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Editor:

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General Articles 465

BOVINE MASTITIS — SOME OBSERVATIONS ON THE DIFFERENTIAL AND INHIBITORY MEDIA IN THE ISOLATION OF THE CAUSAL STREPTOCOCCI*

By

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While conducting investigations on the Bacteriology of Bovine Mastitis, certain observations on the differential and inhibitory media in the isolation of the causal streptococci were made and it was found that, though the media was of limited value, still, under certain circumstances it was found to be extremely helpful.

In trying to isolate streptococci from milk, the greatest difficulty is encountered in finding a colony on agar-plates reasonably isolated from other colonies. This is mainly due to the fact that a number of different types of organisms are there as contaminants.

These contaminants may get access in various ways. Quite a number of them exist as normal inhabitants of the teat ducts and teat canals; examples of these are *Strep lactis*, *Lactobacillus*, certain *Staphylococci* etc. Another source of contamination of the milk samples is the presence of various types of organisms in the atmosphere, excreta, hays and straws which can contaminate the outside of the udder. Even if the milk sample is collected under strict aseptic condition, some of these organisms get included in the sample. Some important organisms in this connection are *B. mesentericus*, *B. subtilis*, *Cl. welchii*, *Bact. alkaligenes*

*Read before the Medical and Veterinary Section of the 36th Annual Meeting of the Indian Science Congress.

Cl. butyricum, *Bact. coli*, *Proteus vulgaris*, *staphylococci*, *micrococci* and some chromogenic bacteria. A further additional source of contamination is what can be said to be the limitation of technical proficiency.

Most common and persistent offenders, however, are the *staphylococci*, *B coli*, *micrococci* and *B. subtilis* which will invariably make their appearance in large numbers in the cultures. The index of contamination rises where the milk sample is incubated before plating out. It is in relation to these organisms that the utility of the inhibitory medium becomes evident.

As far as is known, it was J. W. Churchman (1912) who first made a detailed study of the inhibitory action of dyes as a selective bactericidal agent. He used Gentian-violet in connection with such organisms as *B. subtilis*, *micrococcus aureus*, *micrococci albus*, *B. diptheriæ*, *B. anthracis Sarcina rosea*, *Streptothrix actinomyces*, *Blastomyces* and certain yeasts These organisms refused to grow when stained with Gentian-violet and transplanted to agar. The other group of organisms which he found to be growing quite luxuriantly on plates after being kept in the dye for one hour was *B. proctiosus*, *B. pyocyaneus*, *B. typhosus*, *B. paratyphosus*, *B. lactis-ærogenes* and *B. suipestifer*. Early observations of this kind were made by botanists on plant cells. Cornil and Babes (1890) found that Methyl-violet possessed anti-bacterial effect. Drigalski and Couradi (1920) worked with crystal-violet and found that it inhibited the growth of numerous cocci and bacteria but not of *B. coli* and *B. typhosus*.

Krumwiede and Pratt (1914) worked with Gentian-violet and allied aniline dyes and observed that, in general, their influence on bacterial growth was corresponding to their reaction to the Gram's staining. As a rule, Gram-positive organisms were inhibited by the dyes, a striking exception being the organisms of the *streptococcus* and *pneumococcus* group. The reaction, they found, was rather quantitative.

Klimmer, Haupt and Roots (1928) made use of a special agar medium containing saccharose and brom-cresol purple. On the surface of this medium, they observed that the colonies of *Str. agalactiae* are surrounded by yellow zones, whereas the milk contaminant *Str. lactis* does not as a rule do so.

Seeleman (1928) recommended surface cultivation on agar containing sodium nucleinate for the recognition of colonies of mastitis *streptococci*.

Edwards (1931) describes a medium of meat-infusion-broth containing 1% glucose and 5% serum in which Crystal Violet in the proportion of 1:200,000 was added. This selective medium prevented growth of *staphylococci* and at the same time allowed maximum growth of *streptococci*.

Ritcher (1931) found the lactose-agar plate and lactose-china-blue plate valuable in diagnosing mastitis. Bryan (1932) suggests Gentian-violet liver-infusion-broth as a superior medium for the cultivation of *streptococci* from milk. The Gentian-violet was used in an aqueous solution, the final dilution being 1:150,000. Diernhoffer (1932) seems to prefer surface cultivation on glucose-blood-agar, a medium which favours the growth of *streptococci*.

Edwards (1933) describes a solid medium for isolating *streptococci* and at the same time differentiating them on the basis of their haemolytic character. This is Crystal-Violet-Aesculin-Blood-Agar. Aesculin was added to identify some dye-resistant contaminants such as *B. coli*, *Str. lactis* and a certain variety of dye-resistant *staphylococci*. Edwards accordingly has worked on selective media, both liquid and solid. He suggests that the fluid medium is useful in cases of re-examination of milk from supposed healthy cows. The colonies of the contaminating organisms were usually larger than those of mastitis *streptococci* and could be distinguished by their black colour. The composition of the medium is as follows:

Meat-extract Lemco) agar	...	1000 c.c.
Crystal-Violet (B. D. H.) 0·1 per cent	...	2 c.c.
Defibrinated Ox blood	...	50 c.c.
Aesculin	...	1.0 gm.

Groesbeck (1935) suggested the use of 1 ml. gravity cream emulsified in a test tube containing 10 ml. of freshly prepared sterile 1 per cent solution of pure sodium carbonate. When incubated at 37°C overnight, growth of *streptococci* was unobstructed but the Gram-negative bacilli were destroyed.

Pagnini (1935) used a medium consisting of 90 ml. of agar plus 1 per cent each of mannite and arabinose, 10 ml. of horse serum, 0·27 ml. of a 0·1 per cent aqueous solution of Crystal-Violet and 0·5 ml. of a 1 per cent alcoholic solution of brom-cresol-purple. In this medium *Str. agalactiæ* grew as violet colonies, while *Str. lactis*, *Str. fæcalis*, *Str. bovis*, *Str. innlinaceus* and various other saprophytic strains grew as yellowish colonies.

Plastridge, Anderson and Sereme (1938) and Slanetz and Naghski (1939) in the United States found Edwards medium especially valuable in detecting the presence of *Str. agalactiæ* in incubated milk.

Plastridge, Anderson and Weirether (1942) during a period of temporary shortage of aesculin used a substitution medium in which aesculin was replaced by O. 5 per cent each of mannitol, inulin and sorbitoll. On this medium they report colonies of *Str. agalactiæ* were non-haemolytic or weakly haemolytic and produced no greening or browning of the

medium; colonies of *Str. dysgalactiæ* were usually non-haemolytic or alpha-haemolytic and at times they produced slight greening or browning of the medium; and colonies of *Str. uberis* and most saprophytic *streptococci* produced greening or browning.

Packer (1943) found that a medium consisting of blood agar (*p*H 6·8) to which was added sodium azide (1 : 2,000) and crystal violet (1 : 500,000) permitted the growth of pathogenic streptococci, including *Str. agalactiæ* but inhibited the growth of *Staph. aureus*, *B. subtilis* and Gram-negative organisms. Francis (1948) states that by using Crystal-Violet-Aesculin-blood-agar it is possible to differentiate between the three main types of mastitis streptococci i. e. *Str. agalactiæ*, *Str. dysgalactiæ* and *Str. uberis*, by the character of the colonies produced. Francis also used Sodium azide (1 : 40,000) and found that it inhibited the growth of B. coli.

Procedures and Materials

The observations herein detailed were made on samples of milk as well as on mixed cultures of known species of organisms. Crystal-Violet-Aesculin-Blood-Agar medium was prepared as follows—

Constituents—

1.	Stock nutrient agar	... 1000 ml.
2.	Crystal-Violet (Grubler) O. 1 per cent sol.	... 2 ml.
3.	Aesculin (Baird & Tatlock)	... 1 gm.
4.	Sterile defibrinated Ox blood	... 50 ml.

Preparation—

1. Melted (1) by autoclaving for 15 min. at 115°c.
2. No. 2 and 3 added: No 3 was dissolved in a small quantity of water by boiling prior to adding; while hot, it is a colourless solution but if allowed to cool, it becomes recrystalized,
3. Tubed in 12 ml. lots.
4. Sterilized by autoclaving for 15 min. at 110°c.
5. When used, the agar was melted and kept at 45-50°c and 0·5 c. c. of sterile Ox blood was added to the plate.

Milk sample as inoculum

Procedure:—Milk samples were collected under aseptic conditions, incubated overnight and centrifuged at 2000 revs. per minute for ½ hr. The supernatant was pipetted out and various dilutions of the deposit were used as inoculum. Two sets of plates were used, one set having only Blood Agar.

One variation to this method was tried namely, the addition of requisite amount of Crystal Violet to each plate separately instead of incorporating it in the stock agar.

While colonies were counted on plates it was not possible to identify them merely by their appearence. Therefore, a number of representative colonies of similar type was picked up and subjected to various cultural, biochemical and serological methods of identification.

Results:—Using milk as the inoculum it was not expected to find mastitis *streptococci* in each and every sample. In fact only a small percentage of these samples did contain typical mastitis *streptococci*.

Thus the results in this connection can be divided into two groups; firstly, where mastitis *streptococci* were present and secondly where they were absent.

In the former it was found that crystal-violet in 1 : 500,000 inhibited the growth of most of the *staphylococci* and of *B. subtilis*. This resulted in the lowering of the density of the growth of the colonies and therefore it was made extremely easy to pick out single colonies.

In a smaller number of cases, a strain of dye-resistant staphylococcus was observed but the size of these colonies was definitely very much larger. *B. coli* colonies were easy to spot, mostly due to their size and shape. In many instances, however, the surface colonies of *B. coli* did not take their expected black colour.

TABLE I

The effect of Crystal-violet on the growth of organisms encountered in connection with the isolation of Mastitis streptococci.

A. Where *streptococci* were present in the milk sample.

Dilution	Plain Blood-Agar plates		Crystal-Violet-Aesculin	
	Srep. like colonies (1)	Non-strep. like colonies (2)	Strep. like colonies	Non-strep. like colonies (3)
No. I	172	Countless	150	35
No. II	21	Countless	20	15
No. III	nil	85	1	nil

(1) haemolytic
(2) includes many different types of organisms
(3) *B. coli* in most cases.

B. Where *streptococci* were not present.

Solution	Blood-Agar plate	Crystal-Violet-Aesculin-Agar
No I	Countless colonies of various types.	232 col.
No. II	do.	63 col.
No. III	456 col.	7 col.

Mixed cultures as inoculum. A mixed culture of stock strains of *Hæmolytic streptococci*, *staphylococci*, *B. coli* and *B. subtilis* was taken as the experimental material. This material was used in different dilutions. The medium was the same as in the previous case.

TABLE II

The effect of crystal-violet on streptococci, staphylococci, B. subtilitis and B. coli.

Dilution	No. of colonies on Bl. Agar		No. of colonies of Crystal-Violet-Aesculin Agar	
	Strep. like	Non-strep. like (1)	Strep. like	Non-strep. like (2)
No. 1	572	Countless	463	394
No. II	173	Countless	195	87
No. III	15	820	18	24

(1) includes *staphylococci*, *B. coli* and *B. subtilis*.
(2) *B. coli* only.

Discussion :—From the results obtained it is sufficiently clear that the use of Crystal-Violet is useful in the isolation of ***streptococci*** from mastitis milk. But, there are some limitations.

While it has been possible to differentiate in a number of cases the three main types of mastitis ***streptococci*** according to the colour of the colonies in the Aesculin medium, the practice is not without risk of errors. It has been found that two colonies of the same colour have turned out to be two different species of ***streptococci***. In fact, the surface colonies of ***streptococci*** are actually whitish-grey in colour in many cases.

Again, while it is agreed that the colonies of the contaminating organism are of larger size, the statement that they take a black colour has been found to be only partly true. The surface colonies of *B. coli* in most cases are light-violet to whitish-grey.

In the experience of the writer the addition of Crystal-Violet at the time of actual plating out seems to give a better result, although it is realised that the procedure makes the work more complicated and less accurate.

Conclusion :—Apart from the fact that the method has certain limitations, the use of Crystal-Violet-Aesculin-Agar medium in connection with the isolation of ***streptococci*** of mastitis origin has been found to be helpful. The medium greatly facilitates in identifying and also in isolating a pure culture of mastitis ***streptococci***. It will, however, hardly be of any assistance where a primary bacteriological survey of any herd is carried out.

It can certainly be recommended in the following instances:—

(1) Examination of milk samples from a herd in which ***streptococcal*** infection is known to predominate.

(2) Examination of milk samples from a cow or cows which, on clinical findings, seems to be suffering from streptococcal mastitis.

(3) In the re-examination of milk samples in routine examination to to ascertain the presence or absence of a bacteriological cure.

(4) When ***micrococci*** or ***staphylococci*** are present in such a number that it becomes difficult to find a countable plate unless a very high dilution of the material is used.

(5) When alteration in the characters of milk, visible or otherwise, suggests ***sterptococcal*** mastitis.

(6) To recover a pure stock of ***streptococci*** which has accidentally been contaminated.

Summary

(*a*) The literature in connection with the differential and inhibitory media has been discussed.

(*b*) The utility of Crystal-Violet-Aesculin-Blood-Agar medium as regards the isolation of ***streptococci*** of mastitis origin has been observed.

(*c*) Milk samples as well as mixed culture have been used as experimental material.

(*d*) The original medium advocated by Edwards has been modified in certain instances as regards the method of preparation and observations thereof recorded.

(*e*) The medium has been found to be extremely useful under certain conditions.

Acknowledgment

The author is thankful to Dr. S. Datta, D.SC., M.R.C.V.S., F.R.S.E., F.N.I., Director, Indian Veterinary Research Institute, Mukteswar for making available all facilities for the above work which has been carried out at the Institute.

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IN VITRO ACTION OF ESTROGEN ON RABBIT COCCIDIAN OÖCYSTS

BY

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(With four figures in the text)

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The Problem

In attempts to control rabbit coccidiosis by chemotherapy the lethal action of a large number of chemical agents on the oöcysts has been determined (Perard, 1925; Lund, 1945; Jankiewicz, 1945; and Kar, 1947). Cheyssin (1935) reported the action of a large number of chemicals on the oöcysts of rabbit coccidia and further studied the permeability of the oöcyst wall. Recently, Goodrich (1944) has contributed a valuable paper on the structure and development of the oöcysts of *Eimeria stiedae*.

The present report is concerned with an attempt to study the ***in vitro*** action of estrogen on two species of rabbit coccidia, *Eimeria stiedae* (Lindemann) and *Eimeria perforans* (Leuckert).

Experimental Procedure

An abundant supply of the oöcysts of *E. stiedae* and *E. perforans* was obtained from two infected rabbits. The animals were autopsied and the fresh, unsegmented oöcysts were recovered from the gall-bladder and the intestine. The collected oöcysts were thoroughly washed and then transferred to sporulating dishes containing the estrogen suspensoid.

The well-known synthetic estrogen, diethylstilbestrol (pp'—dihydroxy-*ab.* diethylstilbene) was used in this experiment. A suspensoid of crystalline hormone was prepared in 3% ethyl alcohol. The following three concentrations of the hormone suspensoid were used in this study :—

(1) 0·2 mg. of diethylstilbestrol per c.c. of 3% alcohol.
(2) 1 mg. of diethylstilbestrol per c.c. of 3% alcohol.
(3) 3 mg. of diethylstilbestrol per c.c. of 3% alcohol.

To avoid repetition, the above three concentrations of the estrogen suspensoid have been referred to as trials *a*, *b* and *c* respectively in the text. Three stocks of oöcysts were prepared for each trial and each stock was kept in a sporulating dish containing 5 c.c. of the hormone suspensoid. Oöcysts kept in 3% alcohol served as controls. To obviate inaccuracy, a second batch of control oöcysts were kept in 2·5% potassium bichromate solution.

The percentage of sporulation as well as the mortality of the oöcysts were recorded by observing 100 oöcysts from each stock every 24 hours. The data presented in this paper, therefore, represent the arithmetic mean of three individual readings in each case. The dead and or living oöcysts were determined by the method employed in a previous study (Chakravarty and Kar, 1946).

The present experiment was carried out at the Institute of Animal Genetics, The University of Edinburgh.

Results

A. *The effect of diethylstilbestrol on the mortality of E. stiedae and E. perforans.*

a. *E. stiedae.*

In all the three trials the mortality rate rises steadily from the 24th hour period and the peak is reached in 288 hours (table 1 and fig. 1). In controls *the highest mortality rate is observed in 24 hours (5 per cent). In 48 hours

*The difference between the two batches of control oöcysts (kept either in 3% alcohol or 2.5% potassium bichromate solution) as regards the percentages of mortality and sporulation was insignificant. For this reason the term 'control' refers to the oöcysts kept in 3% alcohol unless otherwise stated.

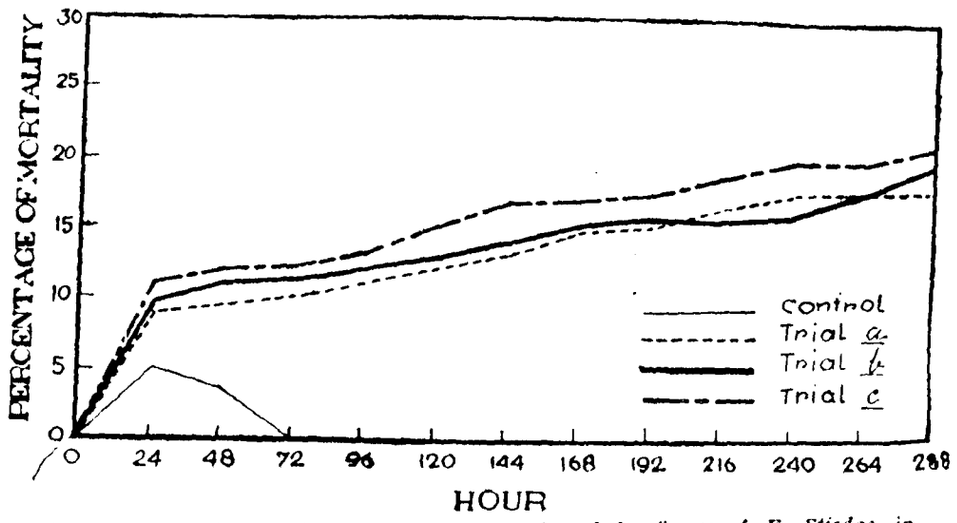

Fig. 1 Graph showing the percentage of mortality of the oöcysts of *E. Stiedae* in different estrogen concentrations.

the death rate declines and finally in 72 hours it becomes nil. It is further evident from table II that the initial as well as the final percentages of mortality in all the three trials were more or less equal.

TABLE I

Mortality percentages of the oöcysts of E. stiedae and E. perforans in different concentrations of diethylstilbestrol suspensoids.

E. stiedae					*E. perforans*				
Time hours	Control	Trial *a*	Trial *b*	Trial c	Time hours	Control	Trial *a*	Trial *b*	Trial c
Percentages of mortality					Percentages of mortality				
24	5.0	9.1	10.0	11.1	24	2.1	8.2	12.0	13.5
48	3.1	9.5	11.2	12.1	48	1.2	9.5	12.2	14.1
72	Nil	10.2	11.5	12.5	72	Nil	10.2	13.0	15.0
96		11.1	12 2	13.5	96		12.1	13.5	15.1
120		12.2	13.0	15.5	120		12.5	14.1	15.5
144		13.1	14.2	17.1	144		12.8	14.5	16.1
168		15.0	15.1	17.2	168		13.2	15.2	17.2
192		15.5	16.0	18.0	192		14.0	16.0	18.1
216		17.2	16.2	19.1	216		14.5	16.2	18.5
240		18.0	16.8	20.1	240		15.0	17.5	19.2
264		18.2	18.5	20.5	264		15.2	18.2	20.2
288		18.5	20.5	22.0	288		16.0	18.5	21.5

b. *E. perforans.*

The behaviour of the oöcysts of this coccidia was strikingly comparable to that of *E. stiedae.* Thus in all the trials a steady rise in the mortality rate is observed for each succeeding 24 hour period. The maximum mortality is recorded in 288 hours (table 1 and fig 2.). In the control oöcysts, however, the

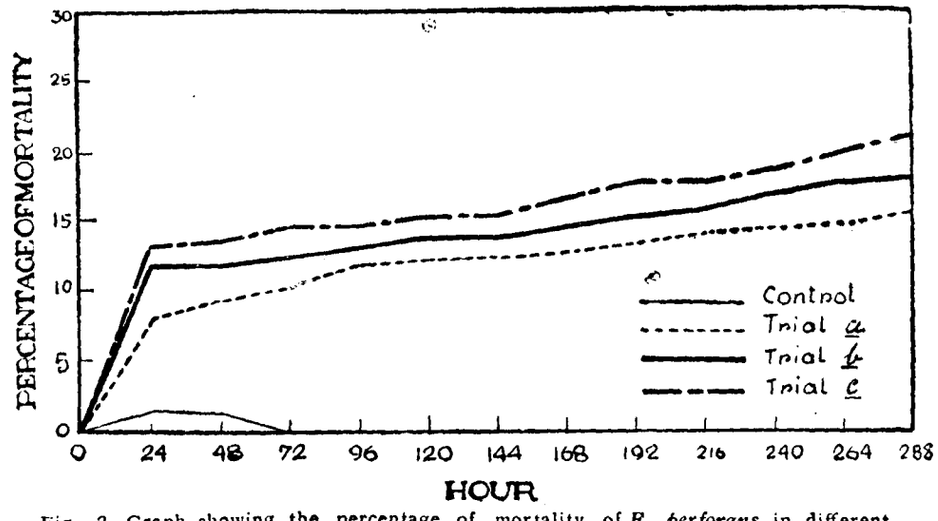

Fig. 2 Graph showing the percentage of mortality of *E. perforans* in different concentrations of the hormone.

mortality rate becomes nil in 72 hours.

It can be appreciated from table 1 that the oöcysts of both the species of coccidia involved in the present study behaved in a likewise manner as regards the mortality rate. This was true of the control batch of oöcysts as well as of those kept in the hormone suspensoids. Further, in both the species the percentage strength of the estrogen was without any influence on the mortality rates, either initial (in 24 hours), or final (in 288 hours).

B. *The effect of diethylstilbestrol on the sporulation of E. stiedae and E. perforans.*

a. *E. stiedae.*

In all the trials, the oöcysts failed to sporulate throughout the duration of the experimental period. In the controls, on the other hand, the sporulation started in 72 hours and 94 per cent sporulation was noticed in 144 hours (table II).

b. *E. perforans.*

Oöcysts kept in the estrogen suspensoid did not sporulate throughout the period of experiment. In the controls, however, the sporulation started in 24 hours and the maximum (94. 1 per cent) was recorded in 48 hours. A point to be noted in this connection is that the initial percentage of sporulation in

E. perforans was lower than that of *E. stiedae*, but the maximum percentage was almost equal in both the species (table II).

C. The sporulation of E. stiedae and E. perforans after their removal to 2·5 per cent potassium bichromate solution from diethylstilbestrol suspensoids.

At the end of 288 hours, the oöcysts of both the species of coccidia plunged in the estrogen suspensoids were examined under the microscope. Curiously, quite a large percentage of the oöcysts were found to be alive. To estimate the viability of these living oöcysts, they were removed from the estrogen suspensoids, thoroughly washed in distilled water and then transferred to sporulating dishes containing 2·5 per cent potassium bichromate solution. The following results were obtained:

a. *E. stiedae.*

The oöcysts transferred from trial *a* (table II and fig. 3) exhibited sporulation in 144 hours (20.2 per cent) and the maximum percentage was reached in 288 hours (86.0 per cent). The oöcysts from trial *b* commenced to sporulate in 144 hours (20.2 per cent) and gradually attained the maximum in 288 hours.

TABLE II

Sporulation percentages of the oöcysts of E. stiedae and E. perforans after their removal from diethylstilbestrol to 2·5 percent potassium bichromate solution.

E. stiedae					*E. perforans*				
Time hours	Control	Oöcysts from trial *a*	Oöcysts from trial *b*	Oöcysts from trial *c*	Time hours	Control	Oöcysts from trial *a*	Oöcysts from trial *b*	Oöcyst from trial *c*
Percentages of Sporulation					Percentages of Sporulation				
24	Nil				24	38.1			
48	,,				48	98.1			
72	53.1				72				
96	66.2				96				
120	88.2				120				
144	94.0	20.2	20.0	30.0	144				
168		25.6	25.0	40.6	168				
192		45.0	35.0	45.3	192		35.0	40.0	35.5
216		60.2	55.6	50.0	216		56.0	65.2	62.0
240		75.0	65.5	55.5	240		67.5	70.0	75.5
264		82.0	75.0	60.0	264		84.6	82.6	80.3
288		86.0	85.0	64.0	288		95.0	96.0	90.0

(85.0 per cent). Those from trial *c* also exhibited initial sporulation in 144 hours (30.0 per cent). The highest percentage of sporulation of the oöcysts from this stock was reached in 288 hours (64.0 per cent). It might be recalled

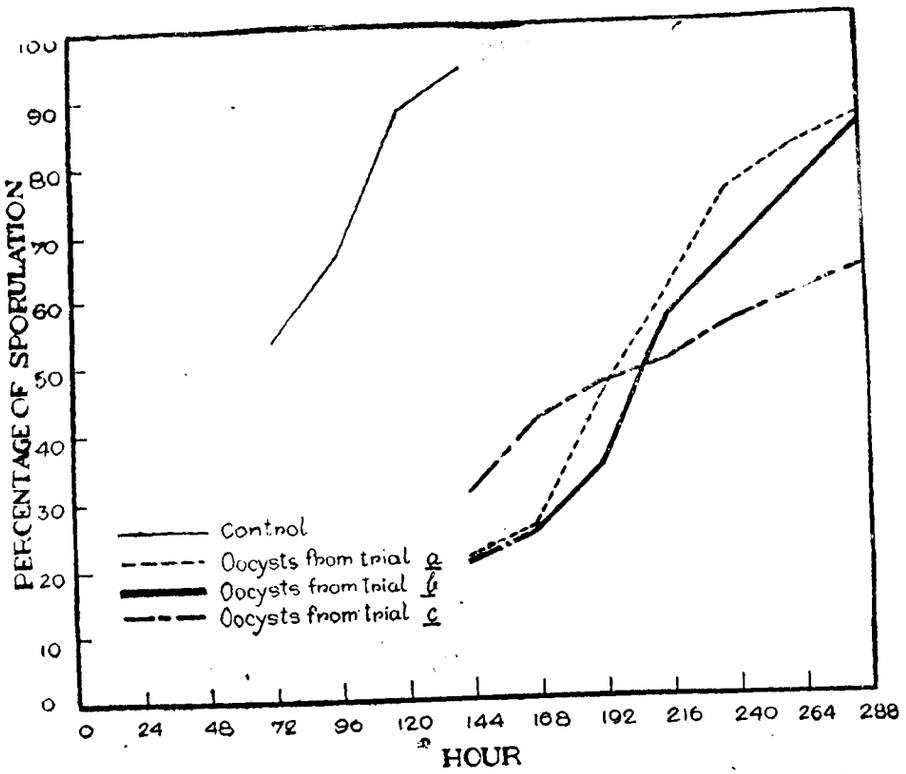

Fig. 3 Graph showing the percentage of sporulation of *E. stiedae* after removal from the estrogen suspensoids.

that in the controls the sporulation started in 144 hours and 94.0 per cent sporulation was recorded in 144 hours.

E. perforans.

The oöcysts from trial *a* (table II and fig. 4) started to sporulate in 192 hours (35.0 per cent) and the same was true of the oöcysts transferred from the trials *b* (40·0 per cent) and *c* (35·0 per cent). The maximum sporulation percentage

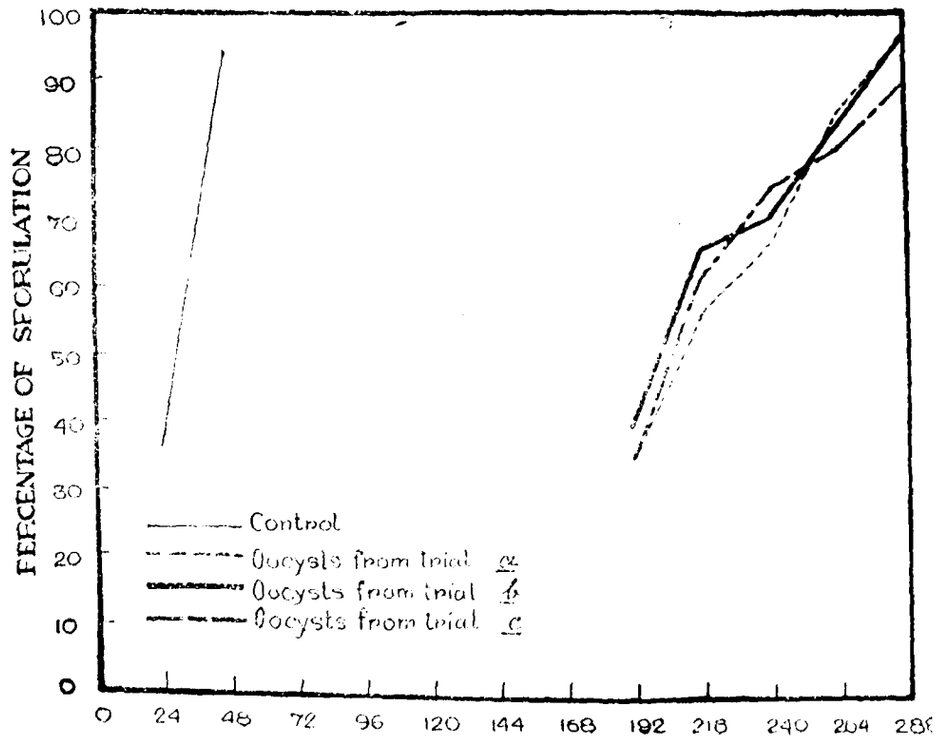

Fig. 4 Graph showing the percentage of sporulation of the oöcysts of *E. perforans* after removal from the hormone suspensoids.

of the oöcysts from trials *a*, *b* and *c* were recorded in 288 hours (95.0, 96.0 and 90.0 respectively). In the controls, however, the sporulation started in 24 hours and the maximum percentage was noted in 48 hours (table II).

Commentary

A perusal of table II will reveal some interesting difference in behaviour between the oöcysts of the two species of coccidia involved in the present experiment. In *E. stiedae*, the oöcysts recovered from all the trials started to sporulate in 144 hours, whereas in *E. perforans* the sporulation was exhibited in 192 hours. However, the peak of sporulation percentage in both the species was recorded in 288 hours. If the maximum percentage of sporulation in the two species is taken into account certain differences again become apparent. In *E. stiedae* the oöcysts from trial *c* exhibited only 64.0 per cent sporulation as against 86.0 and 85.0 per cents respectively. In *E. perforans*, on the other hand the maximum percentages of sporulation in the oöcysts from all the three trials were more or less equal. If the maximum percentages of sporulation of the

oöcysts of *E. stiedae* from the three trials are reckoned against those of *E. perforans* it will be noticed that in the latter the oöcysts from trials *a* and *b* exhibited greater sporulation rate by 9 and 11 per cents respectively. The oöcysts recovered from trial c, however, exceeded the sporulation rate of those of *E. stiedae* by 26 per cent (table II).

Discussion

The interesting fact which emerges from the present experiments is the delayed sporulation of the oöcysts observed after treatment with the estrogen. Pérard (1924) pointed out that a solution of sulphuric acid delayed the sporulation of *E. magna* for three days. Cheyssin also observed delayed sporulation of the oöcysts of the same coccidia when placed in sodium carbonate, gastric sugar, bile, or urea. However, 3 per cent alcohol used in the present experiment for suspending diethylstilbestrol was without any influence in checking the sporulation of the oöcysts. This can directly be inferred from the high sporulation percentage of the control oöcysts kept in 3 per cent alcohol (table 1). Moreover, Cheyssin (1935) reported that the oöcysts of *E. magna* and *E. perforans* exhibited normal sporulation when plunged in 20 or 30 per cent ethyl alcohol, but a solution of 50 per cent alcohol proved lethal for the oöcysts. These findings considerably strengthen the view expressed above that 3 per cent alcohol had no part to play in delaying the sporulation of the oöcysts.

Two alternative explanations may be offerd for the delayed sporulation, observed in the present experiments: (1) the penetration of diethylstilbestrol inside the oöcyst to stop the division of the zygote, or (2) insufficient oxygenation of the oöcysts.

Before making an attempt to explore the validity of the first explanation, it seems fitting to discuss in brief the question of permeability of the Eimerian oöcysts. In the majority of the Eimerians, the oöcyst wall is double; the outer (ectocyst) is comparatively thick, rigid, and often yellowish; the inner wall (endocyst) is much thinner and is more or less colourless. Perard (1925) and Wenyon (1925) pointed out that these walls are completely resistent and impervious to the action of various chemical agents. Recently, Goodrich (1944) also subscribed to this view. However, Cheyssin (1935) noted that various alcohols, formic acid and acetic acid penetrated the oöcyst walls of *E. magna* and *E. perforans*. He further pointed out that the oocyst wall was of an albuminous nature with ultramicroscopic pores and that the mechanism of penetration of the various organic substances was by filtration through these pores.

It we try to interpret the present results in the light of Cheyssin's findings, it would seem highly improbable that the microscopic crystals of the estrogen penetrated the ultramicroscopic pores on the oöcyst wall. Even if we assume that very fine crystals of the hormone ultrafiltrated through the pores on the

oöcyst wall it seems entirely unlikely that these could delay the sporulation of the oocysts just through the experimental period (288 hours), and lose their harmful action on the zygote as soon as the oocysts were removed from the estrogen suspensoid and plunged in 2·5 per cent potassium bichromate solution. Any possible action on the part of the latter reagents to counteract the harmful influence of diethylstilbestrol can be obviated by the fact that these substances serve only as antibacterial agents and have no known part to play in the process of sporulation of the oöcysts. The only other location through which crystalline hormone could penstrate the oöcyst wall is the micropyle which again seems highly improbable, since this opening once closed after syngamy does not open again (Goodrich, 1944).

It is now commonplace that three factors are responsible for the sporulation of the coccidian oöcysts viz (1) temperature (2) moisture and (3) oxygen. In the controls, all the three factors were optimum since the oöcysts exhibited nearly cent percent sporulation. However, in the experimental batches, temperature and moisture factors were optimum but it seems likely that there was insufficient oxygenation of the oöcysts. Possibly, the estrogen played a leading role in disturbing the normal oxygen supply of the oöcysts and as a result the sporulation was considerably delayed. After removal from the harmful influence of the hormone, the oxygenation became normal and the oöcysts commenced to sporulate. However, in *E. stiedae* sporulation was noticed in 144 hours after removal from estrogen (table 1) whereas *E. perforans* started to sporulate in 192 hours. This can be explained by the assumption that the oöcysts of the latter are more susceptible to the harmful influence of diethylstilbestrol and hence commenced to sporulate much later than those of *E. stiedae*.

In the light of the above arguments, therefore, it appears highly suggestive that the estrogen has no direct influence on rabbit coccidian oöcysts but has only an indirect one, namely, its interference with the normal oxygenation of the oöcysts resulting in the delay of the sporulation for a considerable period of time.

Summary

1. Diethylstilbestrol delays the sporulation of the oöcysts of *Eimeria stiedae* and *E. perforans*.

2. The ability of the viable oöcysts to sporulate is impeded by diethylstilbestrol, but not destroyed, for they would sporulate after a prolonged time upon removal from the effects of the hormone.

3. It is suggested that the estrogen interferes with the oxygenation of the oöcysts and thereby delays the sporulation for a considerable period of time.

Acknowledgment

The author wishes to express his sincere thanks to Rev. Fr. Hogbin for translating the French literature.

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A SHORT NOTE ON *MUSCA VISCINA* AS THE POSSIBLE VECTOR OF THELAZIA SP.

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That Arthropods are responsible for the propagation of many of the maladies in man and animals is no longer denied. Investigation of arthropod-transmitted diseases called attention to the association of not only microbes (protozoa, bacteria, fungi, viruses, rickettsia etc.) but also of many nematodes with insects and ticks. The number of species of nematode worms associated with insects is known to be great. There are still many more whose life-histories are unknown.

During the course of an investigation into the larval nemas of insects some years ago, the author had an occasion to open up the bodies of several common flies that were abundant during the fly season, i. e. from July to September, besides a number of other insects. The flies were collected mainly

from cattle sheds, although garbage heaps and such other insanitary surroundings were not over-looked.

The flies belonging to the genera *Musca*, *Stomoxys*, *Tabanus*, *Lyperosia* and *Hippobosca* were dissected.

The common bazaar fly, *Musca vicina*, was extensively studied—nearly seven hundred of that species having been dissected during the course of the study.

Technique of examination :—In the case of Muscids, the head was severed from the thorax and abdomen with a pair of sharp, mounted needles on the middle of the slide, to which a few drops of physiological saline were added. A cover-slip was placed over the head of the insect and gentle pressure applied with the blunt end of the needle until it burst releasing blood and serum from its proboscis. The serum and blood that came out of the head and proboscis were examined minutely for larval stages of nematodes. The whole process of dissection did not take more than ten minutes, and several flies were so examined in a day.

In the bigger flies like *Tabanids*, the whole alimentary canal was opened and its contents examined minutely under a binocular dissecting microscope.

Results :—Out of several hundreds of heads of the common bazaar fly, *Musca vicina*, that were examined, in only one case, about half a dozen minute, whitish-looking, elongated larvae were noticed. The larvae showed a characteristic wriggling movement. About two specimens were actually dissected out of the proboscis. These were slightly less than one. m.m. in length, and, when examined under a microscope, revealed the coarse transverse striations on the cuticle so characteristic of *Thelazia sp.*

Life-cycle :—The life-cycle of the Thelazia worms is not known as no known arthropod host has been incriminated so far. *Oxyspirura mansoni*, a worm found under the nictitating membrane of chickens and turkeys, passes its larval stage in cockroaches. So also may the eye-worms of cattle and dogs have insects as their intermediate hosts in which a part of their life-cycle would be passed.

Should the recovered larvae be of *Thelazia rhodesii* (as it appears highly probable on account of morphological resemblances), there is sufficient reason to believe that *Musca vicina*, the bazaar and the house-fly, would be an intermediate host of this eye-worm of cattle. The flies obviously get infected while feeding on the discharges round the eye of an infected host containing the embryos of *Thelazia rhodesii*. These would then develop in the gut or in the proboscis of the fly and reach the infective larval stage before they are introduced back again in the eye. Craig and Foust (1943) mention that a species of *Habronema* parasitises horses causing "Habronemic opthalmiasis"

and utilise *Musca domestica* as an intermediate host. This similarity in the life history of another spirurid worm is significant and note-worthy.

D. N. Roy and P. K. Mukerjee (1937) discovered adult forms of *Allantonema musca* and *A. stricklandi* in the body cavity of *Musca vicina* but they are quite distinct from *T. rhodesii*.

Further work in connection with the life-cycle of the worms is under progress.

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DILUTION AND STORAGE OF SEMEN—A REVIEW

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Introduction

As artificial insemination on a large scale, has become practicable, the necessity of semen dilution and its successful storage has become evident.

Diluters are used to increase the volume of the semen and to prolong the livability of the spermatozoa. For the purpose of increasing the volume of semen it appears that any diluter may be used as long as it is not harmful to the spermatozoa, has proper *p*H and is isotonic with the semen. The use of diluter for prolonging the livability of spermatozoa involves several additional factors. It must (1) provide favourable surrounding media to the spermatozoa (2) have buffering capacity against lactic acid (3) decrease the electrolyte concentration to produce approximately the same as that of the epididymis and (4) have the capacity for strenthening the lipoid capsule surrounding the sperm cell.

Research workers have endeavoured to increase the livability of the spermatozoa by using various methods. The most typical of these methods are (1) the use of low temperature and (2) the addition of different diluents before storage.

Aim of Diluters

There is no general agreement as to the exact way by which diluters help the preservation of livability of the spermatozoa. Some of the workers maintain that egg-yolk buffer furnishes nutriments for the spermatoza, while others (Herman and Swanson 1941) believe that variations in the length of the survival time of spermatozoa are due to intrinsic properties of the spermatozoa themselves, and the effect of dilution is to furnish the spermatozoa a favourable environment so that their energy will be used most effectively. The work of Lasley, Easley and Bogart (1942) indicates that egg yolk buffer protects spermatozoa from adverse conditions and as a result increases their life in storage. Lardy and Phillips (1941) observed that in the presence of phospholipids spermatozoa maintain their initial motility for a much longer period than in the presence of glucose only. These authors concluded that most probably the phospholipid is used by the spermatozoa as a metabolite and believed that fats are transported across the cell membrane in the form of phospholipids.

Voloskova (1941) reported the presence of lecithin in equine spermatozoa and in the seminal fluid. He reported that sexual activity affects the lipoid level of semen and following intensive activity, this level decreases and a 3 to 6 days, rest interval is required to restore the lipoid level. The lecithin content was also shown to affect activity and survival of spermatozoa. Milovanov (1935) pointed out that in the preparation of semen diluter substances have to be selected which do not injure the lipoid capsule surrounding the spermatozoa of mammals and birds. Popa (1930) and Marza (1930) claimed to have demonstrated this film microcospically, for destruction of the capsule by sodium chloride liberates small lecithin globules which can be stained. Bernstein and Sokolova (1935) examined smears of semen undiluted and diluted with various salt solutions, after staining with sudan-III and scarlet-red. Sudanophill granules were observed equally in both undiluted and diluted semen as well as in the seminal fluid. These results do not confirm the view concerning the destructive effect of certain neutral salts on the lipoid capsule. The presence of a lipoid capsule can therefore be regarded as a working hypothesis.

Principles of storage of semen

The composition of seminal fluid is variable. This is influenced by a combination of several factors such as breed, individuality, age, body condition, season, nutrition, disease and sexual use. According to Chang and Walton (1940), a suspension of sperm is composed of heterogenous population of cells of various age, activities and power of resistance. The metabolic processes are also continually changing the composition of the cells and of the medium in which they are suspended.

Milovanov (1934) considered that the death of spermatozoa outside the body is due to one of three causes viz (1) destruction of the spermatozoa itself (2) expenditure of nutritive material and (3) auto-intoxication by metabolic products. The cells themselves undergo a process of senescence and their resistance decreases. The medium undergoes changes, glycolysis occurs with a decrease in glucose, lactic acid accumulates and there is an uptake of oxygen and formation of carbon dioxide. Storage of semen outside the body involves bringing the sperm into a reversible state of activity in order to slow down the metabolic processes and delay senescence. But since the sperms in this anabiotic state are still living it is necessary to insure a supply of energy material and also to render the metabolic products harmless.

The epididymis is the most favourable place for continued viability of sperm. The epididymis does not allow an excessive accumulation of metabolic products or exhaustion of nutritive material. The low content of electrolyte (chloride ions) and the acid reaction of the epididymal fluid favour the transition of sperm in the tail of the epididymis into a resting stage. The aim in storage is to reproduce in "vitro" the anabiotic condition which is obtained in the epididymis. This is easier with the semen of ram and bull in which the changes that take place in the semen on ejaculation are less than in the semen of stallion, boar and dog which ejaculate a large amount of accessory secretions.

In general, storage of sperm is best accomplished by (1) the gradual lowering of the temperature of the sperm to a level at which its functional activity is reduced to a low but reversible state (2) addition to the semen of various diluters which supply nutrients and control to some extent the metabolic reactions (3) removal of accessory secretions and (4) holding down the bacterial contamination.

Effect of temperature, and rate of cooling on the storage of spermatozoa

Sperms are sensitive to both high and low temperatures. Sensitiveness to high temperature is particularly great. In the body, temperatures higher than that of the scrotum have a harmful effect on the fully formed spermatozoa. Outside the body, at body temperature, they retain fertilizing capacity for only about 10 hours and at 45°C they are almost instantaneously destroyed (Walton 1930). Body temperature is most favourable for motility but not for survival. At lower temperatures the time of survival increases. This increase in survival runs parallel with a decrease in the activity of the cell. Chang and Walton (1940) considered that it is probably due to the reduction in the rate of those metabolic processes which lead ultimately to the exhaustion or destruction of the cell. According to these authors a low

temperature (1°C) is not harmful to the spermatozoa provided cooling is done gradually. Rapid cooling (temperature shock) has a deleterious effect. In a sample of semen subjected to a temperature shock there is a decided reduction in the activity of the cells which do reactivate. No visible changes in the structure of the cells can be detected. Chang (1943) treated testes of rabbits with ice for 10 minutes and found that tailless sperms appeared in semen after 8 to 24 hours. There was no increase of tailless sperms from ejaculates 1 to 2 hours after treatment. The motility of the sperm from the first ejaculate (which came from vas deferens) 1 to 2 hours after treatment was very good but the motility of the sperm from the second or third ejaculates, 1 to 2 hours after treatment, was very poor. This shows that physiological deterioration precedes morphological disintegration.

Willett, Fuller and Salisbury (1940) found that a rate of lowering 5°C per 5 minutes to a storage temperature of 5°C is the most satisfactory. According to Easley, Mayer et al (1942), there exists a definite relationship between the rate of cooling and sperm survival in undiluted semen.

Effect of dilution on livability of spermatozoa

The duration of the life of spermatozoa is correlated with the degree of dilution of semen. In low grades of dilution, vitality rises parallel with the degree of dilution until a point is reached which is designated as the "optimum of dilution". This is specific for each medium. When the dilution is increased beyond this point, the degree of vitality begins to fall. The point of greatest dilution at which the vitality of the sperm is equal to that of the undiluted sperm is designated as the "maximum of dilution" which is also specific for each medium. Continued dilution beyond the maximum has a negative effect, until finally a point is reached at which the diluter is toxic. This analysis of Walton (1933) demonstrates that the diluter has two-fold effect; on the one hand it contains substances which activate the sperm, while on the other it lacks other substances necessary for normal functioning of the spermatozoa. With low grades of dilution the inadequacy of the diluter is not manifested because the sperm itself contains all the substances it needs and the addition of diluter enhances the resources of the sperm vitality. With increased degree of dilution, the equilibrium between the properties of the diluter, of the seminal fluid and of the spermatozoa is upset and vitality begins to fall, until the toxic point is reached.

Salisbury et al (1943) studied the effect of dilution rates of 1 part of semen and 1 part of diluter upto 1 part of semen and 32 parts of diluter and observed that the ability of bull spermatozoa to remain motile during storage was decreased by each increase in dilution rate. The spermatozoa in the more diluted material seemed after a time to be slower in their rotation about their longitudinal axis and died more quickly. There was

considerable variabilty in the response of different samples of bull semen to dilution. Those semen samples having a high percentage of motile sperm were least affected by high dilutions. The samples which showed the most marked effects were those which contained the smallest number of spermatozoa.

Chang, Casida and Barret (1947) studied six semen samples from each of five bulls diluted with 0.08 M sodium citrate and with 0.9 percent sodium chloride at a dilution rate of 1: 10, and from 1 : 100 to 1 : 12800. They observed that the percentage of motility decreased markedly in the higher dilutions and this decrease was fairly uniform for the different samples and in the two diluents.

Influence of the accessory secretions of spermatozoa

According to Milovanov (1934) the alkaline reaction of the accessory secretions induce motility by terminating the anabiotic condition of the sperm in the epididymis and at the same time cause disintegration of the lipoid capsule of the sperm by changing the medium.

In the boar Mckenzie et al (1938), it appears, removal of the contributions of the seminal vessicles and cowper's gland from semen reduces the number of abnormal spermatozoa and increases the duration of sperm motility. Sperm in semen from boars without seminal vesicles and cowper's gland remained motile longer than sperm in normal semen from the same boars.

Walton (1938) was able to produce pregnancies in mares with 20 hours-old semen by centrifuging out the seminal fluid and diluting with glucose–sulphate or tartarate diluters.

Herman and Swanson (1941) studied the effect of removal of the fluid portion of the bull semen. The effect of diluting with yolk buffer after centrifuging was very similar to the effect of diluting the entire semen with the same diluter. It was found that the centrifuged and diluted samples retained much better motility than others for the first three days but on the fifth day, or thereabouts, the motility was almost the same in both treated and untreated semen, thereafter the sperm in the treated semen died more rapidly. It was characteristic of the treated semen to maintain a high motility for several days and then suddenly to drop to a very low rate of motility.

Bacterial control of semen

Semen collected even under most ideal conditions contain certain types of bacteria. Bacteria compete with the spermatozoa for nutriments and other substances. The end-products of bacterial metabolism most probably become as toxic to the spermatozoa as their own waste products,

Hartziolos (1937) attemped to collect sperm aseptically in artificial vagina but found organisms consisting mainly of coliform, proteus, pseudomonas groups, cocci and spore-forming rods. Gansalus, Salisbury and Willett (1941) studied 43 ejaculates collected from 19 bulls with artificial vagina and found a bacterial count of from one thousand to 22 million per ml.

Knodt and Salisbury (1946) reported that sulfanilamide at 50 mg per 100 ml. completely controlled the growth of bacteria in diluted semen both at a temperature of 5°C and 37·5°C. At each level of the sulphanilamide used, spermatozoa livability was promoted. The 300 mg. per 200 ml. addition stimulated the best livabilty, and under all conditions studied proved to be the optimum level.

Almquist, Throp, and Knodt added penicillin at the rate of 0, 250, 500, 750, 1000, 1500 and 2000 Oxford units per ml. of diluted semen and found no significant difference in livability at the level of 0 to 750. The 1000 to 2000 unit level showed a highly significant decline in the ability of the spermatozoa to maintain motility. For the first six days of storage there was no decrease in livability except in the 1250, 1500 and 2000 unit levels. These authors found that penicillin retarded bacterial growth at all levels and did not affect the fertility at the 500 to 1000 unit level.

Conclusion

The points of cardinal importance in Artificial Insemination are (1) dilution—so that a large number of females can be inseminated, and (2) storage—so that it can be used at the time of necessity.

To increase the volume of the semen and to prolong the livability of the spermatozoa, a diluter should have certain physical consistency, buffering capacity, energy metabolite, isotonisity and bacteriostatic properties.

In general, the storage of sperm is best accomplished by (1) the gradual lowering of the temperature of the sperm and (2) addition to the semen of various diluters.

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BLOOD GROUPS IN SHEEP—Part I*

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Introduction

Every organism posseses individuality. Some of the factors determining individuality are inherited, while others are caused by environment. Heredity variations are caused by *genes* which occur in pairs—one member of each pair being obtained from each parent. (Weiner 6)

Until comparatively recent times, the existence of bio-chemical differences transmitted by heredity were not recognised. It was observed during the 19th century, that transfusions of blood from sheep or other domestic animals into human being were followed by serious and in some cases fatal reactions. This caused Landois and others to investigate this problem. Landois found that, if bloods of two different species were mixed *in vitro*, agglutination of the cells and haemolysis followed. This and other similar work lead to the recognition of species specificity of blood. Microscopic studies revealed also morphological differences between the cells of different species.

Differences between bloods of normal individuals of the same speices were first observed by Landsteiner in 1900 in human beings. By mixing the serum of one normal individual with the R. B. Cs of other normal individuals, he observed that the cells were agglutinated in some cases, but not in others. On the basis of this iso-aglutination he divided individuals into 3 distinct groups. The fourth, and the rarest group, was discovered by other workers.

Such studies revealed a marked individuality of the blood in higher animals. Ehrlich and Morgenroth showed such properties in the blood of goats, Todd and White in cattle, and Landsteiner, Miller and Todd in chicks. Later work established the existence of individual differences in apes, monkeys, dogs, cats, horses, sheep, pigs, rabbits, mice, rats and pigeons.

The serological individual specificity of the cells is determined solely by heredity and not influenced by environment. The differences are inherited according to Mendel's law. Substances which characterize the serological individuality of the blood are also found in almost every tissue of the body and in body fluids and secretions.

This subject is not merely of academic interest. A knowledge of it has made blood transfusions a safe procedure. It finds applicaion in forensic medicine, in identification of blood stains and determination of paternity. It is of great value in Anthropology. It has also made a substantial contribution to the study of neurology and to our knowledge of cellular antigens.

*Read at the Madras service Association Conference held in December 1948

On the basis of iso-haemagglutination reactions, human bloods have been divided into several different groups. Definite blood groups have been less satisafactorily established in animals. Little (4) divides cattle into 3 groups but noted irregularities in reaction, while Balwant Singh (7) found in Indian breeds of cattle 4 groups. Amadon (1 & 2) was not able to detect any positive reactions in cattle when examinations were made microscopically, but in horses he found a number of types. Olson (5) has proposed a division of dogs into blood groups. Iso-agglutination of varying intensity and specificity have also been observed in blood of normal sheep.

Experimental

The technique employed by us was essentially that of Landsteiner (3). Samples of blood were collected from the slaughter house in the morning. About 30 to 40 cc. of blood were collected in each case into a 100 cc. conical flask, the blood being caught directly into the sterile flask as it spurted out of the carotid artery when the throat of the animal was cut. Immediately 10 drope of blood were transferred to a 20 cc. centrifuge tube containing 10 cc. of normal saline solution in which was dissolved enough Sod. citrate to give a citrats concentration of 1% to the volume of the blood added.

These were left in a cool place undisturbed for about 2 hours by which time serum separated from the clot. The serum was decanted into a centrifuge tube and centrifuged for 10 minutes at about 2000 r.p.m. to pack the few cells to the bottom of the tube. The clear serum was decanted into another tube and the procedure repeated once.

The tubes containing the cell suspensions were then centrifuged for 10 minutes at about 2000 r.p.m. and the supernatant fiuid decanted off. 10 c c. of normal saline solution were added, the contents of the tube mixed by smart rotation between the palms of the hand and centrifuged once more for 10 minutes. The supernatant fluid was poured out and the volume made upto 10 c.c. and the contents well mixed up.

A series of tubes, each 2 1/2" long and having an internal diameter of about 7 mm., were placed in a rack and to each tube was added two drops of undiluted twice contrifuged (washed) serum. To each tube was added one drop each of the different cell suspensions, including the cells of the serum under test. This process was repeated with every sample of serum and cell suspensions so that all possible serum-cell combinations were obtained. The tubes were then left undisturbed at the temperature of the laboratory which was round about 29°C, for 2 hours. At the end of this period the tubes were shaken and the reactions examined.

In strong positive reactions the, cells formed a disc at the bottom of the tube which on shaking separated in one mass and on further shaking broke up into granules of varying sizes. In other positive reactions, the agglutination

was granular. In other cases a uniform suspension was obtained. In every case shaking was done only just to enable all the deposited cells at the bottom to mix up with the fluid. A drop of the suspension in each tube was transferred to a slide (by closing the mouth of the tube by the slide and inverting it once) and examined under the microsope. This was done in all cases except when reactions were so strong that microscopic examination was enough.

Usually twelve samples of blood were collected and various serum-cell combinations tested on the same day. Occasionally, when serum was found to have a high agglutinating potency, it was kept in the frigidaire and tried with fresh batches of cells on the next day. The serum was found to keep its agglutinating properties for some time. The cells on the other hand deteriorated on keeping.

The results of the various serum-cell combinations are given in the following tables.

An examination of the above tables will show two interesting featurers. (1) Some samples of sera are found to be strongly agglutinative to almost all cells. (2) A small number of samples contain cells which are agglutinative to almost all sera, and serum that agglutinates almost all cells including its own. Analysis of the reactions were much complicated by these peculiar reactions and it was found to be very difficult to group the reactions into a reasonable number. This difficulty is easily overcome if the above two types of reactions are considered to be more or less abnormal and classified as (a) and (b) of a seperate abberant type. On the basis of the remaining reactions, samples of blood may be classified into the following groups :

(1) Cells agglutinable but serum not agglutinative

(2) Cells not agglutinable but sernm agglutinative

(3) Cells not agglutinable and serum also not agglutinative.

Summary

(1) An attempt has been made to classify blood of sheep into different groups.

(2) Division into the following groups is suggested :

I. (a) Sera strongly agglutinating almost all cells.

(b) Sera strongly agglutinating all the colls including its own and cells agglutionable with almost all sera.

II. Cells agglutinable but sera not agglutinative.

III. Cells not agglutinable but sera agglutinative.

IV. Cells not agglutinable and serum also not agglutinative,

TABLE. 1

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1		+			+h	±				+		
2		++			+h	+				++		
3		+			+h	±				+w		
7		++			+h	+w				+w		
9		+										
10		+										
11		+			+					±		
12		++			+h	±				+		

GROUP I(b) - 2.
" II - 1,3,7,11,12.
" III - 10
" IV - 9.

++ = STRONG POSITIVE REACTION.
+ = VISIBLY POSITIVE AGGLUTINATION.
+w = WEAK AGGLUTINATION.
+h = AGGLUTINATION ACCOMPANIED BY HAEMOLYSIS
± = DOUBTFUL AGGLUTINATION.

TABLE. II

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3	±											
4												
5												
6	+w				+w							
8					+w							
10					+w							
11					+w							
12												

GROUP - II - 6,8,10,11.
" III - 1,5.
" IV - 2,3,4,12.

TABLE III.

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1												+w
2												+w
3	+	+		++	+w	++	++	+w	+	±	++	+w
4												+w
5												+w
6												+w
7												+w
8												+w
9×10												+w
11												+
12	+	+		+	±	+	+	+w	+w		++	-

GROUP - I (b) 12
II - 3
III - 1.2.4.5.6.7.8.9.11
IV - 10.

TABLE IV.

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3												
4												
5												
6	±		+w	+w	++	++	++	+				
7												
8												
9		±		±	++		++	+				
10	+w	+w	+w	+w	++	++	++	++				
11	+w	+w	+w	+w	+	++	++	++				
12	+w		+w	+w	+	++	++	++				

GROUP. I (a) - 5.7.8.
(b) - 6
II - 9,10,11,12.
III - 1,2,3,4.

TABLE V.

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1												
2												
3								+w				
4								+w				
5												
6												
7												
8												
9			+w									
10			±					+w				
11			+w					+w				
12								+				

GROUP. II 3,4,9,10,11,12.
" III 2,8.
" IV 1,5,6,7.

TABLE VI

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1												
2								+w				
3								+w				
4							±					
5												
6												
7												
8												
9												
10								+w				
11												
12												

GROUP. II . 2,3,10.
" III . 8
" IV 1,4,5,6,7,9,11,12.

TABLE VII

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1		++						++				
2								-				
3		++						++				
4		+						++				
5		++						++				
6		++						++				
7		++						++				
8												
9		++						++				
10		++						++				
11		++						++				
12		++						++				

GROUP I(a) - 2,8,
II - REST

TABLE VIII

CELLS	SERUM												OF TABLE VII	
	1	2	3	4	5	6	7	8	9	10	11	12	2	8
1			+w		+w	+w				±			++	+
2			+w			+				+w			++	+
3													++	++
4			+		+w	+				+			++	+
5													++	+
6													++	++
7			+		+	+				+			+	+
8													+	+
9					±	1							+	+
10													++	++
11			+		+	+w				+			++	+
12													+	++

GROUP II. 1,2,4,7,9,11.
III. 3,5,6,10
IV. 8,12

TABLE IX.

CELLS	SERUM											
	1	2	3	4	5	6	7	8	9	10	11	12
1			+h			+h						
2			+h			+h						
3												
4			+h			+h						
5			+h			+h						
6												
7			+h			+h						
8			+h			+h						
9			+h			+h						
10			+h			+h						
11			+h			+h						
12			+h			+h						

GROUP - I(a) - 3,6.
II REST.

TABLE X

CELLS	SERUM																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1													+w		+					
2																				
3																				
4		·	+w								+w	+	+		+					
5		+w	+								+w	+w			++					
6		±											+		+					
7													+w		+					
8		+w											+w		+					
9			+w								+w	+w	+		+					
10			+								+w	+w			+					
11																				
12																				
13																				
14			+w								+w	+w	+w		+w					
15																				
16															+w					
18																				
19																				
20		+w									+w	+w	1w		+w					

GROUP - II. 1,4,5,6,7,8,9,10,14,16,20.
III 2 3 11,12,13,15.
IV 18,19

TABLE XI.

CELLS	SERUM																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	18	19	21
1							+w	±											
2																			
3								±	+w			+w							
4							+w	+w				+w							
5							+w					+w							
6																			
7																			
8																			
9							+w	+w				+w							
10							+w	+w				+w							
11												+w							
12																			
13												+w							
15																			
17												+w							
18																			
19												+w							
20																			
22																			
23																			

GROUP II 1 3 4 5 9. 10 11. 13. 17 13.
III. 7 8 12.
IV. 2 6 15. 18.

TABLE XII

CELLS	SERUM																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	18	19	20
2						—													-
4		++																	++
5		++																	++
6		++		+w	+w								+w						++
7		++		+w	+w														++
10		++		+w	+w														++
13		++																	++
14		++		+w	+w														++
15		++											+w						++
16		++		±	+w								+w						++
18		++																	++
19		++																	++

GROUP I (a) 2 & 20
II 6, 7, 10, 14, 15, 16.
III 4, 5, 13.
IV 18, 19.

Acknowledgments

We are highly grateful to Sri. S. V. Mudaliar, G.M.V.C., Principal, Madras Veterinary College, for his keen interest in our work and the encouragement and advice he had rendered from time to time.

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AMPHISTOMIASIS

(A REVIEW OF THE LITERATURE)*

BY

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Introduction:—Many of the helminths belonging to the family Paramphistomidae occur in ruminants, equines, elephants, etc. The conical flukes which parasitise the ruminants are many and varied and the mature forms are most commonly found in the rumen and sometimes in the other fore-stomachs. Hence they are popularly termed 'stomach flukes'. They also occur in the liver and the intestines. *Paramphistomum explanatum, C. cotylophorum, Gastrothylax crumenifer, Fischoederius elongatus* and *F. cobboldi* are the amphistomes recorded so far in cattle, buffaloes, sheep and goats in the Madras Province. Of these, *P. explanatum* inhabits the bile-ducts, gall-bladder and liver only.

Amphistomes are widely prevalent in the continents of Australia, Africa, America and Asia. While the mature ones in the fore-stomachs are quite harmless, their immature forms in the abomasum and intestines are found to be highly pathogenic causing the diseased condition 'Amphistomiasis'.

The disease was known to the people of Punjab from time immemorial. They also knew that it was caused by eating the grass 'Khab' from the swampy areas. Baldrey (1906) and Walker (1906) were the pioneers who studied this disease in Punjab in sheep and goats during the year 1905.

*Read at the monthly meeting of the Madras Veterinary Assistant Surgeons' Service Association—Madras District.

Pande (1935) investigated outbreaks of amphistomiasis in cattle in Assam and found that buffaloes and goats were also affected. Outbreaks of this disease have been prevalent in Sind after the devastating floods in 1929. Since then, the disease has been recorded in sheep, goats, cattle and buffaloes by Haji (1935) and Bawa (1939) in Sind, Hashmi (1945-46) in Ajmer-Merwara-Rajputana, Sahai (1934-35, 1937-38), Ram (1938-39), Kapur (1939-40), Mehra (1941-42) and Kuppuswamy (1943-44, 1948) in Bihar, Pande, P.L. (1936-37) and Gopalakrishnan (1940-41) in Assam, Shahi (1936-37) and Pande (1938-41) in the United Provinces, Menon (1935-36) in Bengal and by Maqsood (1944) in Punjab.

In Madras, Mudaliar (1945) described an outbreak of this disease for the first time among goats in 1943. Subsequently in 1947, a calf received for post-mortem at the Madras Veterinary College proved to be a case of amphistomiasis. D'Souza (1948) recorded this disease to be the cause for the heavy mortality among sheep during 1946-47 at the Livestock Research Station, Hosur. This author also reported its sporadic occurrence in cattle and buffaloes beside its epizootic nature in sheep in other parts of Hosur taluk (Salem District). A disease having similarity of symptoms was enquired into by Ramakrishnan (1947) previously. In the course of the discussion on D'Souza's paper at the Madras Provincial Veterinary Conference in 1948, the prevalence of this disease in Tanjore district was revealed. The symptoms furnished ofteh by the field staff from a number of districts while submitting specimens to the Madras Veterinary College for examination suggest the wide prevalence of the disease in this Presidency, though post-mortem confirmation is lacking. Hence it is reasonable to assume that amphistomiasis is a common malady in Madras Province occurring either as an epidemic, or in a sporadic form, among cattle, buffaloes, sheep and goats.

Epizootology :—Outbreaks of amphistomiasis are seasonal and appear after the rainy season from October to March with a high virulence especially from the latter half of November to the first half of February. Sporadic cases occur before and after, although Hashmi (1945-46) and D'Souza (1948) recorded its sporadicity throughout the year. Ruminants are affected by grazing, or by feeding on grass in the low-lying marshy lands along the banks of rivers, tank-beds, fields and other pasture lands inundated during the rainy season. Animals of all ages and of both sexes get the disease while young ones and those in poor condition are more susceptible. The percentage of infection depending upon the susceptibility, grazing habits, intensity of infection and vitality of the animal is approximately as follows :—Sheep, 90; goats, 80; and cattle and buffaloes, 50. The period of incubation is about 4 to 6 weeks. Usually the disease runs an acute course more especially in sheep and goats: sometimes subacute and chronic forms are also manifested. D'Souza's (1948) observation about the occurrence of acute types only among sheep in Livestock Research Station, Hosur, is not in accordance with the

records from other parts of the country and also from that of Ramakrishnan (1947) who mentioned about chronic cases with similar symptoms in the same Farm. In acute condition, the course of the disease is about 5 to 10 days in sheep and goats, 2 to 3 weeks in cattle and buffaloes, indicating a less acute course in the latter. Deaths even in about 18 hours have also been reported. The more common records of the chronic cases vary from 3 weeks to 3 months. Whatever may be the course of the disease, uniform symptoms are invariably manifested by all the affected animals.

Pathogenesis :—The intermediate snail hosts harbouring amphistome larvae gain access to the low-lying grazing areas inundated during the rainy season. The snails discharge the amphistome cercariae which encyst on blades of grass or on other vegetation growing there. When the ruminants feed on these well grown succculent grass avariciously, they ingest a massive dose of encysted amphistome cercariae. A good percentage of the excysted immature parasites attach themselves to the mucosa of the pylorus and duodenum, penetrate the mucosa and get lodged in the submucous coat. A few get themselves embedded in the mucosa of jejunum as well as ileum. Considerable inflammation of the mucous membrane, production of an inflammatory exudate which infiltrates into the intestinal lumen making the faeces a pea-soup consistency and purulent with decomposed blood, marked destruction and proliferation of the mucous cells and leucocytic infiltration around the sites of attachment of the immature parasites are the resultant changes brought about. The immature forms lodged in duodenum migrate to the rumen after about 6 to 8 weeks and then become mature.

Symptomatology :—General weakness, unthriftiness, inability to move about quickly, depression, anorexia, anaemia, discharge from the eyes and nostrils and slight rise of temperature are the initial manifestations of the disease which usually are not noticed. The first observed symptom is a characteristic oedema at the intermandibular or throat region—commonly known as bottle-jaw—which becomes prominent in evenings and reduced in mornings on account of grazing in day-time with lowered head, and rest at night, respectively. This constant and charcteristic symptom has given rise to a number of names for this disease in the local languages. In Punjab, it is popularly known as 'Gillar', which in Hindustani means a swelling of the throat. This oedema may extend to the face, cheeks and other parts resulting in cough and difficult breathing. Preputial oedema is sometimes seen in males. The abdomen becomes pendulous due to the accumulation of ascitic fluid. These are the outcome of advanced anaemia. The animal does not show any rise of temperature. Increase in malaise, pale colouration of the visible mucous membrane, rapid emaciation, darkish foetid watery diarrhoea with mucus, but with or without decomposing blood, prostration, subnormal temperature and death are the further series of symptoms. Prolapse of the rectum due to severe diarrhoea is noticed in some cases. A number of popular

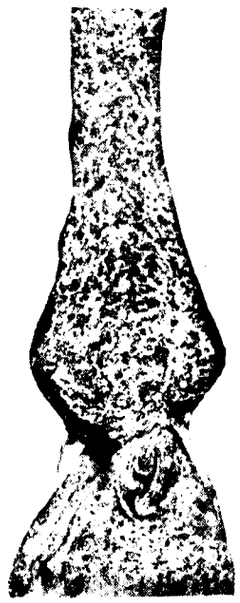
names in different provincial languages have arisen from this diarrhoeic symptom, such as 'Chherah' and 'Bisi' in Bihar and United Provinces respectively. Wool or hair comes off easily from the body. The paraplegic symptoms described by Baldrey (1906) and the intense colicy pains manifested by the head kept turned towards the flank preceding the death of the affected animal recorded by Shahi (1936-37), Ramakrishnan (1947) and D'Souza (1948) are interesting observations. In very acute cases, death is preceded by diarrhoea only. In acute conditions, the animals generally die in a day or two after the onset of diarrhoea. The total cell counts of the blood are much below normal indicating severe anaemia while the blood picture may not reveal the corresponding anaemic changes. Intense leucocytosis, particularly of neutrophiles and eosinophiles is seen. The calcium content of the blood is reduced. Examination of faeces may reveal minute oval bodies which on closer study will be found to be immature amphistomes.

The percentage of deaths among the affected animals is : sheep and goats, 90 and cattle and buffaloes, 40 to 60. After the migration of the immature amphistomes to the fore-stomachs, the symptoms subside and the animals may recover. The infection does not give any immunity.

Post-Mortem Lesions :—The carcase is highly emaciated. The hind quarters are found soiled and the hairs matted with diarrhoeic dung. On skinning the carcase, the adipose tissue is found to be whitish, cheesy and gelatinous and the subcutaneous tissue at the intermandibular space is infiltrated with gelatinous exudate. The muscular tissue is pale and atrophied. Superficial lymph glands are enlarged and oedematous. The blood is thin, pale red and clots slowly. Excessive effusion of clear serous fluid in the peritoneum, thorax and pericardium is noticed. The internal organs are normal or slightly pale and sometimes fatty degeneration may be encountered. But the liver is slightly enlarged and congested due to the engorgement of its vessels and shows fatty degeneration. The gall-bladder is invariably found over-distended and, in goats, especially it is enormously enlarged. This feature of the gall-bladder has given rise to the popular name 'Phet or Pitto' which, in Scindhi, signifies enlargement of the gall-bladder. The whole of the abomasum may be congested. Pylorus and duodenum reveal characteristic lesions. Pronounced acute catarrhal gastro-enteritis is present in the pyloric region of the abomasum, duodenum and sometimes in jejunum and ileum also, the mucous membrane being thickened and oedematous. A large number of small (1-2 m.m.) flesh-coloured oval bodies, resembling bran dusted over the region, are found embedded in the mucosa. These are the immature amphistomes. Congestion of the small vessels which become varicose at times results in haemorrhagic patches in the mucosa. The mucous membrane may at times be ulcerated, and necrotic patches may be found on the mucosa. The intensity of the lesions decreases considerably in the ileum, while, further back in the bowels not much of an abnormality is noticed even though a

Plate No. 23 Vol. XXV, No. 6

AMPHISTOMIASIS



Abomasum (Pyloric end) and Duodenum of sheep showing immature amphistomes studded all over the mucosa.

Affected sheep showing oedema of lower jaw (Bottle Jaw).

Plate No. 21

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CASTRATION OF LIONS

Castration of Lion aged ten months by open method

Castration of lion aged ten months by [illegible] method

Castration of lion aged [illegible] by Burdizzo method

Facing Page No. 11

few immature forms may be found in the mucosa. The abomasal and intestinal fluid contents reveal immature amphistomes. The mesenteric lymph glands are congested and enlarged while the mesenteric veins are prominent and dilated.

The above mentioned clinical symptoms and post-mortem lesions will enable one to differentiate this disease from other conditions exhibiting either similar symptoms or lesions.

Differential Diagnosis:—The history of this disease in our country along with the initially suspected diseases will give a complete study of the various maladies simulating amphistomiasis. Prior to the investigations by Baldrey (1906), and Walker (1906) and Pande (1935) the outbreak of 'Gillar' in Punjab among sheep and goats and the outbreaks of the disease in cattle in Assam were confused with Rinderpest and Fascioliasis because of the similarity of symptoms and the post-mortem lesions. The incidental infection with *S. indicium* in cases of amphistomiasis led Baldrey (1906) Montgomery (1906) and Bhalerao (1938) to suspect the disease as Bilharziasis. In Sind, prior to the investigation by Haji (1935), 'Pitto' was thought to be parasitic gastritis caused by *Trichostrongylus*, *Hæmonchus contortus*, *Mecistocirrus digitatus*, etc. Baldrey (1906) and Haji (1935) considered *Stilesia globipunctata* as the probable causal factor for the intestinal lesions. Shahi (1933–34) recorded a similar condition in a goat in United Provinces as Bisi poisoning. In Madras Province the investigation was confined to the Livestock Research Station, Hosur, where conditions for the disease are ideal. At this place there had been a gradual rise in mortality among sheep since 1928. But, during 1939, the mortality shot up from 12·93% to 22·83% and since then severe outbreaks occurred during 1942, 1944 and 1946 with a slightly lowered virulence in the intervening years. The symptoms manifested by the ailing ones all along were similar. Intermandibular swelling and the gastro-intestinal lesions were thought to be due to Pasturellosis. During 1939-40, Mudaliar (1942) conducted a number of post-mortems on the diseased ones and recorded the prevalence of *Hæmonchus contortus*, *Oesophagostomum columbianum*, and *Monezia*. Since immature amphistomes were never encountered, the above-mentioned helminths were considered as the probable causal factor for the mortality of sheep. The remedy adopted by him seemed to have given fairly satisfactory results in the control of mortality. Visvanathan (1945) investigated the outbreaks in 1942 and 1944 and considered the disease as Braxy caused by *Clostridium septique*, the first record of this disease in India. The findings of Visvanathan (1945) were confirmed by the Indian Veterinary Research Institute. A few chronic cases were suspected to be Johne's disease in the light of the records of incidence of this disease in sheep at the Station by Rahim-ud-din (1940) and Mudaliar (1944) and also since that disease was prevailing in cattle there. But the epidemic in 1946–47 was conclusively proved as amphistomiasis caused by immature

amphistomes. It may be mentioned here that Dr. Looss on examining the materials sent by Baldrey (1906) from sheep died of 'Gillar' thought the disease as one caused by rod-shaped bacteria.

Treatment and Prophylaxis :—Symptomatic treatment as cauterising the throat swelling, administration of astringents to control diarrhoea, and tonics to combat anaemia were adopted before the exact cause of this disease was diagnosed. These, of course, had no effect on the disease. Anthelmintics, as copper sulphate, nicotine sulphate, thymol, carbon tetrachloride, tetrachlorethylene and hexachlorethane, against immature amphistomes are claimed to be effective before the appearance of the symptoms and as a prophylaxis. Mehra (1941-42) claimed good results with injections of Tartar Emetic preceded and followed by a purgative dose of common salt and magnesium sulphate. Administration of Copper sulphate followed immediately by Carbon tetrachloride and next morning by saline purgative was found to be very efficacious by Kuppuswamy (1948). After the onset of gastro-enteritis, treatment with anthelmintics is not satisfactory. Hence it can be inferred that treatment of amphistomiasis after the manifestation of clinical symptoms is not of much use.

The destruction of snails, which are the intermediate hosts for amphistomes, by hand picking, introducing ducks and other snail-eating aquatic birds, and treatment of the tanks with copper-sulphate, calcium cynamide, slaked lime or super-phosphate have been suggested. Removal of weeds from the banks and surfaces is said to reduce the snail population to an appreciable extent (Srivastava, 1944). The best and the reliable prophylaxis is not to allow the stock to graze in the infected localities nor to utilise the grass from the infected areas.

Etiology :—The disease is described under the genera Paramphistomum and Cotylophoron in Veterinary Helminthology books. Haji (1935), Menon (1935-36) and Maqsood (1944) considered the disease as caused by *Paramphistomum cervi*. Le Roux (1930), Sahai (1937-38) and Mudaliar (1945) reported the outbreaks in the Orange Free State (S. Africa), Bihar and Madras respectively due to immature forms of *Cotylophoron cotylophorum*. Bhalerao (1944) who interested himself in this problem and had the opportunity to examine the specimens collected in Assam, Sind, Bihar, U. P. and Madras found that species of Cotylophoron might cause this disease. Srivatsava (1938) experimantally produceed the disease by giving massive doses of the encysted cercariæ of *C. cotylophorum* to goats. Besides, the high pathogenicity of the immature forms of *Gastrothylax crumenifer* was established by Srivatsava (1947) by producing acute amphistomiasis in a healthy goat. *C. cotylophorum* and *G. crumenifer* were thought to be responsible for the outbreak at the Hosur Cattle Farm. The identification of the immature parasites was mainly based on the identity of the mature forms found in the fore stomachs, as it was believed that the identity of the mature as well as immature forms cannot be

different. Another method adopted for their specific identity was to examine the amphistome cercarial fauna of the affected locality. The study of the excretory system of the immature parasites which will resemble that of the corresponding cercariæ can also enable one to identify them.

Before concluding, a reference may be made to the amphistomes and amphistomiasis of equines and elephants while dealing with the same subject in ruminants. In equines, *Gastrodiscus secundus* occurs most commonly while *G. aegyptiacus* and *Pseudodiscus collinsi* are of infrequent occurrence though not altogether absent. Since not much attention was directed to them, their life-histories and pathogenicity are not completely known. Peter & Mudaliar (1948) have, however, recorded a new amphistome cercaria belonging to the sub-group 'Diplocotylea' and established it as the larval form of *G. secundus*, by feeding experiments. This work is the first study on the life-history of an equine amphistome in India.

The recorded amphistomes in elephants are *Gastrodiscus secundus*, *G. aegyptiacus*, *Pseudodiscus collinsi*, *P. hawkesi* and *Pfendarius papillatus*, the pathogenicity of which in elephants is yet to be known.

Summary :—Though the mature amphistomes are quite harmless, their immature forms are highly pathogenic.

Amphistomiasis caused by immature amphistomes has been recorded among cattle, buffaloes, sheep and goats in Punjab, Assam, Sind, U. P., Bihar, Bengal and Madras.

Ingestion of massive doses of encysted amphistome cercariae while grazing in the inundated low-lying areas after the rainy season causes the disease.

The period of incubation is about 4 to 6 weeks; the course of the disease varies from 5 days to 3 months; the percentage of infection being in sheep, 90; goats, 80; and cattle and buffaloes 50. The mortality in sheep and goats is 90% and cattle and buffaloes 40 to 60%.

Progressive anaemia, marked emaciation, characteristic submaxillary oedema and persistent diarrhoea followed by death are the symptoms.

Acute catarrhal and oedematous inflammation of the pyloric region of the abomasum and duodenum with several immature amphistomes attached to the mucosa is the characteristic lesion.

Treatment is not always effective and the best prophylactic method is to avoid the infected pasture lands.

The specific etiological factor is still a matter for discussion but *Cotylophoron cotylophorum* and *Gastrothylax crumenifer*, have experimentally been established to produce the disease.

Acknowledgments

I wish to express my thanks to Sri S. V. Mudaliar, Principal and Lecturer in Parasitology, Madras Veterinary College, for his kind and valuable suggestions in the preparation of this note.

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RED BLOOD CELL VARIATION IN HORSE BLOOD

By

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Routine Blood examination of horses in the Yeravada Stud Farm was being made with a view to obtain standard normal values for the various readings. It was noticed that the blood of an animal gave higher readings for R.B.C. number, Volume of Packed Cells and Haemoglobin content, whenever it was accidentally subject to excitement or exertion. The following experiment was conducted to gain some idea of the scope and extent of this variation.

12 normal healthy horses-(3 Thoroughbred Broodmares and 9 Thoroughbred Racehorses in training) were used. The mares were threatened and excited for 2 to 3 minutes without any physical exertion being allowed, while the Racehorses were made to exert their best physically in an actual Race. The blood was collected in all cases when the animals were quiet and resting for at least 24 hours.

The collection of blood was made from the Jugular vein by stasis for 10 to 20 seconds and by puncture with a 15 gauge B-D. needle resulting in a moderate flow. 10 c.c. (approximately) of blood were received into a graduated bottle containing 20 mgm. of dry Pottassium Oxalate. The examinations were carried out within ½ to 2 hours of the collection. The precaution of thorough but gentle mixing of the blood was taken at every step in the examinations. The volume of packed cells was determined with the Wintrobe Tube centrifuged at high speed for 30 minutes. The Haemoglobin was determined by Sahli's method using Hellige tubes and comparator. The R.B.C. and W.B.C. counts were made with Trenner automatic Certified Pipettes. ***The accuracy of the readings is as shown below :***

P. V. E.	±	0·5%
Hb.	±	0·5 gms.
W. B. C.	+	5%
R. B. C.	+	1% (normal readings).
R. B. C.	±	3% (high readings).

Very accurate and careful work was done and the limits of error shown are the maximum possible in view of the very high figures involved.

The results showed variations which were significantly greater than those recorded so far in literature and greater than could be expected in

the light of our present knowledge. Actually several senior Pathologists refused to believe the results when first shown to them.

The Haemoglobin Grams per cent showed an average rise of 48·6% with a maximum rise of 92·6%. The P.V.E. per cent showed an average rise of 44·1% with a maximum of 80%. The R.B.C. count showed an average rise of 53% and a maximum rise of 82%. Individual values are given in Table

TABLE

No.	Animal	Increase Per Cent		
		Hb.	P. V. E.	R. B. C.
1	BM No. 1	31.2	32.4	47 3
2	BM No. 2	22.8	25.7	33.7
3	BM No. 3	30	49.3	33
4	RH No. 1	37.1	42.3	82
5	RH No. 2	92.6	80	71
6	RH No. 3	71.4	54.5	54.8
7	RH No. 4	75	52.4	77.4
8	RH No. 5	45.4	27.1	40
9	RH No. 6	50	36	19
10	RH No. 7	41.8	44. 3	68.3
11	RH No. 8	38 7	17.4	73. 4
12	RH No. 9	51.5	67.4	55
13	Average	48.6	44.1	53
14	Maximum	92.6	80	82

Fegler (1948) records only a maximum volume of Packed Cells of 50·4% and a maximum Hb Grams per cent of 18·7, while the present writer has recorded a maximum volume of packed cells of 75%, a maximum Hb of 26 grams and a maximum R.B.C. count of 18·64 millions per cmm. The full data reveal very interesting and thought-provoking reflections about the *co-relation between the qualities and performance of the Racehorse with its blood picture at rest and after a Race.* The object of publishing this short note is to draw attention to a field of research which would throw more light on the physiology of blood and other aspects of Haematology.

The machanism of Red Cells variation taking place within very short intervals in the normal blood is not well uuderstood, though some factors are generally accepted such as reservoir function of spleen, exercise and excitement. It was interesting to note that several blood examinations made on human beings before and after a mile race run by them showed hardly a rise of 1% in all the three readings referred to here. In view of the fact that well over 80% rise is observed in the horse, the writer feels that research on Equine blood will be very profitable in this direction.

Summary

Twelve cases are recorded in Thoroughbred Horses showing a rise in the values for R.B.C. due to excitement and exercise, over their normal values while at rest. Maximum rises as the result of a Race recorded are—Hb. 92·6%—P.V.E. 80%—R.B.C. count 82%. This extremely high rise noted in Racehorses opens up a new field for profitable research in basic Haematology,

My thanks are due to the Yeravada Stud Farm for providing all the facilities and the funds for the experiment and for putting the Broodmares and some Racehorses at my disposal. I also thank Trainers B. R. Patel and Major K. P. Jadhav for permission to use some of their animals in the experiment, and Dr. S. N. Yeravadekar, M.D., (Bombay), Poona, for valuable professional assistance.

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THE VISUAL LESIONS IN CERTAIN PATHOLOGICAL CONDITIONS OF THE GENITAL TRACT IN COWS*

By

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The observations reported here have been made on 230 uteri, 81 abnormal and 149 apparently normal, obtained from cows slaughtered in Ayr slaughterhouse. They were all from local cows, and the history of the animals was obtained as soon after slaughter as possible. In most cases we were able to ascertain the age of the cow, the number of calves it had, and full details of all its previous calvings, *i.e.*, whether normal or abnormal and whether the placenta had been retained or any discharge occurred.

Bacteriological examinations have been carried out on these uteri and on their associated Fallopian tubes and cervices. Cultures have been incubated on blood agar, glucose serum broth, Robertson's meat medium, liver infusion agar and bacto tryptose agar aerobically, anaerobically and microaerophilically. All organisms isolated have been fully examined for their morphological and biochemical characteristics and have been classified according to Bergey's (1939) classification.

At the moment the material is also being examined pathologically, but the results are not yet ready, so I shall confine my remarks to what you see microscopically, *i.e.*, the visual lesions, and correlate these appearances with my bacteriological findings without going into great detail.

I must emphasise that the conclusions I shall draw and most particularly the divisions into which I have grouped the material, are very tentative. They are mainly for ease and clearness of presentation, and will possibly have to be modified considerably as further information becomes available.

I intend to confine my remarks entirely to the uterus, the Fallopain tubes and the cervix, for though the state and period in the cycle of the ovaries have been taken into consideration in every case I do not intend to deal with either these or the vagina.

Uterus

An involuting uterus is highly susceptible to infection as there are large areas of raw surface containing remnants of disintegrating placental tissue and numerous blood clots. It is open to infection from both the cervix and the blood stream. Any such infection causes a tissue response varying with the

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organism responsible and the duration of infection. The reaction may be of any type from a simple inflammation, *i.e.*, endometritis, to a purulent necrosis, *i.e.*, advanced pyometra.

As the subject is rather complicated, I am going to try to simplify it by referring to charts, interposing specimens, slides or films where I have them.†

I propose to divide the macroscopic lesions of the uterus into four and to describe each separately.

1. ENDOMETRITIS.

(*a*) *Catarrhal Endometritis* :—By this I mean a simple inflammation of the endometrium with or without some non-purulent discharge. In the mildest form there was no obvious change in the size of the uterus or the thickness of its walls. A slight catarrh covered the mucosa in a thin layer, which was often confined to certain parts of the horn. In some the mucosa was pale and showed only traces of cotyledons while in others it was rather difficult to appreciate any change macroscopically. The discharge was slight and was not sufficient to flow out into the cervix. In more advanced cases the uterine horns were tough and tumefied with a light yellowish-grey lustreless peritoneal serosa. On section the wall was rather thickened with enlargement of one or both horns (usually that recently gravid) in which the reaction was more advanced. The infection from this horn spread to its companion *via* the body of the uterus. There was a thick greyish-white catarrhal exudate with numerous yellowish flocculi, often sufficient to flow out freely from the cervix. The mucous membrane showed yellowish or greyish-brown discoloration, distributed in patches about the size of a penny all over the surface. It was œdematous and the normal lustre and smoothness were absent. Cotyledons were entirely missing or reduced to varying sized greyish-yellow elevations with depressed tops. In such cases of advanced endometritis it was not uncommon to find co-existing lesions in the Fallopian tubes and ovaries.

These two stages of endometritis seem to merge into one another. The earlier cannot be diagnosed clinically but the more advanced can be diagnosed by the cervical discharge where this occurs. From the available histories, however, it appears that there is no absolute relationship between the duration of sterility (presumably the duration of infection) and the quantity of discharge or degree of reaction. In my series there have been 25 cases of endometritis as defined above. In these 25 I found ten with pure staphylococcal infection, three with a protozoon, possibly *T. foetus* though the clinical herd history was not typical, two were sterile and the other ten harboured a mixed flora of staphylococci, streptococci, *Bact. coli* and diphtheroids other than *Corynebacterium pyogenes*. Of these, 17 had a history of being difficult to settle or were definitely sterile. Quinlan (1929), in South Africa, has recorded similar lesions in 68 cows slaughtered because of incurable sterility.

†The charts are omitted from the paper to economise space.

(*b*) *Necrotic Endometritis* :—This has been found in 12 uteri, of which four contained Gram negative bacteria (not *Bact. coli*), one contained a staphylococcus, two mixed infections and five were sterile. Externally the uterus appeared normal except that the serosa showed extensive reddish discoloration. On palpation of typical cases the walls were flabby with complete lack of tone, the tissues were very soft and friable and were easily crushed and torn when pressed by forceps or fingers. When opened a large quantity of curdy exudate containing flakes of necrotic tissue flowed out. The mucous membrane was atrophic, brick red, rough, and pitted with darker necrotic spots, while the cotyledons were replaced by large shallow areas. In a few cases the cotyledons were represented by varying sized pea-like elevations placed close together all over the mucosa. In every case the mucous membrane was studded with small yellowish-grey spots looking as though bran had been sprinkled over the surface.

In some, the uterine walls, while flabby, were very thin and leathery to touch, the whole uterus giving the impression of being in a state of collapse, The mucous membrane was thrown into four or five thin ridge-like longitudinal folds and was of brick red colour, dry, rough and was studded with necrotic spots.

(*c*) *Purulent Endometritis* :—This is probably an artificial clinical distinction and really represents an early stage of pyometra. Bacteriologically, it was almost always caused by *C. Pyogenes* either alone or in mixed culture (19 out of my 20 cases).

In the early stages either one or both horns were affected. If only one it was slightly enlarged with tense walls and a normal serosa externally. Internally, it contained a thick muco-purulent creamy discharge scattered over the mucosa, occurring especially as small clumps around the cotyledons. When this was scraped off the mucous membrane was seen to be inflamed with pin-point necrotic spots and erosions while the cotyledons themselves showed numerous necrotic spots. Occasionally there were small pieces of necrotic tissue mixed with the pus. The discharge was not sufficient to fill the lumen of the horn though in some cases there was sufficient to flow into the other horn through the body of the uterus. The mucosa as a whole was smooth and thickened, and varied from light yellow to light brown in colour. Such a condition seems to follow relatively rapidly after calving, pathologically, merges into my next type.

(*d*) ***Pyometra*** :—In early cases of this, both horns frequently were symmetrically enlarged but cases were also found where they were unequal in size with thick flabby walls. The tubal end of the horn was rounded and pouch-like. The serosa was discoloured and lustreless while internally the horns contained creamy pus which often had small blackish floccules in it, The mucous membrane was light pink to dark brown with areas of greyish-black discoloration and often small necrotic spots and erosions.

In long-standing cases there was an enormous enlargement of one or both horns, depending upon the amount of pus. The serosa was greyish-black, thick, moist and sticky. In two cases there were peri-uterine abscesses on the body, horns and broad ligaments. They varied in size from that of a walnut to that of a hen's egg. The walls of the uterus were thin and the anterior extremity of the horn folded upon itself. On palpation there was usually fluctuation and the walls were thin and leathery. The pus varied in consistency from a thick sauce-like liquid to a semi-solid, and from cream yellow to dark grey in colour. In quantity it varied from one to several litres. In one case about 20 litres of pus were noted. In some cases parts of the macerated foetus were mixed with the pus which often had an offensive odour. The grey-black mucosa showed small and large areas of erosion which were both shallow and deep. The cotyledons were either absent or, if present, were only very small, necrotic and gangrenous. In advanced cases the mucosa was thicker and blacker and the erosions were more extensive. There were also more extensive nodular thickenings, the whole appearance being not unlike the skin of a lizard. Even this advanced type can occur rapidly, since I found it in one case within 12 days of calving when the whole uterus was completely packed with semi-solid bran-mash-like pus.

Pyometra was often accompanied by pathological changes in the cervix, Fallopian tubes and ovaries. The cervix was either stenosed and tightly closed (in well-established cases) or partially open with a dirty brownish-grey discharge in the canal (in post-parturient infections). In very advanced cases the cervix was flabby and open with a purulent discharge. In every case of advanced pyometra a large persitent corpus luteum was present in one ovary. In the other ovary there was no evidence of any developing graafian follicles.

2. TUBERCULOUS METRITIS.

I do not intend to refer to this in great detail since I have seen only two apparent cases, as the animals came from an area which is almost completely free from tuberculosis. One of these appeared to be a case of primary uterine infection since no lesions were observed macroscopically anywhere else in the carcase. The uterine horns were symmetrically enlarged. The walls were thick and tense. The serosa was yellowish pink in colour. The cervix was thickened and contained yellowish viscid mucus. The lesions in the uterus consisted of numerous lentil-sized glistening nodules with a yellowish mucoid exudate. This exudate and the nodules were rich in acidfast bacilli morphologically identical with *Myco tuberculosis*. The Fallopian tubes were apparently normal. The other case was a very good specimen of descending infection of both uterine horns. The peritoneum was grossly infected, showing obvious tuberculosis. The infection had involved the ovaries, the broad ligaments and the Fallopian tubes and had then spread internally down the horns *via* the Fallopian tubes. The lesion was a diffuse inflammation with pinhead-like glistening tubercles protruding from the surface of the endometrium. The

endometrium was pink, smooth and thickened. The older lesions were found at the tubal end and became smaller as they extended down the horn. No macroscopic lesions could be detected in the lower half of the horn or in the body or the cervix. Though there was some yellowish mucoid exudate which contained many acid-fast bacilli, there was no discharge from the cervix itself.

3. Cystic Degeneration.

I have seen eight cases of this condition. The name is possibly a misnomer but it describes the type of lesion I am about to discuss. The horns were symmetrically enlarged with thick flabby walls, the uterus was doughy and the mucosa covered with a tough, tenacious cloudy mucus spread more or less evenly in a thin layer over the whole surface. A few yellowish flocculent masses were occasionally seen and in one case the exudate was a chocolate-coloured gelatinous mass. The mucous membrane was pale and thickened with small, smooth, glistening greyish cysts, varying in size from that of a pinhead to that of a barley grain, protuding slightly above the surface. They were mainly confined to the lower and middle thirds of the horns although sometimes they extended right through the cervix to the os uteri. In such cases the cervix was enlarged and somewhat sclerotic. The mucosa of the cervix also showed small pale cysts. All the cysts contained a greyish translucent mucoid fluid. In old-standing cases the horns themselves were packed with a glairy tenacious mucus similar to the cervical plug of pregnancy. This was so compact that it could be rolled out of the horns as a mould. The cotyledons were completely absent. Beaver *et al.* (1922) and Wright (1945) have recorded similar lesions in sterile cows.

4. Hydrometra.

The next and last abnormality of the uterus I wish to mention is hydrometra, of which I have seen two cases. This condition is not to be confused with hydrops amnii, as this latter is a condition of the pregnant uterus and is related to the foetal membranes. Hydrometra, on the other hand, occurs in the non-gravid uterus and is an abnormal condition of the utetus itself. In one of my cases the condition was confined to one horn which was enlarged and simulated pregnancy. In the other case both horns were about equal in size. The walls were thin and the fluid fluctuated in the same manner as in a gravid horn but when examined the walls were very much thinner than in pregnancy and were leathery. In each case the cervix was stenosed and closed with a false uterine seal and there was a large persistent corpus luteum. The Fallopian tubes were normal. In one the serosa was normal and the fluid thin and cloudy. In the other the serosa was bluish and congested and the contents were thin, viscid and coffee coloured. The mucous membrane was thickened and oedematous with pitted yellowish grey spots about the size of a threepenny-piece scattered all over it. In neither was there any sign of a foetus, foetal membranes or cotyledons and both cases were sterile. Quinlan (1929) has met with

one case of hydrometra, and he states: "The cause of hydrometra would appear to be cervical deformity, which rendered the escape of oestral debris through the ostium uterinum impossible." Williams (1921) has recorded a similar case in which the canal was open and admitted the uterin catheter. I cannot advance any suggestion as to the cause of this condition but care must be taken to distinguish it clinically from pregnancy. In one of my cases the history of the cow showed that it had seven calves and at the time of slaughter was said to be in calf.

Fallopian Tubes and Cervix

That is all I have to say about the conditions I have observed in the uterus itself. The only other parts of the genital tract I am going to discuss are the two which may be regarded as appendages of this organ, *viz*, the Fallopian tubes and cervix,

The Fallopian tubes are naturally involved in uterine infection though gross changes are not so common as in the uterus itself. In my series approximately one-third of the affected uteri also showed salpingitis. In some the whole length of the tube was affected, in others the lesions were confined to certain portions such as the extremities. Simple bilateral inflammation of the Fallopian tubes without appreciable distension of the duct with lymph or purulent discharge was the commonest type of lesion. The tubes were thin walled and varied in colour from greyish white to light yellow. They showed great flexibility and mobility and contained either a clear, straw-coloured or a thick, cloudy fluid in which were suspended small floccules. This type of lesion was associated with catarrhal endometritis and the bacteria present were those also found in the uterus.

In cases of more virulent uterine infection the Fallopian tubes showed either acute or chronic lesions. In the acute type the tubes were greatly convoluted and were swollen to varying degrees up to the thickness of a cigarette The peritoneal surface was tense, glistening and showed petechiae. The mucosa was in thick folds, swollen and often petechiated. The opposing folds were in contact, occluding the lumen of the tubes, and occasionally these gave the appearance of being beaded.

In more chronic cases the walls were much thickened, leading to kinking and deformation of the tubes, to the meso-salpinx and the ovary. When this occured the pavilion showed chronic thickening and was partly or completely adherent to the ovary. When compressed a little yellowish pus could be expressed from the abdominal end of the tube which was packed with a thick mucoid yellowish material. In some specimens there was free drainge of purulent material into the cornu uteri. This type was usually secondary to pyometra but in some other cases of salpingitis it was not possible to isolate any organism in the uterus (which was apparently normal in appearance)

though various bacteria, *e.g.*, *Bact. coli*, were present in the tubes themselves. In my only case of tuberculous salpingitis the infection was a direct extension from the peritoneal cavity. Both the Fallopian tubes were affected. The fimbriated extremity of the tube was thickened and adherent to the ovary. The whole length of the tube was firm and nodular. Barley-to large pea-sized, glistening friable lesions were found on the ovary, Fallopian tubes, uterus and, broad ligaments. On section the lumen of the tube was found to be packed with a yellowish caseous material. On scraping the contents away the mucosa appeared yellowish brown and showed small congested spots.

Another interesting condition found associated with the Fallopian tubes was a cystic condition of the broad ligament along their course. The cysts varied in size from that of a pea to that of a small grape and were situated close to the external wall of the tube on one or both sides. They had no communication with the lumen of the tube. The walls of the cyst were thin, tense and glistening and the cysts contained a clear, colourless fluid. If small they appeared harmless, except that the course of the tube was slightly altered, but if two fairly large cysts happened to be on either side opposite each other the Fallopian tube was crushed between them with consequent obliteration of the lumen. Such a condition would result in mechanical obstruction to the passage of the ovum along the duct. At a clinical examination this condition could not be distinguished from a cystic condition of the tube itself.

The Fallopian tubes are the inner openings of the uterus. The outer opening is the cervix, pathological changes in which have been described by Williams (1939), Nielsen (1926), Quinlan (1929), and others. Inflammatory changes of the dervix may be either primary or secondary to uterine infection. Primary cervicitis is due to injury, particularly during parturition or by infection from the bull (*e.g.*, Williams (1921) gives instances of widespread cervicitis due to the bull which involved 60 per cent. of the cows). Both acute and chronic secondary cervicitis were encountered. In acute cases the cervix was swollen with the mucous membrane inflamed and raspberry red. It was often so tense that the os looked like a ripe tomato with a moist sticky surface and the first cervical fold protruding through the os into the vagina. In subacute cases mucus mixed with yellowish purulent flocculi was often present in the anterior part of the vagina surrounding the os uteri. If pyometra was present the discharge was purulent. In chronic cases the cervix was firm (almost hard) and enlarged with a more mucoid and less purulent discharge. The enlargement was very prominent at the caudal end owing to fibrosis of the walls of the cervix. In theee cases the mucous membrane of the cervix was a dirty brick-red colour studded with greyish spots, with a brownish yellow tenacious discharge sticking all over the os uteri. While this could be indicative of a mucoid degeneration of the mucous membrane, the cervical canal often contained a dirty, chocolate-coloured watery discharge with purulent yellowish floccules. The discharge in secondary cervicitis naturelly yields the bacteria causing the uterine infection.

In old cases of cervicitis polypoid cauliflower like growths protrude into the canal, sometimes completely enclosing it. Such growths were especially seen in old cows and were presumably due to injury rather than to infection.

In conclusion, I would like to emphasise that my work is not by any means complete and that both the terminology used and the conclusions reached are tentative and may have to be modified as the work proceeds.

Acknowledgments

I wish to acknowledge the assistance of the farmers, and particularly of the staff of Ayr slaughterhouse, without whose willing co-operation this work would not have been possible.

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THE

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Editorial

VETERINARY EDUCATION

Quite a good deal has been written in these pages about the importance of the Veterinarian to the body politic and the splendid role he can play in the rehabilitation of the countryside as well as in ensuring our essential food requirements. Equally also has attention been drawn to the paucity of skilled veterinary personnel to look after the immense livestock and the urgent need for opening more Veterinary Colleges in the different parts of the country. It is heartening that these truths are being recognised, though in a very belated and halting manner, and that three additional Veterinary Colleges have been opened since our country attained Independence in August 1947. It is also encouraging to be told that steps are being taken to improve the standard of veterinary education in the other existing veterinary colleges and to get them affiliated to the University wherever they have not been. But, unfortunately, each of these Veterinary Colleges is going on in its own way with its own curricula of studies. This is highly unsatisfactory and it is, therefore, very necessary for us to take stock of the present condition of Veterinary Education, and the facilities available for it in the country with a view to planning out the future on sound and efficient lines. It need hardly be emphasised that the present-day Veterinarian should be equipped adequately to tackle the multifarious veterinary problems of the country.

By way of recapitulation, it may be mentioned that in the past a number of attempts had been made to reform and improve Veterinary Education, but they all turned out to be infructuous. The last of these attempts was in the year 1943

when the Imperial Council of Agricultural Research appointed a Sub-Committee under the Chairmanship of Dr. Minett to enquire into the state of Veterinary Education in the different Colleges in India and draft suitable recommendations for its improvement. Unfortunately, the report of Minett Committee was unsatisfactory in many ways. It did not even present a correct picture of the existing conditions and, as we had occasion to comment in these pages then, its findings were unrealistic to a regrettable extent. In some respects, it followed the Loveday report in the United Kingdom where conditions are very different. It is therefore essential that the subject is considered once again *de novo* in the light of what has been achieved in other countries and consistent with our country's needs and requirements. For this purpose, a representative authoritative committee consisting of officials and non-officials must be constituted immediately by the Central Government. It should visit all the Veterinary institutions, research stations, and livestock breeding centres, and take stock of the existing facilities and equipment including the staff. It should also enquire into the conditions of those Veterinary Colleges which have already been affiliated to Universities and find out how far they can be upgraded for higher training and Post-Graduate studies. Such a kind of enquiry will be productive of exceedingly good results which will enable the Committee to draw up an unified course of Veterinary Education, affiliated to the University, on an all-India basis. It may however, be contended that the Indian Council of Agricultural Research has already got in its Animal Husbandry Wing an adequate personnel to advise the Government on Veterinary Education and that therefore there is no need for the creation of a further body for this purpose. To a certain extent, this may be true; but, unfortunately the Animal Husbandry Wing is already seized of various other matters besides Veterinary Education. By its very nature, it cannot wholeheartedly concentrate and work on the subject of Veterinary Education alone. A more compact body consisting of not only officials but also non-officials with experience in veterinary educational matters, ***and with statutory powers to enforce its decision***, would be the correct agency for considering this subject. In fact, a body like an

Indian Veterinary Council is what we envisage and it is absolutely necessary that it is created as a matter of ***immediate urgency*** to deal with the whole subjeet of veterinary education. We say purposely "immediate urgency" because the need for a controlling body like an Indian Veterinary Council is a matter of extreme importance in the formative stages when veterinary colleges are being started and higher studies are being planned. The initial mistakes, if left uncorrected then and there, would constitute serious obstacles in the long run and hence the need for the formation of a statutory body like the Indian Veterinary Council immediately. We earnestly request the Central Government to give this matter its early consideration.

TO OUR READERS

We feel constrained to bring to the notice of our readers that the cost of the production of this ***Journal*** has of late increased tremendously and that consequently it has become necessary to review our financial position and stabilise it by an increase in the rates of subscription. It would be remembered that this ***Journal*** which was started Twenty Five years ago as a quarterly was converted into a Bimonthly and published every alternate months from July 1939. It would also be remembered that this conversion was effected without any corresponding increase in the subscription as it was then thought that, with increased circulation, the ***Journal*** would pay its way. Unfortunately these calculations were upset by the outbreak of the Second World War and the consequent abnormal rise in the cost of printing and paper. This has affected the financial position of the ***Journal*** very much and therefore it has been decided to revise the rates of subscription of the ***Journal*** as under with effect from July 1949 ie commencing with the 26th volume :—

For Members of the profession and students—Rs. 6/- per annum including postage in advance. Single copy Rs. 1-8-0.

For Government, Local Bodies and others—Rs. 10/- per annum. Single copy Rs. 2/-.

We are sure that our readers will appreciate our position, consider this increased rate as inevitable under the circumstances and continue to extend their co-operation to this *Journal*, which is really their own, as they have been doing all along.

We also wish to take this opportunity to appeal to our subscribers to clear off their arrears which have swelled up to an undesirably big figure and have drawn adverse comments from the auditors.

RETURNED FROM ABROAD

Dr. I.M. AZIZUDDIN, B.A., G.M.V.C., B.V.Sc. (Mad.), Ph.D. (Edin.).

We are glad to learn that Dr. Azizuddin, a Lecturer of the Madras Veterinary College, who was deputed for higher training in United Kingdom in 1946, has returned with a Doctorate degree from the University of Edinburgh. We understand that throughout his stay in the United Kingdom, Dr. Azizuddin earned high praise from the leading members of his profession for the diligence and enthusiasm that he displayed in his research and for his scientific ability and personal initiative.

It may be mentioned Dr. Azizuddin was a Bachelor of Arts of the Madras University with zoology and Botany as optional subjects, before he joined the Madras Veterinary college and took his B. V. Sc., degree in 1942.

Soon after his graduation, he was engaged in research work in Bacteriology and Pathology at the Imperial Veterinary Research Institute, Mukteswar and for about one year held the appointment of Research Scholar in Bacteriology under the Government of India.

In June 1943, he was recruited to the Madras Veterinary Service and appointed as Lecturer in Medicine at the Madras Veterinary College, the first B. V. Sc. to be so directly recruited. In the autumn of 1946, he was deputed by the Government of Madras for higher studies in Bacteriology in United Kingdom.

During the course of his training at the University of Edinburgh, he was engaged for over a period of two years in research on the Bacteriology and Pathology of Bovine Endometritis, and on the basis of this research submittad a thesis for the Degree of Doctor of Philosophy which was awarded to him in December 1948. He is the first B. V. Sc., (Madras) to be awarded this Doctorate Degree.

The main portion of his work was carried out at the Royal (Dick) Veterinary College, Edinburgh, and the Hannah Dairy Research Institute, Ayr, but he also had the privilege of studying diagnostic and research techniques at reputed institutions viz., Veterinary Research Division, Belfast, Ministry of Agriculture and Fisheries Veterinary Laboratory, Weybridge and Poultry diseases Research Laboratory, Lasswade, Lister Institute of Preventive

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DR. J. D. SAMPATH KUMARAN, L.V.P., M.A., PH.D. (MISSOURI)

DR. I. M. AZIZUDDIN, B.A., G.M.V.C., B.V.Sc. (MAD), PH.D. (EDN.)

INDIAN VETERINARY RESEARCH INSTITUTE, IZATNAGAR.
ADVANCED COURSE IN POULTRY HUSBANDRY 1948 - 49

Dr. S. C. H. Datta

Medicine, London and some of the disease investigation centres in the United Kingdom. He made a special study of Trichomoniasis including its serology, and tuberculin testing in cattle with special reference to 'storment method' in Northern Ireland.

During his study in these institutions, he came in close contact with the specialists and leading members of his profession.

He also had the unique distinction of presenting a scientific paper on his research before the National Veterinary Medical Association of Great Britain at its invitation. This paper was illustrated by charts, lantern slides, and actual specimens and was highly appreciated by a critical audience of research workers.

He attended the First international Congress of Physiology and Pathology of Animal Reproduction and of Artificial Insemination held under the sponsorship of UNESCO and FAO in Milan in June 1948 and took an active part in its deliberations. He visited the Veterinary Colleges and Research Institutions of repute in Italy, Switzerland, France, Belgium, Eire and the U. K., and had the privilege of meeting eminent research workers and acquainting himself with the methods of teaching and research in these institutions.

We do hope that his knowledge and experience would be properly utilised by the Government.

We are also glad to learn that Mrs. Azizuddin accompanied her husband overseas and studied Poultry Husbandry and Domestic Science at the East of Scotland College of Agriculture, Ayr and the College of Domestic Science, Edinburgh, respectively.

Dr. J. D. SAMPATH KUMARAN, L.V.P., M.A., Ph.D. (Missouri).

Another deputationist who has returned from abroad after a successful Post graduate study is Dr. J. D. Sampath Kumaran, of the Indian Agricultural Research Institute, New Delhi. He was in the University of Missouri from January 1947 to February 1949 and worked under internationally recognized Dairy authorities like Dr. C. W. Turner and Dr. Samuel Borody. His main work was in dairy and animal husbandry. His academic career in the University of Missouri was a brilliant record in the sense that he took the degrees of M. A. and Ph. D. with very high honours in two year's time. His main thesis for the Ph.D. was on "the Endocrinology of spermatogenesis." He also worked under Dr. H. Daniel Mazia, the Great Cell Physiologist (who is at present engaged in Atomic energy investigations) and under Dr. H. Herman who is an outstanding authority on Artificial insemination.

Dr. Kumaran returned to India in April 1949 after visiting various dairy farms in U. S. A., Canada, Phillipines and Indonesia, and has joined his post in the Indian Agricultural research Institute.

FOREIGN BODY IN THE OESOPHAGUS AND RUMEN OF A COW

By

D. Vaidyanathan, G.M.V.C.,

Veterinary Assistant Surgeon, Ramnad, Madras.

Subject :—A local-bred black cow, aged 8 years, was brought to the dispensary at 9 A.M., on 2—11—48.

History and Symptoms :—The owner reported that the cow was given a feed of green grass and straw the previous night and, when seen the next morning, it was observed to be in distress. A long length of wire was seen hanging from its mouth which could not come out when pulled and appeared to be stuck up in the throat.

On examination, a length of twisted electrical wire without the insulation covering was found to be stuck up somewhere beyond the pharynx, and would not come out when pulled forward slightly. It measured 35 inches from its free end up to the throat. The cow was breathing hard regurgitating pieces of chewed ingesta, and was dribbling from the mouth.

Treatment :—The cow was held firmly in the standing position and a mouth-gag was put on. The free end of the wire was secured with a long piece of twine. It was then passed through a well lubricated cattle probang, the stillet of which had been removed. The twine and wire, passing through the stillet aperture, was well secured by an attendant. The probang was then slowly passed into the œsophagus till its end reached the rumen, and gurgling sounds of the stomach were audible at the free end. The wire in the probang could now be moved slightly forwards and backwards. Holding the twine and wire firm, the probang was now slowly removed and with it the entire length of the wire. On removal, it was found that the swallowed end of the wire had formed into a twisted loop, with pieces of straw and grass, measuring about 2 inches in circumferance. This end got itself embedded into the metal nozzle of the probang and came out with the probang without much difficulty and without damaging the gullet.

The length of the whole piece of the wire measured 70 inches.

The cow's mouth was gargled with a weak solution of Potassium Permanganate and the animal put on gruel diet for the day.

The cow was normal when seen the next day and was given the usual feed. It was again seen a month later and found to be normal and quite healthy.

Note :—Although it is quite common to find cattle swallowing small pieces of foreign body accidentally with their feed, this case is rather of unusual interest where the object swallowed was an exceptionally long piece of wire, 70 inches in length, and, hence, is recorded.

CASTRATION OF LIONS

By

N. R. Modak, G.B.V.C.,

Veterinary and Livestock Officer, Sangli.

Three lions belonging to Deval Circus were castrated at Sangli at the request of Prof. Deval with a view to rendering them more docile. Two of these were aged about ten months and were operated by the open method on the 17th March 1949.

Each lion was secured with strong ropes in the big cage prepared for them at the time of show. The lion was made to stand on stools placed near the bars of the cage and then, the head, chest, Lion, fore-legs and hind-legs were secured by passing the ropes round each part separately and tying them to the iron bars of the cage (vide photo).

The hairs in the region of the pertitoneum and scrotum were clipped and the site of operation was painted with Tr. Iodine. 5 c.c. of a 2 per cent Procaine Hydrochloride solution was injected over the cord and after a few minutes, an incision was made along the median raphe of the scrotum and the testicles exposed. These were removed after ligaturing the cords with cat-gut. The scrotal incisions were not sutured. The wounds were plunged with Acriflavine in Glycerine. Tetanus Anti-toxin 5,000 I.U., was injected to each lion after the operation was over.

The subsequent treatment consisted in keeping the part clean and painting the area with Tr. Iodine. The wounds healed in two weeks.

On the 18th of March 1949, the third lion, aged about 8 to 10 years old, was castrated by the Burdizzo Castrator, after securing him by the method described above. Tr. Iodine was applied to the part for two days after the operation.

HYPOCALCAEMIA IN A CALF

By

R. N. Srivastava,

Veterinary Assistant Surgeon, Mirzapur, U.P.

Subject :—A cow-calf, about 2 months old, of a Desi cow.

History :—On 29—11—47, at about 3 P.M. the owner, hearing some noise from the calf shed, went there and found the calf vainly struggling to get up. It was very nervous and anxiously looking all round. Later on, she became quiet and then according to the owner, the following symptoms were noted :—Prostrate and unable to get up, head and neck stiff and turned upwards with

inability to return to normal position, foaming slightly at the angle of the mouth, urine passed but dung retained. She was however able to swallow when forcibly fed with milk. I was called to see the animal on 1—12—47 and the symptoms exhibited by the patient then were:—Animal prostrate and cold, (temperature could not be recorded as it was below 96°F,) respisation shallow. Neck stiff and turned upwards and could not be brought back to normal even by force. Eye balls rolling upwards showing the white of the eyes but sensitive. Tetanic spasms every 5 minutes which became intensified when the body was touched. Passed sufficient quantity of normal urine but bowels costive.

Treatment :—10 A.M. a soap and hotwater enema brought out a small quantity of mucous coated dung. Prescribed Chlor. Hydras grs10, Pot. Bromide grs 30 in rice gruel. Gave ten c.c. of a 10% Calcii Gluconate intravenously.

2 *P.M* :—There was a noticeable decrease in the spasms; the animal took milk and linseed tea without difficulty

5 *P.M* :—Gave 15 c.c. of the Calcium Gluconate solution intravenously and repeated the mixture.

2nd day The calf had a peaceful night. Temperature 101°F. She was given two seers of buffaloe milk and a dose of the Chloral Hydrate mixture. Also 20 c.c. of 10 per cent Calcium Gluconate intravenously.

At 6 *P.M.* :—The temperature went down to 99. 6° F, while the pulse and respiration were 112 and 31 p.m. respectively. 10 c.c. of 10 per cent Calcium Gluconate was again given intravenously.

3rd day 9 *A.M.* 97. 8°F, pulse 104 and respiration 22. Watery discharge from both the nostrils, dull and anxious looking. Gave 10 c.c. of 10 per cent Calcium Gluconate intravenously. Repeated the Chloral Hydrate mixture with one ounce of Ol. lini to relieve the bowels.

6 *P.M.* :—100°F. 100 p.m. 26 p.m. Repeated the Chloral Hydrate mixture with Ol. lini and the Calci-gluco injection—10 c.c. intravenously and also intramuscularly.

4th day 99. 4° F, 103 and 21. p.m. The animal was still dull and depressed. Repeated Calcium Gluconate injections intravenously and intramuscularly.

5th day:—Great prostration, occasional twitching of the shoulder muscles, 98. 6° F, 90 and 20 p.m. Increased the quantity of Calcium and gave 10 c.c. of a 12% solution intravenously and intramuscularly.

No change in condition on the 6th and 7th days.

8th day Animal lying with the neck and muzzle turned towards the stifle. 104. 6° F. Gave 14 oz. of a 25% solution of Cal. Boro Gluconate intravenously and 15 c.c. of Calcium Gluconate intramuscularly.

An hour after this, the calf got up by herself and began to walk and suck her mother. The improvement was maintained and gradually she picked up her strength. The treatment was discontinued from that day and it was reported later on that there was no relapse in her condition.

This case is interesting owing to the persistence of the symptoms and the necessity for repeating the injections for over a week in increased dosees.

CONTAGIOUS AGALACTIA AMONGST SHEEP AND GOATS IN BARODA STATE

BY

H. V. KULKARNI, G.B.V.C., P.G.,

Disease Investigation Officer, Baroda.

A disease, locally known as "Thakale" and simulating contagious agalactia amongst sheep and goats, was first recorded by me in Baroda State in the month of February 1942: since then outbreaks of this disease have been met with every year.

The disease is generally observed in a sub-acute or chronic form and it is characterised by inflammatory changes in the udder, joints and eyes Three forms of this disease are thus met with viz. Mammary, Joint and Ocular forms. Majority of the cases are of udder infection. Animals in milk are most susceptible, but, animals not in milk, and even male animals, may also be affected.

In udder infection, the mammary gland is hot and swollen and painful. The affected female sheep and goats go dry all of a sudden though they may have been yielding full quantity of milk the previous day. Any milk obtained from these animals is saltish in taste and yellowish in colour and contain flocculi. The udder gets atrophied and somewhat hardened. The animals affected with this condition may have either the joint or eye involved simultaneously but such cases are rare. There are no other constitutional disorders. Rise of temperature is noticed only in acute cases.

In the ocular form, there is lachrymation, conjunctivitis, opacity of cornea and blindness of either one or both the eyes.

In joint infection, the joints are swollen, hot, painful, stiff and doughy with the result that they are unable to walk or lie comfortably. The legs, the fore or hind, singly or in pairs, may be affected. The animal feeds well and the milk yield is normal.

Animals once cured are liable to be attacked next year also. There is practically no mortality in affected animals except in acute cases which varies from 5 to 10 per cent.

The udder infection entails a great loss to the stock owners. It is very difficult to trace the source of infection. If an affected animal is allowed in a healthy herd, they contract the disease, and once the disease makes its appearance in a herd, practically there is no chance for other healthy ones to escape the infection, unless strict isolation measures are adopted.

There is a belief amongst shepherds that the urine of the affected animals is infective, and it is probable that every discharge of the affected animal may contain the infective agent. The disease spreads only very slowly.

The affected animals do not yield any milk at all but in the second year the milk yield is partially restored and in the third year becomes fully restored. Thus the effect of the udder infection lasts for about three years, which means a great economic loss to the stock owner.

Post-mortem lesions :—The udder was found to be enlarged and to a certain extent in a hardened condition ; in a few cases, necrotic areas were observed. The joints were observed to be in an inflammed condition, the capsule of the joint being involved in the majority of the cases. Other organs were found to be normal.

Milk samples, blood and urine from affected animals were examined microscopically and culturally for the presence of any micro-organisms with negative results.

Treatment is only symptomatic as no specific curative drug has been known or recommended. Mag. Sulph and Pot. Nit. by oral administration and in drinking water yielded good results.

Conclusions :—1. A disease simulating Contagious Agalactia of sheep and goats occurs as an epizootic in the State and many outbreaks of this disease have been detected and recorded.

2. The disease is not a seasonal one as it makes its appearance in any season of the year but the majority of the outbreaks are recorded in winter season.

3. Out of the three forms of the disease the udder infection is serious and majority of the animals suffer from it. This form therefore entails a great loss to the stock-owners.

4. There is practically no mortality amongst the affected animals except in acute cases.

5. Animals in milk are found to be most susceptible.

6. The etiological factor appears to be a filtrable virus as repeated examinations of blood smears, samples of milk and films prepared from the udder lesions, joint-fluid, and from internal organs like spleen, proved to be negative for the presence of any bacteria or protozoa. Further work in respect of transmission experiments, etc., will be taken up when opportunity occurs.

A Statement showing some details of recorded out-breaks with No. of animals attacked and recovered etc.

Year	Locality	No of Out-breaks	Attacks	Deaths	Recovered
February 1942.	Mehesana Dist.	24	695	12	683
Nov. & Dec. 1943.	Baroda Dist.	6	218	2	216
Dec. & Jan. 1944.	Navsari Dist.	4	69	1	68
Oct. & Nov. 1945.	Mehesana Dist.	12	329	4	325

COLOUR IN KANGAYAM BREED

By

K. T. BENJAMIN I.D.D., and K. K. RAJU G.M.V.C., A.I.D.I.,

Livestock Research Station, Hosur, Madras Presidency.

In Animal Husbandry, the word colour is applied to the colour of the coat of the skin of animals and is a genetical factor generally transmitted from parents to progeny. Besides serving as a useful guide in distinguishing the different breed characteristics of animals it plays a prominent part in determining their market value also.

Many breeds of animals retain the colour with which they are born throughout their life-time with very slight variations which are not worthy of special mention, but, the Kangayam breed of animals, which is one of the renownd draught breed of South India, bahave in a peculiar way.

At birth, irrespective of the sex, the calves are born brown, light, or dark brown in colour with general glossiness all over the body. A grey or white tinge extending over the lower portion of the barrel, sometimes spreading over the inner aspects of the greater thighs and inside the ears and arms is also frequently met with. In some animals, grey or white rings are found round the region of pastrons and fetlocks. The switch is black. With the growth of the animal, the colour begins to change. From about the third month, the animal

begins to shed off its red coat. There is an admixture of grey and red hairs all over the body. Sometimes the animal presents a coat with dull or dirty brown colour with grey specks spreading all over the body. As age advances this grey colour of the coat becomes intensified and when the animal reaches one year there is a definite change in the colour, which is grey or dark grey or dull or dirty grey, sometimes with red tinge over the poll and occassionally over the back and body. Black rings over the fetlocks and coronets, a dark shade over the region of the pastern connecting these two rings are also common. In some animals this dark shade extends over the shanks up to the knees and hocks.

When the animal reaches two years it presents altogether a different picture from what it was at birth. The heifers turn out to be grey or dark grey, frequently with black rings and shade as described above and remain to be so till the end of their life time.

The adult male generally runs a darker grey or iron grey colour, with black shade over the head, neck, hump, dewlap, fore and hind quarters, shoulders, and thighs. The tips of the ears in many cases are black in colour. As the animal approaches maturity the black shade over the regions mentioned above becomes intensified and the animal retaines this colour during the rest of its life. The hairs at all seasons of the year remain short giving a fine glossy coat in well bred and carefully looked after animals.

Some animals of either sexes present well defined dark rings around their eyes.

These definite changes in the colour at regular intervals during the career of Kangayam breed of animals which form a separate class by themselves, go to show the purity of the breed.

A FURTHER CASE OF PROSTATIC ENLARGEMENT IN A DOG, RESPONDING TO TREATMENT WITH STILBOESTROL DIPROPIONATE IN OIL (MAY & BAKER).

By

FRANCIS JOSEPH, G.M.V.C., P.G. (Mad.),

Lecturer in Animal Hygiene,

and

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

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Agricultural College, Coimbatore.

Joseph and Vaidyanathan (1947) have reported on a case of enlarged prostate in a dog responding to treatment with injections of Stilboestrol Dipropionate in oil administered intramuscularly and supplemented with oral

administration of tablets of Stilboestrol. The dog was treated between 6-7-46 and 20-7-46, at the end of which period there was complete disapparance of the swelling in the region of the prostate.

In the follow up of that case, an examination was possible on 10-5-48 *i. e.* nearly two years after cessation of treatment and it was found that the old trouble had not recurred.

The following case report on another dog with a similar condition is detailed below :—

A Small-Sized mongrel dog, aged about 4 years, weighing a little under 10 pounds, was presented at the Agricultural College Veterinary Hospital on 4-12-47 with the following history : Animal ill for four days, dull and off-feed, T. 102.8% F. urine passed in drops, slight discharge of pus like material from the urethra, reaction of urine—acid to litmus paper.

Examination per rectum revealed in the region of the prostate an elongaged thickening.

Up to 8th Dec. 47 the animal was treated with urinary antispetics, diuretics, etc., without any relief of symptoms.

On the 9th December 1947, 5 milligrams of Stilboestrol Dipropionate in oil was given intramuscularly and the owner was advised to give a 2 milligram Stilboestrol tablet once daily on the 10th, 11th and 12th and bring the patient on the 13th to the Hospital. The owner, however, mistook the instructions and gave a 2 milligram Stilboestrol tablet morning and evening these three days and reported that the dog had commenced to pass urine in a thin stream on the 12th itself. When the case was next brought to the hospital on the 13th December 47, it was noticed that the urine was passed normally. Examination per rectum revealed complete absence of the thickening previously detected in the region of the prostate.

On the 13th and 19th December 1947, 9 and 8 milligrams respectively of Stilboestrol Dipropionate in oil was given intramuscularly to complete the course of treatment.

It was possible to examine this animal on 10-5-48 *i. e.* nearly 6 months after cessation of treatment. The trouble had not recurred then.

The required quantity of the oily preparation for each injunction was drawn out from the bulk packing-10 c.c., rubber-capped bottle (May & Baker) containing 10 milligrams of Stilboestrol Dipropionate in each c.c.

REFERENCE

Francis Joseph & Vaidyanathan, S. N. Prostatic Enlargement in a dog. Treatment with Stilboestrol Dipropionate. *Ind. Vet. Jr. Vol.* XXIII, No. 6, PP. 463-64.

INHIBITION OF LACTATION IN A BITCH WITH STILBOESTROL DIPROPIONATE IN OIL (May & Baker)

By

Francis Joseph, G.M.V.C., P.G. (Mad.),

Lecturer in Animal Hygiene,

and

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

(*Addl.*) *Asst. Lecturer in Animal Hygiene*,

Agricultural College, Coimbatore.

A Small-sized Mongrel bitch, aged about 3 years, and weighing about 8 pounds, was presented at the Agricultural Veterinary Hospital, Coimbatore on 26-12-47. According to the owner it had littered a dead pup two days previously and at the time of examination her mammae were distended with milk. The milk had to be dried off.

On the 26th and 27th December 47 the mammae were completely stripped of their contents and pigmentum belladonna applied liberally with a light massage and then covered over with lint and bandaged. This had no effect.

On the 28th, the glands were stripped off completely again, 11 milligrams of Stilboestrol Dipropionate in oil was given intramuscularly. The external dressing was discontinued.

Response to this treatment was spectacular. After 24 hours, only a few drops of altered yellow coloured milk could be stripped out which decreased to nothing two days later.

HELMINTHIASIS IN PUPPIES—TREATMENT WITH HOMOEOPATHIC DRUGS

By

Capt. G. Venkata Narasu, G.M.V.C., P.G.,

Veterinary Officer, Gwalior Kennels.

Introduction:—Helminthiasis in puppies is quite a common complaint but its treatment has been far from satisfactory. Frequent administration of vermifuges and vermicides usually results in harm to the growing young animal either by excessive purgation or by the absorption of the vermicides and vermifuges. There is a common saying among the 'Canine World' that

'worming' more often kills a dog than the actual worms. To a certain extent, this, in my opinion, is true. I have had fairly good experience in the use of the various anthelmintics in the British Pharmacopia and also of the many proprietory 'Worm' preparations, have found out that they could not produce satisfactory results, especially in toy breeds like Pekingees and Pomeranians. The result of the anthelmintic treatment has usually been only temporary, and, although the worms were expelled, the subsequent effect has been serious. Some of the patients have died in about a week. Post-mortem on these puppies revealed extensive enteritis which could be attributed either to the damage caused by the worms themselves or to the effects of anthelmintics used.

I therefore gave a trial to homoeopathic remedies and, after a fairly extensive trial, I am pleased to say that they are both effective and safe in puppies of the toy breeds.

In the use of these homeopathic remedies, there is no previous preparation of the patient, nor are the doses calculated according to the weight of the animals.

Very young puppies, between the ages of a month and two, are treated by me, in the case of Ascaris infection, with 'Cina Martima 3 X' and 'Chenopodium 3 X'. Three drops of these drugs in a teaspoonful of water are given once a day and continued for a week. After this period, a saline enema is given.

In the case of Oxyuries Vermicularies infection, puppies are treated with 'Filix Mass 3 X' and Artemisa Vulgaris 3 X' on lines similar to above.

In taeniasis, the treatment is almost similar to above, but occasional doses of 'Sulphur 3 X' were given.

The above line of treatment has proved very effective and no mortality has been observed by me so far.

UTERINE PROLAPSE IN BOVINES-USE OF COCAIN HYDROCHLOR IN

By

Bishembhar Dass Bahl, L. V. P. (Hons.), P. G. (Mukt),

Veterinary Hospital, Jullunder, E. Punjab.

During my experience of 15 years, I have come across many a case of Prolapse of the uterus. Bovines, particularly stall fed ones, have been more prone to this complaint than sheep and goats and the inversion in them has been more complete. In mares I have seldom seen these complications. Whether

the inversion is complete or incomplete, it is always a very tedious job to correct as the animal goes on straining in spite of all veterinary aid. I have seen many deaths from Prolapse Uteri mainly from persistent straining although the uterus had been completely replaced and trusses applied. It should also be mentioned here that in these cases the veterinary aid is not called for in time and that the cases are mishandled by the quacks in the first instance.

In the treatment of these cases, I have given a fairly good trial to all the standard lines of treatment in text-books but very few remedies have helped in preventing straining and putting the animal at ease.

Latterly, I have been injecting Cocaine Hydrochlor solution intra-spinally and I can say with confidence, after using it on over 70 cases, that it gives very good results.

The injection is made in the lumbo-sacral space which is easily located by drawing a line across the vertebral column to connect the summits of the external angles of the Ileum. The site at the place of intersection of the two lines is clipped and sterilised. A needle is inserted at the lumbosacral space and, when the spinal fluid escapes through it, the injection is given. As cocaine cannot be boiled, it is first dissolved in ether and, when the ether evaporates, 5 to 10 c. c. of re-distilled water is added. According to the live weight of the animal, Cocaine Hydrochlor is injected in a 10 per cent solution. When the needle is withdrawn, the site is sealed with a collodion swab.

I have found this method very efficacious in stopping the straining and I wish the members of the profession give a trial to this method.

ROUND-CELLED SARCOMA IN A FOWL

BY

M. MAQSOOD, L.V.P., (HONS.),

Lately Civil Veterinary Department, Murree Hills, Punjab.

(Now at Michigan State College, East Lansing, USA).

A Desi fowl (Indian breed), age about one year, was brought to the Hospital in May 1947, with the history that about a fortnight previously a growth about the size of a walnut was noticed on its left thigh. The growth continued to increase in size and three more such growths had also appeared in the surrounding area. Previously in April 1947, the fowl was treated for "Bumble Foot" of the same leg and that swelling ultimately disappeared. The present growths appeared about ten days after the date of recovery from Bumble Foot.

The fowl was kept under observation. The growths continued to increase in size rapidly and a few more growths appeared along with these, above and below the joint. The smaller growths were somewhat firm in consistency but the bigger ones were soft. The growths continued to increase both in size and number and after about three weeks it was observed that the thighs and flanks of the left leg were practically covered with numerous such growths varying in size from a marble to a golf ball. Majority of these growths were coalesced with one another while a few of them were isolated. The fowl became emaciated and was therefore destroyed On dissection of the diseased leg, it was observed that these growths had arisen from the subcutaneous connective tissue. Microscopic examination of the pieces of tumours showed characteristics resembling those of a round celled sarcoma, the cells representing the intermediate stages betwen the small and large round celled sarcomata. The intercelluar stroma was scanty and the blood vessels were numerous but were of a primitive type.

It may be that the absorption of certain irritant materials from the foot pad affected with Bumble Foot, might have predisposed the fowl to develop sarcomata.

NASAL SCHISTOSOMIASIS — TREATMENT WITH TARTAR EMETIC

M. R. SEN, G.B.V.C., P.G. (Mukteswar)

Asst. Superintendant, Bengal Veterinary Research Institute.

Occurence of Nasal Granuloma has been known in this country for a long time. Jey Sing Raj (1910) was probably the first who recorded the disease in Madras. In Bengal, the disease has been reported for over half a century by observers in the Midnapore district. In colloquial language the disease assumed the name "Sankra" or "Pinas" (rotten nose) from the characteristic snoring sound.

As a result of investigation conducted by Research workers, especially Datta, Malkani & Anant Narayan Rao, it was established beyond doubt that the disease was caused by a Schistosome named *S. nasalis*.

From the year 1944 to 1946, about ten thousand cattle and buffaloes were clinically examined by the writer at different villages in Jhargram Subdivision of Midnapore district. Clinical symptoms of Nasal Granuloma were found present in about 20% cattle, In some endemic villages, however, about 60% cattle maifested clinical symptoms. Out of about 500 buffaloes examined none manifested any clinical symptoms. Nasal discharges from about one thousand cattle and buffaloes were at the same time microscopically examined

at these Nasal Granuloma infected areas and Schistosome ova were detected in cent per cent cattle showing clinical symptoms of Nasal Granuloma and in 90% cattle & 87% of buffaloes showing no clinical manifestation of the disease. These symptom-free animals were clinically examined after every 6 months for about 2 years and about 7% of cattle manifested clinical symptoms during this period. Since the Schistosome Ova were demonstrated in such large number of animals without any clinical spmptoms or any previous history of the disease, it is a matter for consideration whether Schistosome is the actual organism of Nasal Granuloma or whether it simply helps the entrance of other organisms responsible for the disease by causing injury to the nasal mucosa from constant irritation.

Technique for collection & Microscopical examination of Nasal discharges :—

The elaborate process of casting the animals, of syringing their nostrils and of centrifuging the washings before examination under Microscope are neither practicable nor necessary specially when a large number of animals in the field are to be examined at a time. The nasal discharge may be collected with the aid of a small spoon or a smooth glass rod with flat end, thoroughly washed each time before use and kept in separate small phials or test tubes containing clean water. To expedite examination in the field, the operator may carry the microscope with him and examine the specimens on the spot. The nasal discharges from 3 animals can be placed separately on a single slide with cover slips and examined. It is necessary that the thick discharges are diluted with a little quantity of clean water to make the consistency thin, as otherwise the ova may be missed in the thick discharges. Sometimes 30 to 40 ova may be found present in diluted discharges, whereas no ova could be detected in the same discharge when examined previously undiluted. By adopting such method one can examine the nasal discharges of 200 to 300 animals in a day in the field.

Treatment ;—Parthasarathy (Madras) was the first Veterinery Surgeon to adopt the treatment of Nasal Granuloma by Tartar Emetic in 1921 and he claimed this drug to be a specific for the disease. All the othor workers practically followed the same line of treatment. Roy Choudhury in 1932 reported to have successfully treated the disease by Bayer's Antimosan. Latterly, Anthiomaline (May & Baker) is also reported to be effective. But these drugs are too costly for mass treatment in endemic areas although one of the principal advantages of these preparations over Tartar Emetic is that they are practically nontoxic and can be given intramuscularly.

Dose & interval ;— Parthasarathy (1921) gave Tartar emetic in doses of 3 to 6 grains to calves and 10 to 30 grains to adult animals at an interval of 1 to 7 days. Das (1929) gave 10 to 20 grains of the drug at an interval of less than 4 days. Ofspring (1932) gave 10 grains of the drug per dose irrespective of body weight of the animal once in 4 days till 10 doses were given. Some of

his animals were reported to have had a relapse after an apparent cure and a 2nd and even a 3rd course of treatment was found necessary. Naik (1941) reported a few accidents amongst the animals treated with a daily dose of 1'5 grains per 100 lbs. body weight. Anant Narayan Rao (1936) recomends intravenous injections of 6% solution of Antimony Tartarate, 1'5 grains for every 100 lbs. body weight of the animal repeated daily for six days or 2'5 grains given every alternate day. This dose, he claims to be safe and effective. He arrived at this line of treatment after experimenting on a few animals of abnormally small size. The line of treatment recomended in pamphlet on Nasal Granuloma issued by Mc Gregor & Ali (Bengal) in 1942 is apparently a corroboration of Anant Narayan Rao's finding.

Following the recommenation of Anant Narayan Rao one very healthy bullock weighing 500 lbs. was injected with 12 grains of Tartar Emetic in 20 c.c. of distilled water at Charfasson in January 1940. After about 8 hours the animal was found dead in the grazing field. Again in 1943, an Australian cross-bred cow weighing a little over 400 lbs, in Jhargram Subdivision, was given daily injections of 6½ grains Tartar Emetic for 4 days, and on the date of 5th injection, the animal was found dull, taking very little food and passing high coloured scanty urine. Eruptions on the skin were also noticed, therefore injection was not repeated. The animal died after 4 days. In January 1944, Mr. S. M. Ali, former D. V. S., Bengal visited Jhargram after these incidences were reported to him. According to his instruction, a batch of 4 animals, each weighing 300 to 350 lbs. were selected for treatment. 7½ grains of Tartar Emetic in 20 c. c. of distilled water was injected into each animal. 5 such injections were given at an interval of one day. 24 hours after the injection, 2 animals died and 3 weeks after full course of treatment, another animal died showing symptoms of dullness, loss of appetite, passing of scanty high coloured urine and gradual emaciation. The remaining animal was disposed of by the owner when it started showing untoward symptoms. Again, on 20. 1. 44, another batch of 36 animals, at a different centre, was injected at the rate of 2 to 2'5 grains per 100 lbs. body weight. On the same night, at about 11 o' clock it was reported that the 2nd of the injected animals died in the evining and 4 more animals were manifesting severe toxic symptoms These 4 animals however, subsequently recovered.

After these incidences, an attempt was made to find out a safe and effective dose and whether the drug could be injected intramuscularly. Deciding on a dose rate of 1 gr., gradually increased to 1'5 grains per 100 lbs. body weight at an interval of 1 to 2 days, over 400 animals were treated at different centres in Jhargram Subdivision from 1944 to 1946, and 3 to 6 injections were given to each animal. The results were observed after 3 weeks 6 months, 9 months and 1 year after full course of treatment. The symptoms of Nasal Granuloma abated within 3 weeks in almost all cases that received 5 to 6 such injections. Nasal discharges of about 25% of the recovered animals

were examined microscopically and Ova of Schistosome were found absent except in a very few cases. The symptoms reappeared in about 20% of the animals after 8 to 9 months and in about 45% after one year, but the symptoms were generally not so acute as they were before treatment. The injections were repeated in these cases in the following year. After this dose rate no fatalities or severe toxic symptoms were noticed except in a few cases which showed diarrhoea, dullness etc. Slight pain and swelling at the seat of inoculation were observed only on a few occassions out of about 1800 intravenous injections given to 400 animals. 30 animsls were treated by intramuscular injections of Tartar Emetic in the same dose but in combination with Cal. gluconate and boric acid each 2 grains. 4 to 5 injections were given to each animal at an interval of 2 to 3 days. The results were very satisfactory and all the cases recovered. Slight pain and swelling at the seat of injection was observed in 12 animals out of the 30 animals treated by this method. Treatment had to be discontinued after 2 injections in only 2 animals due to severe local reaction which subsided after daily fomentation for about a week. An apparent cure from the disease was noticed in these 2 cases also after 3 weeks. 6 recovered animals showed relapse or re-infection after one year.

Summary:—1. Nasal discharges from about one thousand cattle and buffaloes were microscopically examined at a few Nasal Granuloma infected areas in the district of Midnapore. Schistosome Ova were detected in cent per cent cases showing clinical symptoms of Nasal Granuloma and in 90% cattle and 87% of buffaloes showing no clinical manifestation of the disease.

2. Treatment consisted of intravenous and intramuscular injections of Antimony Tartarate. The Bengal cattle showed remarkable intolerance when 2'5 grs. of Tartar Emetic per 100 lbs body weight were given intravenously.

The optimum level of 1 gr. gradually increased to 1'5 grs. per 100 lbs. given intravenously and at an interval of 1 to 2 days was generally found satisfactory. Cure was usually observed after 6 such injections.

Subsequent observations among apparently cured animals showed relapse or reinfection during the next year in about 45% cases.

30 animals treated with a solution containing 1 gr. Sod. Antim. Tart., 2 grs. Cal. Gluconate and 2 grs. Boric acid in 4 c. c. of distilled water and administered intramuscularly at the rate of 4 c. c. to 6 c. c. per 100 lbs. body weight at an interval of 2 to 4 days showed remarkable results of recovery after 4 to 5 such injections and without involving any acute post-injection complication, either local or general.

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College News

BIHAR VETERINARY COLLEGE

PATNA.

List of successful final year students according to Merit.

Sl : No.	NAME		Name of Govt. or District Board
1.	Munshi Lal	...	U. P.
2.	Bhagwan Saran Rajya	...	U. P.
3.	Madan Behari Lal Bharduaj	...	U. P.
4.	Jagdish Chandra Bhatnagar	...	U. P.
5.	Purandar Sahu	...	Orissa
6.	Bahera Krishna Murty	...	Orissa
7.	S. G. Mohiuddin	...	U. P.
8.	Jadubans Prasad	...	Bihar Private
9.	Lachman Prasad	...	U. P.
10.	Bishwa Pati Sitaram Singh	...	Bihar Private
11.	Shiva Kant Tewary	...	Champaran
12.	Har Mahinder Singh Carewal	...	U. P.
13.	George Bara	...	Bihar Govt.
14.	Radha Krishna Patnaik	...	Orissa.

Patna,
14th May 1949

S. K. SEN, B.SC., M.R.C.V.S.,
Secretary, Board of Examiners
Principal, Bhiar Veterinary College, Patna.

EAST PUNJAB CAMP VETERINARY COLLEGE, HISSAR

EXAMINATION RESULTS

The following candidate of the East Punjab Camp Veterinary College, Hissar (now East Panjab Veterinary College, Hissar) passed the Annual Final Professional B.V.Sc. Examination of the East Punjab University held in August-September 1948 :—

S. No.	Name		Marks (Max. 900).
1.	Bakhshish Singh Gill	...	707
2.	Bhavnesh Dutt Bhambani	...	672
3.	Prem Lal	...	653
4.	Jawahar Singh Garewal	...	649
5.	Udhishtra Deva	...	636
6.	Om Parkash Tejpal	...	620
7.	Wazir Singh Thamrait	...	612
8.	Balbir Singh	...	593
9.	Gurcharan Singh Sandhu	...	590
10.	Sain Lal	...	586
11.	Manohar Singh	...	583
12.	Hari Singh Pannu	...	582

The following candidate passed the Biannual Final professional B.V.Sc. Examination of the East Punjab University held in December 1948.

I. Bhagat Singh 542

Hissar
Dated 1-5-49

A. C. AGGARWALA, MAJOR,
B.SC. HONS, M.R.C.V.S., A.I.R.O., P.V.S.I.,
Principal,
East Punjab Veterinary College.

BOMBAY VETERINARY COLLEGE
DIAMOND JUBILEE CELEBRATIONS

PRELIMINARY NOTICE

Dear Sir,

It gives me great pleasure to communicate to you that the Government of Bombay have been pleased to permit the celebration of the Diamond Jubilee of the Bombay Veterinary college. The Diamond Jubilee Committee held on 27-3-1949 have decided to celebrate the Jubilee during the last week of December this year. Among other major items of celebrations it is intended to found a "Research Fund in Animal Husbandry and Veterinary Science" and to arrange an "Exhibition Fair in commemoration of the Dimond Jubilee. The Research fund is intended to direct aggressive research and to afford facilities to graduates of this College in doing research work so as to care for and cure animals in the best possible manner. The exhibition will include all animals useful to man, their anatomical and physiological models, their food and industrial products, and drugs instruments, electrotherapeutical appliances and biological products used to alleviate their sufferings. Firms and bodies dealing with the above will also be invited to exhibit their wares. You are therefore invited to pay a visit to your *alma mater* and to contribute towards the success of the function. The Jubilee reception committee will look after your boarding and lodging. You are requested to send me articles on different branches of Veterinary science and Animal Husbandry, on interesting clinical cases and about your reminiscences of the College by about 15th October next. Those who have not paid their subscription may kindly send the same to Prof. K. R. S. Aiyar, Hon. Treasurer, Bombay Veterinary College, Parel, immediately. The success of the function is dependent upon the funds. Every *alumini* of this College is requested to contribute liberally and to assit in the collection of funds through other sources. The righteousness of the charity towards the cause of dumb animals afflicted with sickness and sufferings which produce agonising pain and death is too well known to be emphasized further.

Your sincerely,
R. N. NAIK,
Hon. Secretary.

Proceedings of the Diamond Jubilee Committee held on 27-3-1949.

Mr. S. R. Chadha, Principal, Bombay Veterinary College presided.

The President stated during the course of his speech that the Government of Bombay had desired that the celebration of the Diamond Jubilee should await favourable times and now they have permitted us to celebrate the function.

The following resolutions were passed,

(1) Diamond Jubilee of the College should be celebrated during the last week of December this year.

(2) Prime Minister of India be approached to inaugurate the Jubilee celebrations and in case he is not available the Governor of Bombay be requested to do so.

(3) Collection of funds should be urgently taken through the following means:—

1. By approaching those past graduates of the College who have not yet subscribed to the Jubilee fund;

II. By issuing appeals to the citizens who are interested in the welfare of animals.

III. By arranging Jubilee benefit shows and dances.

(4) Messrs Alur and Murkibhavi were appointed as members of the Exhibition Committee in the place of those who have gone out of Bombay.

Mr. K. S. Van der Lee, Indian Representative, "Hexyclan" Insecticides and Dr. J. N. Karande Principal, National Medical College Bombay who had also attended Diamond Jubilee Committee promised donations of Rs. 400/- and Rs. 100/- respectively.

R. N. NAIK,
Hon. Secretary.

BOMBAY VETERINARY COLLEGE
DIAMOND JUBILEE CELEBRATIONS

The following subscriptions and donations have been gratefully acknowledged :—

Amount previously acknowledged Vol, XXIII, No. 2 of this *journal.*	...	1,942	14	0
Dr. K. N. Gopal Iyengar, Mysore Veterinary Services	...	3	0	0
,, V. G. Khare, 495 Shaniwar Peth Poona	...	10	0	0
,, P. V. Akula, Aden	...	25	0	0
,, V. I. Patel, Veterinary Assistant Surgeon, Prantij	...	8	0	0
A. A. Natesan, ,, Ernaculam	...	5	0	0
Lt. B. N. Swami, I.A.V.C., Malleshwaram, Bangalore	...	50	0	0
Dr. N. N. Desai, Veterinary Assistant Surgeon, Sanand	...	5	0	0
,, V. K. Damley, ,, Darwha (Yeotmal)	...	8	0	0
Lt. M. A. Siddique, 114 Cardew West, Karachi, Pakistan	...	20	0	0
Dr. M R Garudhachar, Manday	...	50	0	0
,, K. D. Marathe, Veterinary Assistant Surgeon, Sankheda	...	5	0	0
,, D. M. Chitre, ,, Shevgaon	...	8	0	0
,, T. T. Shukla, ,, Chickli (Surat)	...	10	0	0
,, D. R. Mudholkar, ,, Vaduj (Satara)	...	10	0	0
,, M Sreekantiha, Veterinary Inspector, Neelmangada, Bangalore.	...	15	0	0
,, V. S. Shinde, Dairy Manager, Deolali	...	65	0	0
,, K. B. Vyas, Veterinary Assistant Surgeon, Sundabad (Junagad)	...	20	0	0
,, S. N. Luktuke, Izatnagar	...	10	0	0
,, K. G. Pandya, Veterinary Assistant Surgeon, Mehmadabad (Dist. Kaira)		14	0	0
,, K. S. Shetty, Royal (Dick) Veterinary College, Edinburgh	...	4	0	0
,, A. E. Kulkarani, ,,	...	13	15	0
,, S. S. Bhosale, Veterinary Assistant Surgeon, Dewas, Madhya Bharat	...	10	0	0
Lt. M. K. Hawaldar, I. A. V. C., Ambala	...	30	0	0
Rao Saheb, B. R. Mankad, Retd. Veterinary Asst. Surgeon, Rajkot	...	10	0	0
Dr. G. Prakash, Veterinary Assistant Surgeon, Chhinuwara	...	10	0	0
,, K. A. Mirza, Veterinary Assistant Surgeon, Kalol	...	10	0	0
,, M. D. Khanvilkar, ,, Mongrol	...	8	0	0
Lt E. G. Purchure, Ujjain, Madhya Bharat	...	25	0	0
Dr. M. G. Bhosale, Veterinary Assistant Surgeon, Dehagaon (Baroda State)		10	0	0
,, V. E. Nikumb ,, Vani	...	6	0	0
,, Budh Sing, Udaipur	...	15	0	0
,, C. N. Kelkar, Nagpur	...	15	0	0
Risaldar, S. K. Naik, Gwalior, Madhya Bharat	...	9	0	0

Jemadar, Y. N. Punekar,	,,	...	8	0 0
Risaldar, Y. G. Mantri,	,,	...	9	0 0
Jemadar, G. M. Kangude,	,,	...	9	0 0
,, R. D. Patil	,,	...	7	8 0
Lt. V. S. Date	,,	...	12	8 0
Risaldar, B. V. Bhate	,,	...	9	0 0
Lt. Col. Rao Raja Sardar M. S. Apte, Gwalior, Madhya Bharat		...	51	0 0
Dr. H. B. Atidoria, Veterinary Assistant Surgeon, Bansda		...	7	8 0
,, K. N. Murthy	,, Koppa	...	10	0 0
,, M. P. Parmar,	,, Sajitra	...	12	0 0
,, Parwani		...	2	0 0
Mr. C. V. Dayal, 251 Walkeshwar Road, Bombay		...	25	0 0
Miss Gimi, West View, Woodhouse Road, Bombay		...	50	0 0
Mr. D. B. Dubhash, Bombay		...	50	0 0
Mrs. S. H. Gimi, West View, Woodhouse Road, Bombay		...	15	0 0
Mrs. D. K. Lala, Bombay		...	42	0 0
Mrs. Setna, Bombay		...	15	0 0
Servants of Miss Gimi, Bombay		...	3	0 0
Mr. M. N. Palekar, B. Ag. G.B.V.C. Sitaram Building, Near Crawford Market Bombay		...	25	0 0
Mrs. Gardinar, Curamally Court, Peddar Road, Bombay		...	75	0 0
Miss Ghadially, G. S. Medical College, Parel, Bombay		...	25	0 0
Mr. D. C. Johnstone, C/o Phipson & Co., Bombay		...	100	0 0
Dr. N. L. Naravan, Sheep and Wool Improvement Officer, Jaipur.		...	5	0 0
	Total	...	3,027	1 0

R. N. NAIK,
Hony. Secretary.

Association News

WEST BENGAL VETERINARY MEDICAL ASSOCIATION

West Bengal Veterinary Medical Conference.

The Annual General Meeting of the West Bengal Veterinary Medical Association and Conference was held in Ram Mohan Library Hall, Calcutta on the 24th and 25th December 1948.

Dr. H. N. Ray of the Indian Veterinary Research Institute, Mukteswar, presided. The Hon'ble Sri Bhupati Mazumdar, Minister-in-Charge of Irrigation and Waterways, was the Chief Guest. The Hon'ble Sri Hem Chandra Nasker, Minister-in-Charge of Fisheries was also present amongst the distinguished visitors interested in Animal Husbandry problems in the province.

Mr. S. K. Bhadury as Chairman Reception Committee of the Conference presented in his welcome address a brief outline on the activities of Veterinary profession in the country and stressed the need for creation of more veterinary aid centres. The Province of West Bengal has 13 districts, 39 Sub-divisions, 239 Thanas and 1, 670 Unions. The total number of livestock population

including cattle, buffaloes, sheep and goats and poultry according to the last census was about 1,84,68,323. But the present veterinary staff in the Field Section consisted of only 90 Touring Veterinary Assistant Surgeons, 24 Stationary Veterinary Surgeons in charge of hospitals, besides one Inspecting Officer in Charge of every district and four Range Officers. The average number of livestock within the jurisdiction of each Veterinary Assistant Surgeon came roughly to about 1,62,003. The area of activity of the Touring Veterinary Assistant Surgeon comprised on average about 2.5 Thanas or 21-22 Unions per Officer. This was such a collossal and an unwieldy task that it was extremely difficult for the officer to do full justice either to the rural people or to the livestock population.

The livestock occupied such a pivotal position in the entire fabric of our economic or social life that we could no longer afford to neglect them, if we were really anxious and keen to do something to raise the standard of living of the common man in the village. For this reason, it was considered essential that there should be at least one Veterinary hospital equipped with all modern appliances together with a model farm at each Union. Whereas our ultimate requirement is 1,670, we have at present only 114. This is too poor, too inadequate. One of the primary objects of these Union Veterinary Hospitals will be apart from rendering yeterinary aid, to demonstrate practically the methods of cattle management, the technique of calf rearing, the principles of hygiene and sanitation and the science of fodder cultivation and preservation in Silo or the production of Compost. By such ocular demonstration and Kindergarten methods of teaching animal husbandry in the elementary schools, the village manhood and womanhood will naturally grow with the knowledge on elements of Animal Husbandry.

Hon'ble Sri Bhupati Mazumdar in an inspiring speech reminded the house on the responsibility of Veterinary Profession and the very noble part played by them defying personal discomfort in the call of humanitya nd the greater task that lay ahead in the alleviation of distress of the common man. He felt certain that the Government of India and Provincial Government would do all possible efforts to give effect to the various development schemes and he expected that all ranks in Government departments will work harmoniously with zeal and in missionary spirit.

Hon'ble Sri Hem Chandra Naskar laid stress on wider propaganda among the masses by distribution of suitably printed leaflets, pamphlets etc. dealing with the various aspects of livestock improvement. He emphasised the point on greater mass contact and felt that establishment of demonstration farms would lead us in the right direction.

Dr. H. N. Ray in his presidential speech spoke eloquently on the high ideals of the members of Veterinary Profession in the protection of livestock which in an agricultural country like India was bound to stay and play an important role inspite of mechanical means of transport and cultivation.

The Bengal Cattle had deteriorated, the soil lacked its potency and in order to bring back the abundance in this proverbial land of milk and honey, the scientists, the workers, the peasants must join hands so that the average man could live in peace and plenty. Hard work was therefore necessary and he felt certain that, given facilities, the scientists of India were capable to stop the rot and raise better cattle and better health.

He therefore wanted full co-operation of the people and to trust on the bonafides of Government in all measures of campaign for the eradication of diseases and pests.

Sri Surendra Mohan Ghose, President-elect of the Association for 1949, in a message exhorted the Association to follow the Gandhian principles and try to establish 'Go-Seba Sangas' which were ideal for rural upliftment of our country. Sri Surendra Mohan Ghose felt that the Association should have a propaganda branch which will publish suitable literature describing in simple vernacular language for common people the art and science of animal husbandry.

Among the resolutions at the Conference, extension of Artificial Insemination as means to rapid improvement of livestock and establishment of model demonstration farms attached to each veterinary hospital in the province were adopted.

A third resolution emphasised the need for enlarging the present number of veterinary hospital and to increase the strength of Veterinary Assistant Surgeons as per recommendations of the Royal Agricultural Commission so that every Veterinary Assistant Surgeon may have charge of not more than 25000 head of cattle.

The Conference unanimously agreed that the scale of pay of Veterinary Assistant Surgeons in the province was very low and urged the Government for ameliorating their present condition of pay and other emoluments.

The following office bearers of the West Bengal Veterinary Medical Association were unanimously elected for the year 1949.

President :	...	Sri Surendra Mohan Ghose, Member Constituent Assembly and Ex President B.P.C.C.
Vice-Presidents :	...	Sri Charu Chandra Das Gupta and Sri Joy Chandra Mazumdar.
Secretary :	...	Sri S. K. Bhadury.
Treasurer :	...	Sri P. C. Sen Gupta.
Asstts. Secretaries :	...	Sri D. B. Mukherjee and Sri M. G. Bagchi.

S. K. BHADURY,
Secretary, West Bengal Veterinary Medical Association.

PHILLIPPINE VETERINARY MEDICAL ASSOCIATION

A Report of The Proceedings of The Twenty Sixth Annual Convention of The Phillippine Veterinary Medical Association.

The 26th annual Convention of the phillippines Veterinary Medical Association was held in the Assembly Hall, University of Phillippines on 22nd and 23rd of April 1949. The opening Session Commenced at 9.30 A.M. on 22nd of April. About 100 Veterinarians from different parts of Phillippines attended the convention. The writer had the privilege of attending the convention by special invitation.

After one minute's silent prayer for the deceased members of the Association and declaration of loyalty by new members, Dr. B. M. Gonzales, President of the University, welcomed the gathering. Messages from the President of The Republic and others were then read.

Dr. M. D. Sumulong, (Executive Secretary of Food and Agriculture organisation of U. N. O. in Philippines) President of the Association in his remarks dealt with the various activities of the Association.

Then Dr. Gomez introduced the Guest of Honour, Hon'ble Remedios O. Fortich, —to the audience as the wife of a late Veterinarian. Dr. Gomez told that there are not many Veterinarians who are elected as Congress-men. The late husband of Remedios O Fortich had the opportunity of becoming a Congress-man and later when he died people showed their trust in him by electing his wife unopposed, to the Congress. Remedios O Fortich thanked the Association for giving her the honour and promised her support for the development of the department and improving the status of Veterinarians. She assured the audiance that they can look upon her not only as their representative but also as a friend since her late husband was their colleague in profession.

After luncheon the business session was held under the president-ship of Dr. M. D. Sumulong. Dr. A. K. Gomez was elected as the new President of the P.V.M.A.

The Scientific session was held on the next day and the following professional papers were read and discussed.

1. Observations on the use of Mukteswar strain of avian pest virus as a vaccine in the Phillippines—Drs. J. D. Generoso and I.L. Mendoza, Bureau of Animal Industry.
2. Systemic alkalinization with sodium bicarbonate in the treatment of "colds" of horses—Dr. A. Gonzaga, College of Veterinary Medicine, U. P.
3. A report on the presence of Japanese B encephalitis-neutralizing antibody among Filipinos and certain Phillippine animals—Dr. E. S. Salafranca, Bureau of Animal Industry, and Dr. L. Espiritu, M. D., Institute of Hygiene.
4. Plastic in biological specimens for study and display—Dr. T. T. David, College of Veterinary Medicine, U. P.
5. Bringing veterinary service to the people—Dr. V. M. Zaratan, Bureau of Animal Industry.
6. The effect of Splenectomy on the resistance of white rats to anthrax—Dr. J. B. Uichangco, college of Veterinary Medicine, U. P.
7. A report of experiments on the control of surra-Dr. Z. de Jesus, College of Veterinary Medicine, U. P., Dr. D. J. Cabrera, Malaria Control Divisions, U. P. Public Health, and Dr. F. Z. Gonzalew, Veterinary Division, City of Manila.

8. Swine brucellosis in the Phillippines with special reference to imported Stock-Dr. F. San Agustin. Bureau of Animal Industry.
9. Observations on the incidence of tabanids with surra transmission experiments-Dr. L. M. Yutuc, College of Veterinary Medicine, U. P.
10. Notes and observations on the mass vaccination of hogs against hog cholera with the use of the simultaneous method-Dr. T. M. Capulong, Disease Control Division, Bureau of Animal Industry.
11. Necrobacillosis-Its treatment and control.-Dr. M. Baluyot, Hacarin Dairy Farm.
12. Keratitis (Pink eye) of cattle-Its treatment.-Dr. P. G. Refuerzo, Veterinary Research Division, and Dr. E. E. Acasio, Animal Husbandry Division, Bureau of Animal Industry.

During the Convention, there was also an exhibition arranged by Winthrop-Stearns Inc.

K. J. SIMON, G.V.Sc., D.V.M.,
Cochin State.

Correspondence

[The views expressed in letters addressed to the Editor represent the personal views of the writer and must not be taken as expressing the opinion or having received the approval of the A. I. V. A.]

Bi-monthly (?)

Sir,

Our journal is marked as 'A Bimonthly' publication indicating its periodical issue. The expression is 100% correct. But 'Bimonthly' equally applies to a fortnightly issue which is rather a more frequent interpretation. In fact, the Comman man is liable to carry his impressions this way. How would it sound if the term is substituted by 'Published on alterate months or something likewise more expressive. It would be in the fitness of things if our Silver Jubliee Issue sets aside this ambiguity.

It would be needness for me to add that the subject matter is put up purely as a suggestion and not as a criticism.

Ferozepur City,
E. Punjab,
16th April 1949.

D. P. SHARMA,
Veterinary Assistant Surgeon.

[We appreciate the suggestion of the Correspondent. Ed. I. V. J.]

Diploma Holders and B. V. Sc., Degree.

Sir,

May I seek the aid of your columns for ventilating a real grievance of the Veterinary Diploma Holders all over the country, please ?

With the march of time, the impoteance of the Veterinary profession also is growing and is gaining due recognition in India. Universities one after the other, are instituting Degrees in Veterinary Science and consequently the old Veterinary Diploma is being replaced by the degree of Bachelor of Veterinary Science. This is surely a very desirable, progressive sign in keeping with the present age. It is likely that the B. V. Sc., degree may be considered equal to the M. R. C. V. S., diploma for holding Commissions in the Veterinary Wing of the Indian Army. This Indisputedly opens a new era in the Veterinary History of this country and those responsible for this improvement deserve our heartfelt congratulations.

Unfortunately, there is no uniformity in the curriculum of studies for this Degree. It is understood that it is of four years' duration at the Bombay Veterinary College, 4½ years at the East Punjab Veterinary College and of approximately 5 years at the Madras Veterinary College. The requisite qualification for admission is F.Sc. (Med.) though in the undivided Punjab, the war-time-first three batches of B. V. Sc., were mostly Matriculates. In contrast to this, it may be mentioned that in the Punjab College of pre-partition days, its Diploma course (L. V. P.) was of 4 years' period, and that most of its admissions were from F. Sc. (Med.) group and some even from Science Graduates. The same thing applies to the graduates of the Madras Veterinary College to a more or less extent. A glance at these facts can convince that the 4 years' Diploma holders of Madras and of Veterinary Colleges have already undergone the study period prescribed for the B. V. Sc., course, at least at the Bombay Veterinary college. It will not be out of place to mention here that, with the introduction of the Degree, there has not been very many changes in the curriculum.

These factors go to show that the old Diploma holders have got a reasonable claim for demanding facilities for taking up the Degree. All the same, it is a matter for regret that these facilities are denied.

In Madras, certain facilities do exist and pre-degree Diploma Holders are allowed to appear for the B. V. Sc., degree. But the conditions are so stringent that no Diploma-Holder has till now found it possible to avail of those facilities. Bombay Veterinary College appears to be rather undecided in this matter. The same is the case with the East Punjab College though here it is futther handicapped for lack of accommodation in its new'camp after partition.

It is therefore necessary that the authorities look into this matter at an early date and arrange to have some uniformity in the granting of these facilities so that the Diploma-Holders of the pre-degree period may be enabled to obtain a Degree. This is only a fair and legitimate request and it should be an easy matter for the Universities to arrange it without any loss of time.

Ferozepur City,
E. Punjab,
16 April, 1949.

D. P. SHARMA,
Veterinary Assistant Surgeon.

When writing to advertisers, please mention this Journal.

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