—	—	—	—	—	—	10	100	—	—	—
Controls	—	10	,,	10	—	—	—	—	—	—	—	—	100	—	—	—
ADRI Vaccine	0·5 cc	10	8 weeks	—	—	—	—	—	1	—	1	8	100	—	—	—
Groups	0·2 cc	10	,,	—	—	—	—	—	—	1	1	8	100	—	—	—
Controls	—		,,	9	1	—	—	—	—	—	—	—	0	—	—	—
ADRI Vaccinated at 6 weeks (Pos. Controls)	1 cc	10	8 weeks	—	—	—	—	—	—	—	—	10	100	—	—	—
Negative Controls	—	10	8 weeks	10	—	—	—	—	—	—	—	—	0	—	—	—

TABLE I—*(Continued)*

The Immunity Response in 2 day-old chicks vaccinated with formalin inactivated adjuvant vaccine challenged with the Herts ND Virus.

	Dose of Vaccine	No. of Chicks Bled	Interval after Vaccination	HI Titer Distribution in Power of								Challenge		SN Titer
				0	5	10	20	40	80	160	320	640	Percent Positive	Survival Ratio	Percent Survivors	
ADRI Vaccine Groups	0·5 cc	10	9 weeks	—	—	—	—	1	1	1	—	8	100	—	—	—
	0·2 cc	10	,,	—	—	—	—	1	1	1	1	7	100	—	—	—
Controls	—	10	,,	8	2	—	—	—	—	—	—	—	0	—	—	—
ADRI Vaccine Groups	0·5 cc	10	10 weeks	—	—	—	—	1	1	1	2	5	90	—	—	—
	0·2 cc	10	,,	—	—	—	—	1	2	1	1	5	90	—	—	—
Controls	—	10	,,	9	1	—	—	—	—	—	—	—	0	—	—	—
ADRI Vaccine Groups	0·5 cc	20	11 weeks	—	—	—	—	6	2	6	2	4	70	—	—	—
	0·2 cc	20	,,	—	—	—	—	4	2	8	4	2	80	—	—	—
Controls	—	10	,,	8	1	1	—	—	—	—	—	—	0	—	—	—
ADRI Vaccine Groups	0·5 cc	30	12 weeks	2	3	9	3	3	2	2	3	3	30	6/20	30	—
	0·2 cc	30	,,	2	3	8	3	4	6	4	—	—	33·3	6/20	30	—
Controls	—	10	,,	9	1	—	—	—	—	—	—	—	0	0/10	0	—
ADRI Vaccinated at 6 weeks (Pos. Controls)	0·5 cc	10	12 weeks	—	—	—	—	—	—	—	—	10	100	10/10	100	—
Controls		10	12 weeks	10	—	—	—	—	—	—	—	—	0	0/10	0	—

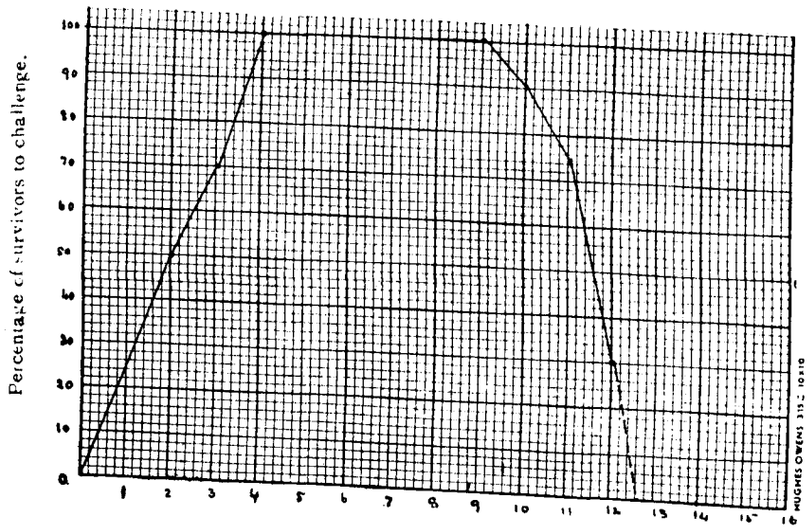
TABLE II

HI Titers and Results of challenge with Hertfordshire ND strain on day-old vaccinates, tested after 12 weeks

0·5 cc group				0·2 cc group			Results of Challenge
Serial Number	Wing tab Numbers	HI Titers	Results of Challenge	Serial Number	Wing tab Numbers	HI Titers	
1	226	80	Negative	1	152	160	Negative
2	271	40	died	2	159	0	died
3	258	10	,,	3	157	160	Negative
4	316	10	,,	4	163	40	died
5	290	640	Negative	5	169	160	Negative
6	300	160	,,	6	170	40	died
7	308	10	died	7	179	40	,,
8	295	10	,,	8	164	40	,,
9	228	20	,,	9	387	10	,,
10	220	640	Negative	10	382	40	,,
11	284	0	died	11	182	160	Negative
12	296	320	Negative	12	384	40	died
13	315	10	died	13	330	320	Negative
14	252	10	,,	14	400	0	died
15	246	20	,,	15	349	40	,,
16	318	40	,,	16	350	40	,,
17	320	20	,,	17	357	0	,,
18	291	10	,,	18	398	0	,,
19	234	20	,,	19	335	640	Negative
20	212	320	Negative	20	339	20	died

relatively unorganized state of the reticulo-endothelial system of the developing chick which is incapable of the type of reaction that is necessary for the production of an enduring immunity till a later date. No significant difference was observed between the two groups receiving 0·5 cc and 0·2 c.c. respectively, as regards the duration of immunity.

Immunity Response of Day-old Chick-vaccinated against New Castle d sease.



Summary

Experiments were conducted to assess the duration of immunity in day-old vaccinated chicks with the ADRI vaccine against Newcastle disease. The serum neutralization, and Haemo-agglutination-inhibition antibody levels in the vaccinates were at their maximal at 4 weeks and continued to be so up to 9 weeks, but declined rapidly to a 30% level by 12 weeks, while 70% of the chicks succumbed to the challenge exposure. The results indicate that the pattern of immunity response evoked in early vaccination is imperfect and is incapable of developing a durable immunity. Therefore a second "boosting" dose of the vaccine between 8–10 weeks is recommended to cause an anamnestic response and thus confer a prolonged immunity.

Acknowledgements

The author is highly indebted to Dr. Chas. A. Mitchell, Chief, Animal Pathology Division, Production Service, for his valuable advice and suggestions during the course of the work, and is grateful to Dr. R. V. L. Walker, Head of the Virus Unit, A.D.R.I., Hull, Que. for his interest and guidance.

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Clinical Articles

EXPLORATORY LAPAROTOMY IN PORCINE SURGERY

By

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Pigs of the exotic variety are uncommon in Madras and as the indigenous varieties are scarcely if ever taken care of, porcine medical practice in this part of the country is indeed negligible. The chance to cut a pig with surgical intention is thus an adventure to the veterinary surgeons over here. Whereas the hospital attached to the Madras Veterinary college caters to a variety of patients—the daily attendance mounting to over a hundred—the number of pigs attended to will be only two or three *per year*.

It was on 16th November 1954 that a large white sow belonging to the Military vehicle depot Avadi was admitted for attention in the out patient clinic of the hospital. The sow was reported to have littered the previous day—incidentally her first-dropping only a single white piglet. Ever since she was reported to be very lethargic with absolute lack of appetite. From the external appearance of her genitals there was no evidence to indicate that the parturition was not complete. It was with difficulty that a manual examination of the vagina was possibe and this showed that the cervix permitted the passage of the index finger alone. The temperature recorded was normal being 102 degrees F°. However a 2 c.c. dose of Pituitrine was injected subcutaneously as an ecbolic and a protective dose of penicillin against possible uterine sepsis was also administered. The owner's representative, a subaltern, was advised to keep the sow under observation till the next morning and report.

Accordingly she was brought to the hospital the next day with her general state of health further deteriorated, though the temperature continued to be normal. The external genitals were now completely involuted giving no evidence of recent littering. As the sow continued to be ill it was thought worthwhile to attempt a skiagram of the abdomen and pelvis so that retention of foetuses if any on any account may be eliminated. The result was not an unexpected failure as the portable X-ray plant available in the clinic could not command the necessary voltage and milliamperage.

With a diagnosis of the ailment still unmade and with general condition of the patient begining to cause anxiety it was decided to perform an exploratory laparotomy, 24 hours hence. With that object in view a further dose of penicillin was administered and the right flank was prepared and covered over with sterile bandages ready for operation on the morning of 18th November i.e., the 4th day after littering. The commandant of the Military vehicle depot was kept informed of the operational risk, enhanced on account of the small experience of the surgeon (M.N.M.) in porcine surgery.

The patient was held under restraint on the left lateral recumbent position and chloroform was administered by the open method through an improvised mask. The surgical plane of anaesthesia was reached with only 4 drachms of chloroform needing another 2 drachms for maintenance. The bandage covering the field of operation was removed and a coat of Harrington lotion was applied over the area. The surface was then limited by sterilised surgical drapes. A 6" long vertical incision was made commencing from the middle of the hollow of the flank and extending to above the flap of the flank on the same side, going through a thickness of over an inch, of skin and sub-cutaneous fat. Then the incision was carried through the thick parietal sheath of the obliqus abdominis externus and again through the thick soft and friable muscle tissue itself and through its visceral sheath all in a line, to expose the much thinner internal obliqus muscle of the abdominal wall. This structure was also divided similarly exposing a thick and tough membrane consisting of the aponeurosis of the transverse abdominis muscle clothing the parietal peritoneum which itself is very leathery. The incision on this membranous partition was made carefully and in slow stages such that a bluish thinned transparent distended membranous bag which was pouting into the gap was not traumatised. This incision was in the same line as the others but shorter. To begin with it was not apparent that this enormously distended bag was really the urinary bladder. Attempts to pack off this organ out of the field did not meet with success and hence a search for other pelvic viscera had to be made by sliding the hand througha side of the incision

and along the ventral abdominal wall. This examination revealed that both the uterine cornua were empty and involuted and besides at this stage the animal passed a large quantity of highly concentrated powerful smelling urine. Simultaneously the distended bag that was interfering with the manipulation till now collapsed to a size as small as the first revealing a thick wrinkled wall. This rather dramatic revealation of the urinary bladder was obviously itself the diagnosis and treatment of the postpartum condition from which the mother was ailing.

Now the laparotomy wound was closed in 4 layers after depositing 8 lakh units of Procaine penicillin in the peritoneal cavity. For internal sutures on the peritoneum and musculature 20 day chromic catgut size 2 was used continuous sutures for the former and interrupted sutures for the two layers of muscles and their sheaths were applied, and the skin wound was closed with a set of interrupted stitches with silk. The suture line was sealed off with a strip of elastoplast, and a many tailed suspensory bandage was applied for supporting the abdominal wall and for protecting the wound.

In 20 minutes after the discontinuance of the administration of chloroform the patient regained consciousness and in 2 hours was fully recovered and a feed of soured milk and glucose was offered as she showed signs of hunger and thirst whereas this was refused, little mouthfulls of water were eagerly swallowed from a trough kept within reach. 24 hours later a deep enema of warm soap water was administered to stimulate urinary and defecatory reflexes. A massive motion of accumulated faeces was the result of the enema while no urine was passed. The temperature remained normal but even so a further dose of penicillin was repeated. After the enema a drink of barley water and glucose was consumed with great avidity.

The following morning the sow appeared to be much brighter and when allowed a run at pasture passed voluntary motion and urine. The temperature was normal and the appetite good. The diet for the day consisted of mashed groundnut cake, milk, glucose and barley water.

The next day though urine and motion was voided normally a slight rise in temperature to 103 degrees F., was recorded. The patient was otherwise normal and 2 pounds of rice boiled with potatoes was eaten with eager appetite.

On the 5th day after operation the temperature was normal and for the first time in 8 days the patient was found briskly rooting at pasture with the young one fondly keeping pace. The sutures were removed on the 8th day and the mother and child were discharged fit. A photograph taken at the time of discharge showing the site operated is reproduced. A point of interest was that the mother was able to

suckle the young one all through this period with neither being the worse for it.

Discussion

It would appear from the foregoing case report that the real cause for such severe retention of urine was pressure from a highly impacted rectum on the neck of the bladder coupled with exhaustion. But the whole procedure in the case under observation was based on the assumption that a large white sow should litter more than one piglet at a time and that in this case there might have been a segmental torsion of the uterine cornu, and consequent premature closure of the cervix.

Acknowledgments

My thanks are due to every member of the hospital staff and the Principal of the College, but for whose co-operation and assistance, this work would have been extremely difficult of accomplishment. My thanks are particularly due to the Commandant of the Military Vehicle Depot for agreeing for the conduct of the operation when the risk involved was known to be more than usual.

ESMODIL IN DIGESTIVE DISTURBANCES

By

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Esmodil (Bayer) is a 0·75% isotonic solution of Trimethyl Methoxy Propynyl Ammonium Bromide. It has been reported that Esmodil injected into Rabbits intravenously in doses of 0·05 to 1 mg. per kilogram bodyweight immediately produces salivation and defecation. With subcutaneous injection it is stated that no influence on blood pressure could be observed. Only 100 times the effective intravenous dose is said to have a perceptible decrease on the blood pressure. Only very slight influence has been observed after intramuscular injection whereas intravenous injection of small doses is said to have led to a rapid but transient decrease in blood pressure. Animal experiments have been reported to have shown that neither the central nervous system nor the vagus or the heart participate in this action; but the point of attack is to be sought in the periphery. Esmodil is a vagotropic substance and only produces a general stimulation of the vagal endings. It primarily acts on the intestinal tone and acts on the smooth musculature of the digestive system manifested by the increase in peristalsis.

Esmodil was tried in a few cases of digestive disturbances in the large animal clinic of this hospital and the following is a report of the trials so far carried out.

1. *C.W.O.P. 2739.* Bullock—Nondescript—age about 4 years—Condition fair.

14-10-54. History :—The abdomen gets bloated and has not passed any dung since 2 days. Has not taken its feed and not ruminating.

Temp. 100·8. Tympany present. Animal in distress.

Gave Esmodil 3 c. c. s/c.

In a few minutes the animal showed profuse salivation and passed urine and loose dung.

Gave the following : orally :

R/ Mag. sulph
Sodi chlor aa Oz. iv.
Pulv. Zingiberis
Pulv. Chiretta aa. Dr. ii.
Treacle q.s.
Ft. elect
Advised gruel diet.

15-10-54. The abdomen was said to get bloated and subside immediately; but the animal when brought to the hospital was found ruminating well. A dose of saline with Formalin dr. i was given as electuary.

As the animal was not brought for further treatment it was presumed that it had completely got over the sickness.

2. *C.W.O.P. 2765.* Cow—Crossbred—Age about 6 years—Condition poor. 17-10-54—History was that the animal had a colicky pain from the previous day and was not feeling well. Abdomen found bloated.

Temp. 101·2. R/ Chloral hydras Dr. iv.
Tr. Zinziberis Oz. i.
Tr. Asafoetida Oz. i.
Ol. Terebinth Oz. i.
Ol. Arachis ad. Oz. xii.
Ft. haust sig now.

18-10-54. T. 101·6. Owner reported that the animal had another attack of colic in the night. Hard mucous coated dung was passed.

Sent dung for examination. Negative for worms.

Esmodil 3·5 c.c. s/c. Salivation started in 1½ minutes. Straining frequently. Passed semisolid dung mixed with mucus. Gave 2 lbs milk mixed with egg albumin and Mag. carb oz. ½.

19-10-54. T. 103.6. No further colic. Took a little gruel. Passed semi solid dung. M.M. normal. Other habits normal.

R/	Sodi Salicylas Sodi bicarb	aa. Oz.½
	Pulv. Chiretta	Dr. ii
	Treacle	q.s.
	Ft. elect sig now.	

20-10-54. T. 101·4 Animal better. Passed semisolid dung. Taking its feed.

R/	Pulv. Tonic	Oz. i.
	Treacle	q. s.
	Ft. elect sig now.	

21-10-54. T. 101.6. The animal did not take feed properly. Dung semisolid. Abdomen said to be bloated last night. Nothing abnormal seen at the hospital.

R/	Amm Carb	Dr. iv.
	Pulv. Nuxvomica	Dr. i.
	Pulv. Chiretta	Dr. ii.
	Treacle.	q. s.
	Ft. elect sig now.	

22-10-54. T. 101. 2. Animal completely cured. Grazes well. Repeated electuary.

3. *C.W.O.P.* 4490. She buffalo—aged—condition fair.

7-2-55. Abdomen found bloated. Not taken its feed and not passed dung since 2 days. T. 99.0. Slight tympany present.

R/	Cresol	Dr. i.
	Formalin	Dr. i.
	Sodichlor Magsulph aa.	Oz. ii.
	Treacle	Oz. ii.
	Aqua	O. i.
	Ft. haust sig now.	

8-2-55. T. 96.8. Condition same.

R/	Amm carb	Dr. iv.
	Pulv Chiretta	Dr. ii.
	Pulv nuxvomica	Dr. i.
	Treacle	q.s.
	Ft elect sig now.	

9-2-55. T. 99·8· Condition same. Did not take any feed. Not passed any dung.

8-10 A.M. Esmodil 3 c.c. s/c Salivation started in 4 minutes. No defaecation observed till half an hour after injection.

8-30 A.M. Esmodil 2 c.c. s/c. Salivation increased.

9-45 A.M. Slight urination. No dung passed. Repeated electuary.

10-2-55. Owner says that the animal passed plenty of dung and urine at 9 P.M. Animal did not feed well. Tympany slightly relieved.

Repeated electuary.

After this the owner discontinued treatment.

4. *C.W.O.P. 4553.* She buffalo—age 5 years—condition poor.

12-2-55. Animal not feeding well and not passed dung since ten days.

T. 99·4. Animal very dull. M. M. very pale. Severe impaction present.

Esmodil 3 c.c s/c. No action seen.

Esmodil 2 c.c. s/c. half an hour after the first injection. Started salivation after ½ hour. No dung passed. Abdominal movements increased and exaggerated.

R/	Amm. Carb	Dr. iv.
	Pulv. Chiretta	Dr. ii.
	Pulv. Nuxvomica	Dr. i.
	Treacle	q.s.
	Ft. elect sig now.	

13-2-55. The owner reported that the animal passed dung in the night. Impaction less. Took feed. Repeat electuary.

14-2-55 to 16-2-55. Repeat electuary.

17-2-55. Animal completely recovered.

R/	Pulv. Tonic	Oz. I.
	Treacle	q.s.
	Ft. elect sig now.	

5. *C.W.O.P. 1702.* She buffalo—age 4 years—condition fair.

22-2-55. Not feeding since 2 days, Dung hard. Rumen impacted.
T. 101.0 Esmodil 5 c.c. s/c. Salivating profusely and passed semisolid dung.

R	Amm carb	Dr. iv.
	Pulv chiretta	Dr. ii.
	Pulv Nuxvomica	Dr. i.
	Treacle	q.s.
	Ft elect sig now.	

23-2-55. and 24-2-55. Animal better and ruminating. Repeat electuary.

24-2-55. Animal eating well.

R/	Pulv Tonic	Oz. i.
	Treacle	q s.
	Ft elect sig now.	

6. *C.W.O.P. 5039* Bullock—4 years—condition poor.

18-3-55. Took dry horse gram flour on 17-3-55. Rumen highly impacted and not passed dung. Animal dull. T. 102·0 Sent blood smears for examination Negative. M. M. normal.

Esmodil 4 c.c. s/c. Began salivating in 2 minutes after injection.

There were evidence of increased peristalsis; but no dung passed.

18-3-55. 2 P. M. Esmodil 2 c.c. s/c. No further action than salivation.

19-3-55. T. 101·8. No tympany. No dung passed. Respiration normal. Impaction reduced. Animal brighter.

R/	Amm carb	Dr. iv.
	Pulv. Chiretta	Dr. ii.
	Pulv. Nuxvomica	Dr. i.
	Treacle	q.s.
	Ft elect sig now.	

20-3-55. Animal not brought.

21-3-55. T. 104.2. M.M. /petechiated. Blood smears positive for Theileria Mutans. Animal very dull. Respiration hard. No feed taken. Impaction and slight tympany present. Backraked the animal and took out hard pellets of foul smelling dung.

R/	Sodi Salicylas.	Oz.	I.
	Sodibicard	Oz.	I.
	Pulv. Chiretta	Dr.	IV.
	Treacle		q.s.
	Ft elect sig now.		

and repeat elctuary on the 19th, to be given in the evening.

22-3-55. Animal did not turn up.

From the above case records, it may be seen that Esmodil is effective in atonic condition of the digestive tract, tympany and impaction. Injection of Esmodil stimulated peristalsis and tone of the gastric and intestinal musculature. There were no untoward results even in cases where the animal was in a very poor condition. No toxic symptoms were seen. The action on buffaloes was delayed; but all the same it was quite effective. In all cases that were tried only one case did not come round on account of Theileria Mutans infection during the course of treatment.

The author gratefully acknowledges the help renedered by Messrs. Chowgule and Co., by way of supply of Esmodil. My thanks are due to the Principal, Madras Veterinary College, the Ward Officers of the College Hospital and my colleagues in the Large Animal Clinic of this hospital for their hearty co-operation and advice in the work carried out.

BIRTH OF A MONSTER

By

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On 1-10-55, I was called to relieve a cow suffering from dystokia. The history of the case was that the cow had shown symptoms of parturition at about 4 p.m. and the four limbs together became visible from 5 p.m. and from that time the local ' Experts ' tried to relieve the patient but failed and informed me at about 7-30 p.m.

I went to the spot, relieved the patient within 20 minutes and a monster was delivered. It remained alive for 15 minutes after birth. It was sent to the Bengal Veterinary College, Calcutta, for preservation.

The external features of the monster were as follows:—The hind-quarters had been arched completely and placed over the head.

The limbs and head were well developed and covered with hairy skin. The thoracic abdominal and pelvic cavities were completely open. The viscera which were also well developed remained exposed to the open air. The heart and lungs were covered with diaphragm. The ribs were not at all developed. The anus was imperforated.

FREAK OF NATURE

(Dicephalous Monstrocity)

By

R. S. Jothi

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On the 5th April 1955, I was called to attend a Dystokia case in a she-buffaloe, which was mishandled and left as a hopeless case by the quacks.

On examination, the Foetus was felt to be in the breach presentation - only the tail could be felt ; on further examination, I felt number of legs and two heads. It was decided that there must be twins. By manipulating, the hind legs of both the calves could be felt well flexed under the abdomen. With much difficulty, the legs could be extended and brought into the pelvis and with continuous and uniform pressure and traction, and retraction, the foetus was extracted with great deal of difficulty. Both the calves were dead. The mother unfortunately had to undergo this great ordeal and is now alive doing well.

The following pecularities were noticed :—

(1) The two calves were fused at the thorax.

(2) had two heads, two necks, four fore-limbs, four hind-limbs and two tails with a single heart and diaphragm.

News and Views

The Indo-American team of Experts, selected under the Operational Agreement between the two countries, went into the question of improving the existing facilities for Agricultural and Veterinary education, research and field extension work.

* * *

Their report which was released recently, makes an interesting reading. It endorses the recommendation of the University Education Commission, to establish a Rural University, which should include "a ring of small, resident under-graduate Colleges with specialised and University facilities in the centre".

* * *

It also envisages, the location on the same campus and in close jutkaposition, a College of Agriculture and a College of Veterinary Science to which should be added, a College of Home Science, a College of Applied Liberal Arts and Sciences, and a College of Technology with a group of villages used as a laboratory for the students.

* * *

Some may consider it as too ambitious ; Some others may be cynical and say that it sounds more like an All-purpose-integral-factory of different University talents. But we welcome all steps taken towards progress and prosperity. Humanity has advanced more through trial and error method, than through precision and exactitude of human ingenuity. Let us hope for the best.

* * *

The report has also recommended establishment of new Post-graduate Colleges at the Indian Agricultural Research Institute, New Delhi and the Indian Veterinary Research Institute, Izatnagar, so as to offer M.Sc., Ph.D., and D.Sc. degrees. This is a very welcome suggestion which would be applauded by the the entire profession. These degrees must be recognised reciprocally by Foreign Universities. This will obviate the necessity of looking to other lands for such degrees.

* * *

One other suggestion which is even more practical and of utmost immediate importance, is the up-grading of certain institutions on a regional basis for higher education in subjects taught by them. The following institutions have been suggested :—**Agriculture** ;—I.A.R.I. New Delhi ; Ludhiana College, Punjab ; Agricultural College, West Bengal ; Anand Agricultural Institute, or Poona Agricultural College, Bombay State ; and Coimbatore Agricultural College, Madras State.

* * *

Veterinary : I.V.R.I. College, Izatnagar ; and Veterinary Colleges at Madras ; West Bengal or Bihar ; Bombay or Hyderabad and Jabalpur.

* * *

The report recommends "initiating and undertaking regional research schemes and also schemes of an all-India nature". This is a subject on which we have ourselves written years on end, in the pages of this Journal. Let us hope that something tangible will come out of the recommendations of such a High-Power—Committee.

* * *

One other point which the Committee has touched upon, is "the problem of transfer of specialists trained in a particular field to higher positions in other fields for which they were not qualified, mainly on the basis of seniority".

* * *

They have suggested that "reasonable opportunity to develop experience, confidence and competence through assignment of increasing responsibilities" should be given to workers in their respective fields and that categories should be established, within which such scientists could advance without detriment to their prospects and at the same time maintain continuity and long experience in their own fields. None can quarrel with this suggestion. We have ourselves been pleading for such specialisation.

* * *

Well, the Report is quite alluring as far as it goes. But its implementation is what counts. We have seen Reports and Reports and they have the peculiar knack of walking into the cold chamber. Let us hope the same fate will not overtake this Report.

* * *

But to attract the best type of men, for all such expanded programme, the **Madras Mail** is right and even more than right when it says "the Government should enhance the salaries in these Departments".

* * *

Inaugurating the School of Veterinary Science and Animal Husbandry at Hyderabad, which is one of the nine centres sponsored by the Government of India to train Veterinary personnel on a short-term basis, as an emergency measure to supplement full-fledged Veterinary Graduates, Mr. B. Ramakrishna Rao, Chief Minister of Hyderabad, said the breed of cattle in the country compared to what it was about 40 years ago, had deteriorated in spite of offorts to improve it.

* * *

This is a statement which is not likely to be shared by all, who are in the know of things. Apparently, it is not based on any recorded evidence or scientific data. It is a matter of opinion passed on from mouth to mouth. There may or may not be any truth in it. But a beginning must be made to assess such periodical progress or deterioration, through proper surveys and compile the necessary records. It is up to the Heads of Departments to take the initiative in the matter.

* * *

This new School provides a two-year Diploma course and will train 100 young men of Hyderabad State and 25 from Orissa. We expect all the Nine Centres will work more or less on the same scale.

* * *

The Chief Minister further added that he was one of those "incorrigible conservatives" who did not believe in the efficacy of the mechanisation of Agriculture. So far as the Veterinarians are concerned, it is a blessing in disguise and we wish there are more 'incorrigibles' like him in the land.

* * *

We pass on the following advertisement appearing in the daily news papers, dated 22nd October 1955, to the members of the profession. We suggest to the authorities concerned that the Indian Veterinary Journal is the best medium for such advertisements.

* * *

Remounts Veterinary and Farms Corps

A number of short service Regular Commissions will be offered to Civilians with B.V.SC., degree of an Indian University or equivalent foreign Veterinary degree, in the Remounts Veterinary and Farms Corps as Veterinary Officers. Initially commissions will be granted for a period of three years. Candidates must be citizens of India and of Medical Category "A", that is fit for service in any part of the world. Age limit: 21-35 years on the date of application. For full particulars apply to the Director of Remounts Veterinary and Farms, QMG's Branch, Army Headquarters, DHQ., P.O. New Delhi-11.

* * *

The Madras Veterinary College students have hit the head-line in daily news papers! Well done, boys! Here is the news:—"The students of the Veterinary College have volunteered to do service in the cyclone affected areas, in controlling epidemic among cattle. It has been decided to carry on mass inoculation of cattle. The Principal of the College made the suggestion, when the Director of Animal Husbandry consulted him on the present position. The students responded. Eight students in batches of four had been deputed to Ramanathapuram, Tanjore, Madurai and Tiruchirapalli. They left Madras last night and will return on January 7, 1956."—*The Mail*, 23rd Dec. 1955.

* * *

The news in exhilarating but why only 8 students? There must be some reason. This is a good example of what resourcefulness could do. We congratulate the Director of Animal Husbandry and the Principal Madras Veterinary College on the impetus given to the enthusiasm of the students at this hour of need of the stricken area. May their efforts be crowned with success!

THE BLOCK DEVELOPMENT CORNER

DAIRY COWS—THEIR BREEDING AND MANAGEMENT

By

T. Vinayaka Mudaliar,
Retired Livestock Development Officer,
Government of Madras.

Milk and more milk is the slogan to-day. The cattle population of India is the largest in the world. And yet, the *per-capita* consumption of milk is the lowest in the world in some parts of the country. This is mainly due to the very poor milk yield of her cows. If plenty of wholesome milk were available at a price within the purchasing capacity of the people, consumption would automatically increase. A report on the marketing of Milk in India, says that the annual milk yield of a cow (Buffalo included) is on an average 580 lb. in India, whereas in England it is 5,000 lb.! The need therefore of building up dairy herds, with the primary object of producing more milk is quite apparent. How can this be done? This can be done by adopting three definite methods of improvement in our present system of dairying.

They are :—

1. Scientific breeding,
2. Proper feeding and animal management and
3. Improving marketing facilities,

The high yielding cows of to-day are not mere accidents but are the result of hard labour of years.

Let us take Scientific breeding. This consists in the selection of good sire and dam. What is now happening is, a village cow comes on heat and she is served by an unknown and sometimes immature bull. The result is the disastrous state of affairs now obtaining in this country: Cows, Cows every where but no milk to drink: So to improve the milk yield of the progeny of your cows, you should first select a good bull, that comes from a high milk yielding line. That is, his dam and grand-dam should have yielded a good lot of milk. At any rate far above average. It is often said, 'Bull is half the herd'. It is the bull that passes on either the good or bad qualities of a breed to a marked degree. The line of descent is mainly through the bull. This study of the history of ancestors of the bull is known as the study of its pedigree. If this is not available or possible, you turn round and see if there are any daughters born to this bull and if they are

yielding good amount of milk. This study is known as the study of its progeny. Next best would be to see if he has any sisters yielding good amount of milk Such ought to be your selection of a sire to get your cows mated. Similarly selection of cows to be purchased to build up your herd should also be on pedigree basis, on their performance at the pail and on the performance of their sisters and daughters if any. If you mate such good bulls to such good cows, it has been recorded that the progeny will yield about 10 to 12 per cent. more milk than their dams. If these improved progeny are mated to still more improved bulls, the result would be a marked improvement in the milk yield. It is this study of pedigree and progeny and mating the best to the best, is known, in scientific language, as selective breeding. Through such selective breeding, Sind cows yielding 50 pounds of milk a day, at the peak of their lactation are not un-common in India to-day. It is through this method that the high yielding cows of other countries have also been brought into existence, within each breed.

Next is, proper feeding and animal management. A well balanced diet is as necessary to a cow as to a human being. To think that a cow can ever produce a large quantity of milk merely on roughages or on sparse grazing, is not understanding the principles of dairying at all. A certain amount of concentrate feed such as cotton seeds, oil cake, bran, etc., is necessary. A cow needs a 'maintenance' ration and over and above it 'production' ration. Three pounds of concentrates may be given as maintenance ration and one pound more for every 3 pounds of milk produced or part thereof. That is, if a cow yields 8 pounds of milk a day, she should get 6 pounds of concentrate feed. In addition to this, she should be given 15 pounds of straw and 40 pounds of green fodder.

The young and dry stock are not generally cared for. This is being blind to one's own future. They have to be fed also on concentrates and roughages. About 2 to 3 pounds of concentrates daily should be enough. They are your future milch cattle. Don't neglect them.

Through such proper feeding, it has been recorded that the milk yield could be increased by nearly 50 to 60 per cent. The other factors that contribute to successful dairying are regularity in feeding and milking, bringing your heifer calves to early maturity through good feeding, making your cows to breed regularly, having shorter calving intervals, long lactation periods and shorter dry periods. Compare these breeding principles with what you are now doing: Breeding does not mean mere multiplication of numbers. You breed for type and production. Be kind to your animals and make them docile. Let them develop a dairy temperament. Protect them from all weather conditions. Groom them, keep them clean and in sanitary surroundings.

Supply them with clean fresh water, move with them and understand them. They will repay you amply.

The third point is improving marketing facilities. No trade can improve or increase without proper marketing facilities. See that you keep open an easy outlet for all your production to the maximum advantage.

If you follow these few hints, carefully, you can certainly produce more milk and thus benefit yourself and benefit the country. Artificial insemination and cross-breeding experiments are in the safe hands of experts in the line. Follow their advice and guidance and gain intelligent experience.

POULTRY FARMING AS A COTTAGE INDUSTRY

By

T. Vinayaka Mudaliar,

Retired Livestock Development Officer, Government of Madras.

Amongst the several industries that go to make a Nation prosperous and happy, Poultry Industry deserves a honoured place. It is an industry which lends itself both to individual enterprise and collective co-operation. It is both a poor man's industry and a rich man's. The capital required, comparatively speaking, is insignificant. You derive both pleasure and profit out of it. The women of the house can manage it successfully as a cottage industry. The value of eggs as a food product is not quite well appreciated in this country; otherwise, poultry farming would have established itself long ago on a firm footing and on a wide scale. Necessary conditions for successful poultry farming exist in this country. Vast expanse of vacant lands, cheap grain, good climate, fairly big consuming public, etc., are enough to give the industry the necessary philip.

Next to milk, egg is the one single product which is highly nourishing and yet the per—capita consumption per annum in this country is 8 eggs. Compare this with 283 eggs in Irish Free State, 260 in Canada, 236 in the United States of America, 158 in the United Kingdom and 114 in Germany.

Poultry keeping is within the scope of everybody. People even in big Cities and Towns with some available space at their disposal can maintain a few birds. With a little attention, good accommodation and proper feeding, this can be made to become a source of small income. But poultry can be maintained at a very low cost under village conditions, with insects and grubs to pick up, and grains from harvested

fields and thrashing floor. Thus a few home-grown grains, surplus greens and vegetables and kitchen garbage and a little butter milk, will make your birds lay better. There is an old proverb which says that a hen lays its eggs through its beak, which means a better fed hen lays better.

Now let us see how poultry farming can be taken up as a cottage industry to supplement the meagre income of the Indian ryot. You can keep say, about 10 good Desi hens and one cockerel or as many birds as you like depending on the space available. In addition to your scraps from the kitchen and other sources of food indicated above, a bird may cost you about eight annas per month for its upkeep, under village conditions. She may give you 8 eggs in a month, on an average. That will fetch you twelve annas at the least, thus giving you a profit of four annas over each laying hen. So the ten birds and one cockerel should leave you Rs. 2/-, per month as profit; well: this is with Desi hens. This is a highly conservative estimate and a rough one and there is enough margin for fluctuations under all heads.

You can improve and increase your out-put of eggs, by keeping exotic birds like White Leghorns, Rhode Island Reds, Black Minorcas or Light Sussex, if you can manage a little initial outlay. They lay bigger and greater number of eggs. Each Desi hen's egg may weigh about an ounce to an ounce and a quarter and that of the exotic bird, very nearly weighs 2 ounces and more. And each exotic hen will lay at least 16 eggs a month. So for almost the same upkeep charges, you will get Rs. 9/8/- a month as profit if you keep a pen of 10 hens and one cokerel of any one of the exotic breeds.

Lest my estimate should be far from correct at the present prevailing price-level, I wrote and ascertained a friend who has been keeping a small unit of White Leghorns, for a very long time in one of the suburbs of Madras—Perambur. Here is what he says:—

"The actual cost is Rs. 11/- per month for 13 hens and 2 cockerels. It works out to about 12 annas to feed a hen for a month. It lays about 20 eggs per month on an average for first six months and then it gradually decreases but not very much. Even taking the average as 18 eggs, we still get a profit of Re. 1-8-0 per bird per month at annas two an egg".

Perambur is an urban area and so my estimate should be almost correct under village conditions. We need not worry about labour charges, medicine charges and housing charges etc., under village conditions. Let us leave all these to big farms in Cities and towns.

There is another method of improving and increasing your output of eggs. You may keep a flock of Desi hens and use an exotic cockerel.

The resulting progeny is a crossbred bird, which should again be mated to a pure-bred cockerel and the process kept on. This process is called "grading-up" and if this is followed by you for about three years, the birds at the end of that period will be very nearly cent per cent, as pure blooded as the exotic birds. In the meanwhile, the crossbred birds will be laying heavier and greater number of eggs than the Desi birds, thus fetching you more and more profit, as they get improved in the strain.

Other countries had advanced so much in poultry farming that they are trading on a colossal scale in dried eggs, dried yolk, dried albumen, frozen eggs, canned table birds &c. Well, what of India? Here is an industry which can be developed by people themselves on a limited or unlimited scale. The ryot in the village, the local bodies, City Corporations and industrial organisations can all help to put India on the map of world's Poultry Industry. Are you thinking of the risk involved due to disease? Which industry has not risks? Is the risk involved so great as not to make you attempt this industry? Now with protection available against Ranikhet disease—the worst scourge of fowls—the risk in this industry is reduced to a minimum.

So, take to poultry farming. Besides all the above, Poultry farming has a charm all its own and it may prove a fine hobby for you, your women-folk and children.

I. C. A. R.

Farm News Releases

Farm Fillers:—The Indian Union has 69 million poultry birds, valued at rupees ten and half crores. A little less than a third of these are laying hens, producing over 134 crores eggs, worth rupees 10 crores and 73 lakhs.

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High temperature all the year round burns out the organic matter in the soil quickly. Heavy soils as well as light soils are benefited by the addition of organic matter. The former become less sticky and more porous, while the latter become more retentive of moisture.

* * *

The average economic life of a hen in India is 2½ years.

* * *

Our annual output for the past five years in coir fibre has been 1,32,600 tons, valued at about Rs. 15 crores.

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The cashewnut was introduced into India from Brazil by the Portuguese some 400 years ago.

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It is a sound plan to take out cows for exercise daily particularly when the weather is suitable Too much exercise, however, should be avoided for cows in an advanced stage of pregnancy.—No. 133.

Washing sheep before shearing better prices for wool:—Washing the sheep before shearing and properly grading the wool for marketing bring in extra money to sheep owners.

This was shown to the farmers in Ajmer recently under a scheme sponsored by the I.C.A.R.

In washing the sheep, only clean water tanks were used and flock owners were advised to use hard ground for keeping the sheep on, till they were dry.

After shearing, the wool was graded into white and coloured. The produce was marketed at the nearest wool market, and the flock owners taken to the market to watch the open auctions.

It was found that the washed and graded wool fetched Rs. 20 to 30 more per bale than the usual unwashed and ungraded wool. This worked out to an extra profit of Rs. 0-1-9 per sheep.—No. 136.

Poudrette-making—A new method:—Research has shown a new method of making poudrette manure from night soil. It consists of adding such material to the night soil as can easily and quickly turn it into a dry state.

Saw dust and broken leaves have a high capacity for absorbing water and are ideal for mixing with night soil.

For preparing poudrette, night soil is treated in a trench a foot deep and of suitable length and breadth. A layer of the absorbing material is spread in the trench over which the night soil is spread out. A long iron or wooden rake can be used for the purpose. Additional absorbing material is thrown over the night soil and mixed with the rake, until the mixture is reduced to a powdery form.

The material is then piled up in a heap to dry further in the sun. It can be disposed of as manure a few days after, or stored in a pit or heaped in a shed until required.

The method is ideal for adoption in small towns and villages. It requires a small area, quickly disposes of the night soil, controls fly-breeding and foul smell. It produces a rich manure which is suitable for direct application without needing further fermentation.—No. 138.

Tick Fever in Poultry—preventive steps :—Ticks often cause serious disease in poultry. Very often, healthy stock despatched from poultry farms by rail pick up ticks in transit because of infected vans. Many of the birds die by the time they reach the end of the journey.

Poultry farmers are advised that immediately they receive a consignment of birds by rail, they should examine them for seed ticks on their body, especially under the wings and between the legs and pectoral muscles. If any are present, the birds should be suspected of suffering from tick fever. Such birds should be kept separate and got treated by the Veterinary Officer.

Poultry Specialists say that dusting the birds periodically with insecticides like 'gammexane' or 'Hexyclan' keeps them free of ticks.—No. 139.

Reviews

The Merck Veterinary Manual.—Published by Messrs. Merck & Co., Inc., Rahway, New Jersey, U.S.A. Price $7·50.

This reputed firm has brought out a very useful handbook for reference on the diagnosis and treatment of diseases of animals. It is on the same model as the Merck Manual of Diagnosis and Therapy issued by them for the use of the medical and allied professions.

It may sound paradoxical, but it is true, if we say that it is a compact and yet an exhaustive work, which should have claimed a colossal amount of planning, labour and time. The work reflects the faith they have in the Veterinary profession and it is a compliment paid to the profession in general and to the Field-workers in particular.

Part I deals with diseases of large and small domestic animals, including sections on allergic diseases, endocrinology, metabolic disturbances nutrition, etc.

Part II deals with toxicology.

Part III deals with poultry diseases.

Part IV deals with the health and disease problems of the Furworld, laboratory and zoo animals.

Part V deals with Laboratory procedures, submission of specimens, Veterinary Radiology, Meat inspection, Disposal of dead animals, Weights, Measures and Equivalents, Conversion formulas, etc.

It should serve as a useful guide both to the student and the practitioner. The get-up is what is to be expected from an American publication. It is in pocket size on strong Bible paper with a maroon, gold-stamped, durable sturdite binding and is quite attractive.

T.V.M.

The Physiology of Domestic Animals.—By H. H. Dukes, D.V.M., M.S. Seventh Edition. Price 75*s*. Messrs. Bailliere, Tindall & Cox, Ltd., London, 1955.

"The Physiology of Domestic Animals" By H. H. Dukes.—has been the standard text book on Physiology for Veterinary students and the new edition of this book is a worthy successor to its earlier editions. The new edition shows extensive revision and rearrangement of the subjects especially the following:—haematological data, physiology of the heart, respiration, physiology of the equine and ruminant stomachs, temperature regulation especially in cattle and physiology of the nervous system. Many authorities on certain special aspects of Physiology have contributed chapters on their specialities and this has enhanced the value of the book. A special addition in this edition is the appendix on "Lecture Demonstrations in Physiology" and Physiology being primarily a science whose growth is in no small measure due to carefully designed and skillfully conducted experiments, this addition will be specially welcomed by the teachers in the subject.

Our knowledge of Physiology of large domestic animals and birds is still not complete and as such, extensive references given at the end of each chapter will be found very useful to those who desire additional information on any topic and to the research worker.

K. N. G. NAYAR.

Gaiger & Davies Veterinary Pathology and Bacteriology.—By Gwilym O Davies, D.V. Sc., M.R.C.V.S., D.V.H., Reader in Veterinary Pathology, University of Liverpool, London. Pages VIII+803, 200 illust. Bailliere, Tindall & Cox, Ltd., 7 & 8, Henrietta Street, Covent Garden, London, W. C. 2. 1955. Price 42*s*. Postage 1*s*. 3*d*.

This book continues to be popular with the under graduate students appearing for the examination in Pathology and Bacteriology. As a book of reference, its value has long been recognised by the practitioner. The subject matter is dealt with in a clear and concise manner and a large number of excellent illustrations are to be found in the book.

In this edition the general plan of treatment of the subject matter is same as in the earlier editions. Only minor alterations are effected in the text, excepting in respect of two chapters on Protozoal diseases, which have been thoroughly revised and new materials added.

Though in recent years, the trend has been to write separate text books on Pathology and Bacteriology, the author's attempt to continue successfully the presentation of the subjects is an integrated and coherent manner deserves commendation. To the students who are a novice to the subjects, such an approach is conducive towards gaining a fuller and comprehensive idea of the disease processess involved.

We note from the preface that the author is now engaged in the arduous task of recasting the book in the light of his long experience. While doing this, it is hoped he will bestow more attention to the diseases prevalent in this country. Inclusion of more technical details especially with regard to some of the virus diseases will also be helpful to the students.

The publishers have maintained their usual standard of excellence in printing, paper and reproduction of illustrations.

K. P. C. NAIR.

Association News

THE ALL-INDIA VETERINARY ASSOCIATION

The Office of the General Secretary of the All-India Veterinary Association is shifted from Bangalore to Madras and is now located in the same place as the Indian Veterinary Journal.

All communications intended for the All-India Veterinary Association may in future be addressed to :—

23, First Street,
Vidyodaya East, T'Nagar,
Madras-17.

The affiliated Branch Associations are particularly requested to note down the change of address.

Madras,
16th December, 1955.

T. V[illegible]NAYAKA MUDALIAR,
General Secretary.

The Indian Veterinary Journal

NOTICE TO CONTRIBUTORS

THE INDIAN VETERINARY JOURNAL is intended for the publication of papers on Original Work, General and Clinical articles, Extracts, Reviews, Association News and other cognate matters pertaining to animal health and disease and progress of Veterinary Science and the profession in general.

The Editor, in his work of examining papers received for publication, is assisted in an honorary capacity by a large number of scientists working in various parts of India.

Matter for publication should always be typed and sent in duplicate. The type scripts should be on one side of the paper only with double spacing and one inch margin on the left side. They should be sent after careful revision and correction, otherwise they are liable to be not considered.

The papers must be brief and to the point. They are accepted subject to the right of editorial revision, wherever considered necessary. If papers submitted are considered to be of excessive length, they may be returned to the authors for necessary reduction and re-submission. A copy of the page proof will be sent to the author, in cases, where it is considered necessary and it should be returned without delay with necessary correction. Extensive changes in the matter are not permissible at that stage. Orders for *reprints* should be made at the time of the submission of the paper or when the proofs are returned. Otherwise only the usual number of complimentary reprints viz. 10 will be sent to contributors of Original and General articles.

The number and size of tables, charts and plates should be limited. Coloured plates cannot be reproduced, except under exceptional circumstances or if the author is willing to bear the cost.

Abbreviations of references to Authors, years and Journals should be on the model adopted normally in all international publications.

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