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Vol. XXXIV, No. 6 NOVEMBER, 1957

THE INDIAN VETERINARY JOURNAL

(The Journal of the All-India Veterinary Association)

A Bi-Monthly Record of Veterinary Science

28 NOV 1957
MADRAS

(ESTD. 1924)

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Vol. XXXIV November, 1957 No. 6

THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION]

PUBLISHED ON ALTERNATE MONTHS

★

A Bi-Monthly Record of Veterinary Science
Devoted to the cause of the
Veterinary Profession

★

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Advertisements should be in the hands of the Editor not later than the 10th of the preceding month.

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- Rs. 6 or 10s. per annum to members of profession. Single copy Rs. 1-8-0 or 2s. 4d.
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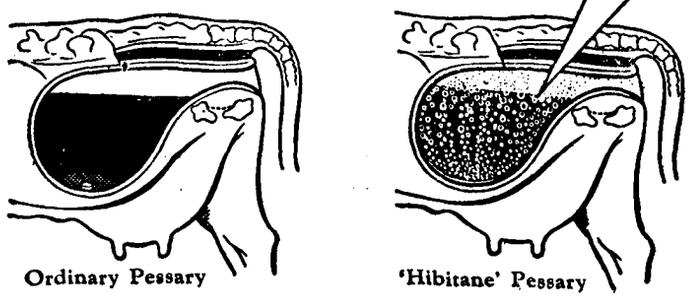

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They Go Abroad

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K. N. GOVINDAN NAYAR, G.M.V.C., Professor of Physiology, Madras Veterinary College, who has proceeded to U.S.A., for higher studies under the T.C.M. Plan.

Dr. P. G. NAIR, B.Sc., B.V.Sc., M.Sc., Ph.D., who returned recently from abroad.

Dr. M. AHMED HUSSAIN, who has been appointed Principal, University College of Veterinary Science & Animal Husbandry, Hyderabad-Dn.

THE

Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

Vol. XXXIV NOVEMBER, 1957 No. 6

We Wish Our Readers A Merry Christmas!

Editorial

ONE SOLITARY LIFE

" Here is a young man who was born in an obscure village, the child of a peasant woman. He grew up in another village. He worked in a carpenter's shop until he was 30 and then for three years he was an itinerant preacher. He never wrote a book. He never held public office. He never owned a house. He never had a family. He never went to college. He never put his foot inside a big city. He never travelled 200 miles from the place where he was born. He never did one of the things that usually accompany greatness. He had no credentials but himself. While he was still a young man, the tide of public opinion turned against him. His friends ran away. He was turned over to his enemies. He went through the mockery of a trial. He was nailed to a cross between two thieves. While he was dying, his executioners gambled for the only piece of property he had on earth and that was his coat. When he was dead, he was laid in a borrowed grave through the pity of a friend.

Nineteen wide centuries have come and gone and to-day He is the central figure of the human race and the leader of the column of progress.

I am far within the mark when I say that all the armies that ever marched and all the navies that were ever built and all the parliaments that ever sat and all the kings that ever reigned, put together, have not affected the life of man upon this earth, as has that One Solitary Life".

Over a period of years the foregoing anonymous tribute has appeared in many anthologies and has been often quoted in sermons. It is a piece of great distinction but none can name the author.

Christmas will soon be on us. To whatever religion we may belong the good old Christmas spirit of colour, happiness, good-will and merriment overtakes us all. It is the true greatness of Christ, that Prince of Peace, that is responsible for this human happiness across all continents and through all ages. There is not another day in a year that is so universally celebrated and enjoyed all over the world as the Christmas day.

To our readers all over the world, we send our heartiest greetings and wish them all happiness and prosperity!

THE *I. V. J.* BECOMES A MONTHLY

Another land-mark in the life of this Journal is soon to be staged. It is to become a monthly from January 1958. This momentous decision was taken by the Managing Committee of the All-India Veterinary Association, after a very careful and anxious consideration of all aspects of this intricate question. The Committee have been watching the progress of the Journal from year to year and waiting for a favourable phase in its career to give effect to this long cherished desire of the profession. That phase, they feel, has now been reached, even though partly through force of circumstances and they have called on the Editor to convert the *I. V. J.* into a monthly from its Thirty-fifth Volume, which is to commence in January 1958.

The following points weighed with the Committee very much in arriving at this decision:—

(1) The present economic tension that is obtaining in our country to-day does not permit of the *I. V. J.* being continued on its present low level of subscription.

(2) The price-level of printing paper, art paper, photo-blocks, etc., is ever on the increase and sometimes the required quality of paper is not available, thus necessitating the use of more costly paper. Then there are the printers, who keep on asking for more.

(3) The postage paid on a bi-monthly is very high normally even and on the top of it has come the recent enhancement in postal rates, which might prove the last straw on the camel's back. As a monthly the *I. V. J.* will be eligible for cheaper postage and thus there may be some appreciable savings under this head.

(4) Our Advertisers prefer dailies or monthlies to periodicals at longer intervals, for publicising their wares. This change-over may bring in a little more revenue from this source.

(5) The pressure on our space has been very great in recent years. It is the sign of a growing profession and as such the Committee felt that the frequency of the publication of the *I. V. J.* should be suitably adjusted to meet the growing demand.

Thus with the anticipated savings and revenue mentioned above, the Committee are of opinion that a small rise in the annual subscription of the *I. V. J.* would be enough to meet the cost of publication adequately and they have accordingly fixed the following rates of subscription from January 1958:—

Rs. 8-00 per annum to Members of Profession.

Rs. 12-00 per annum to Governments and all public Institutions. Single copy. Rs. 2-00

Foreign 25*s*. Single copy 3*s*. 6*d*.

We feel the Committee have been very considerate and have played fair and wise with the profession. It is up to the profession now to cheerfully back up the decision of the Committee. It will be seen that it is all to the advantage of the profession to pay only an additional Rs. 2 and get in return six more issues of the Journal, though probably slightly reduced in bulk. A new feature with this change-over will be a separate section opened for Abstracts and Extracts in the *I. V. J.* This work will as far as possible be entrusted to specialists in each branch of Science. There will in future be only two classification of articles as "General" and "Clinical". A few other improvements are also under consideration.

As for ourselves, we bow to this call of the profession and cheerfully accept all its implications. Our only hope is that our loyalty to the profession may lighten our task and we look up to Providence for Light and Leading.

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Original Articles

STUDIES ON THE UTILITY OF CERTAIN COMPOUND STAINS FOR STAINING SEMEN SMEARS

By

Dr. C. Krishna Rao, B.V.Sc., M.Sc., Ph.D.,

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Several workers used different types of compound stains in the past for staining semen smears. Azur-eosin (Pollak & Joel, 1939), Giemsa's stain (Lane-Roberts *et. al.*, 1948; Van Drimmelen, 1951; Hancock, 1952; Rao, 1953, 1956), Leishman's and Wright's stains (Rao, 1953, 1956) are some on which work was reported earlier. There are also certain other compound stains like Ehrlich's triple stain (Heidenhain, 1892), Ehrlich's triacid stain (Heidenhain, 1888) and methyl green-pyronin stain (Pappenheim, 1899; Saathof, 1905). Greenberg *et. al.* (1943) recommended a methyl green-pyronin formula for staining human sperm and Macleod and Hotchkiss (1946) reported this technique to be quite satisfactory for smears of human semen. It is necessary to determine whether the compound stains mentioned could be used for staining smears of bull and buffalo semen satisfactorily.

Experimental

The semen of the bull and buffalo was used in this study. Clearing when necessary was done with a saturated aqueous solution of chlorazene for 15 seconds. Further details are furnished separately under each experiment.

Experiment No. I

Suitability of Ehrlich's triple stain for Staining semen smears.

This stain is also known as Ehrlich-Biondi-Heidenhain stain or Biondi-Heidenhain stain.

Ehrlich's triple stain obtained from three different sources was used to determine the best product for staining semen smears. These were, the laboratory-made stain, the Gurr stain, and B. D. H. stain. The laboratory stain was made as follows (Mallory, 1938):

Orange G, saturated aqueous solution		—	50 c.c.
Acid fuchsin	do.	—	10 c.c.
Methyl green	do.	—	25 c.c.

In practice, the preparation of the stain in the laboratory was found to be very difficult. When saturated aqueous solution of acid

fuchsin was added to the saturated solution of Orange G slowly with agitation, there was no difficulty in mixing the two, but when methyl green was added, even in spite of extreme care in adding and thorough agitation, some precipitation of the stain was inevitable. To this stain mixture, 10 volumes of distilled water were added and the whole precipitate brought into solution with the aid of heat, which after cooling and filtration became the stock stain. The stock stain and dilution of the same in the ratio of 1:2 and 1:4 with distilled water were tried for staining semen smears.

The Gurr Stain was prepared according to the directions of the manufacturers, as follows:

Ehrlich's triple stain (E. Gurr)	—	0·9 gm.
Distilled water	—	100 c.c.
Chloroform	—	6 drops.

The B. D. H. stain was prepared according to the instructions of the company as follows:

Ehrlich's triple stain (B. D. H.)	—	0·6 gm.
Distilled water	—	110 c.c.

The results obtained with this stain are presented below.

Conventional Method

With the Laboratory-made stain, when smears were stained for ½ to 1 minute and later washed in 95 percent ethyl alcohol, the entire sperm took a bright pink colour and sperm morphology was very clear. With longer exposures clearing became essential to avoid intense background staining. Five minutes staining gave excellent preparations. The cytoplasmic cap on most sperm was also clearly visible. When smears were stained for 2 to 3 minutes and washed in tap water the entire sperm took a moss-green colour and their morphology was very clear. Clearing is essential at longer exposures. With cleared smears 5 minutes exposure gave excellent preparations. The cytoplasmic cap was also quite clear. The dilutions of the stock stain were found to be rather weak and hence not satisfactory for use.

Gurr stain

When smears were stained with the Gurr stain for 1 to 2 minutes and later washed in alcohol, the sperm heads took a light green colour while the tails and the cytoplasmic cap took a bright red colour and sperm morphology was very clear. Longer exposures gave deeper staining and at 10 minutes excellent preparations were obtained, the sperm heads taking a deep moss-green colour while the necks, tails and cytoplasmic caps took a bright red colour. The differential staining was

excellent. When smears were washed in tap water after 1 to 2 minutes staining, the sperm took a moss-green colour throughout and no differential staining could be observed. Preparations were satisfactory for morphological study. 5 to 7 minutes staining gave pretty preparations, the sperm taking a deep moss-green colour. Generally speaking, there was no trouble from background staining.

B. D. H. Stain

When smears were stained for 5 minutes and later washed in alcohol, preparations were satisfactory, the sperm heads taking a light olive-green colour while the tails and cytoplasmic caps took a dull reddish safron colour. 10 to 15 minutes staining gave excellent differential staining. With longer exposures, clearing was necessary to avoid background staining. By this method the Gurr stain was superior to the B.D.H. product. When smears were stained for 1 to 2 minutes followed by washing in water, the sperm took a deep moss-green colour and their morphology was quite clear. Clearing of smears was necessary at longer exposures. 3 to 5 minutes exposure gave excellent preparation. By this technique the B. D. H. stain was superior to the Gurr stain.

Direct mixing technique :—By this method all the three types of stains gave unsatisfactory results.

Dipping and blotting technique :—All the three makes of the stain gave excellent results by this method. When the laboratory-made stain is used, the sperm took a bright red colour and preparations were excellent.

The Gurr and B. D. H. stains gave about the same type of staining, the results varying with the period for which the smears were left in contact with the stain. When smears were exposed to the stain for 5 to 10 seconds and then blotted dry, the sperm took a deep orange colour. At exposures beyond 10 seconds, the sperm staining varied from an orange-green to green, the greenish hue increasing with longer exposures. The sperm morphology in all these cases was excellently delineated.

EXPERIMENT No. II

Suitability of Ehrlich's triacid stain for staining semen smears

Ehrlich's triacid stain from three different sources was tried to determine which product gave the most satisfactory results. These were,—the laboratory-made stain, the Gurr stain and B. D. H. stain. The laboratory stain was prepared as follows (Lee. 1950).

Mix in the order given below.

Saturated aqueous solution of Orange G	... 13 to 14 c.c.
,, ,, ,, ,, acid fuchsin	... 6 to 7 c.c.
Distilled water	... 15 c.c.
Absolute alcohol	... 15 c.c.
Saturated aqueous solution of methyl green	... 12·5 c.c.
Absolute alcohol	... 10 c.c.
Glycerine	... 10 c.c.

The Gurr stain was prepared as follows, according to instructions from the manufacturers.

Ehrlich's triacid stain (E. Gurr)	... 5 gm.
Distilled water	... 38 c.c.
Glycerine	... 8 c.c.
90 per cent alcohol	... 17 c.c.

The B.D.H. stain was prepared as follows as per instruction from the company.

Ehrlich's triacid stain (B. D. H.)	... 10 gm.
Distilled water	... 180 c.c.
Glycerine	... 15 c.c.
Industrial alcohol (anhydrous)	... 55 c.c.

The same techniques of staining as employed in the first experiment were adopted and the results of the study are presented below.

Conventional method :—The laboratory-made stain was very powerful and gave rise to intense sperm staining even at very short exposures and further, even in spite of repeated filtration there was continued trouble from stain deposition. For these reasons the concentrated stain was not considered to be satisfactory for use. It was, therefore, diluted in the ratio of 1 : 1 and 1 : 3 with distilled water and 95 per cent alcohol separately and these solutions were then tested for their staining capacity.

Even with the diluted stains clearing of smears was essential to avoid intense background staining. The 1 : 1 aqueous dilution was far superior to the 1 : 3 dilution and at 15 to 30 seconds exposure excellent preparations were obtained. The sperm heads took a green colour while their tails took a greenish violet colour. After 2 to 3 minutes staining, there was no further increase in depth of staining. The 1 : 3 aqueous dilution gave satisfactory preparations at ½ to 1 minute exposure and 3 to 5 minutes staining gave excellent preparations.

The alcoholic dilutions of the stain were much weaker than the corresponding aqueous dilutions. The staining reaction was of the same general pattern as with the aqueous stain. Clearing of smears was

essential to obtain satisfactory preparations. The 1 : 1 alcoholic dilution gave satisfactory preparation at 2 to 3 minutes exposure while the 1 : 3 dilution gave satisfactory staining at 5 to 7 minutes.

Gurr-stain :—This stain made according to directions of the manufacturers was very powerful, viscous and not quite satisfactory for use as such. This was, therefore, diluted 1 : 1 and 1 : 3 with distilled water and 95 per cent alcohol separately and the suitability of these products for staining purposes ascertained.

Clearing of smears was found to be essential to avoid intense background staining. The 1 : 1 aqueous or alcoholic dilution was found to be distinctly superior to the 1 : 3 dilution. There was no difference in the staining reaction between the aqueous and alcoholic stain. The aqueous dilution gave deeper staining than alcoholic stains of the same strength. With the 1 : 1 aqueous dilution, ½ to 1 minute exposure gave excellent preparations, the sperm taking a greenish violet colour. The cytoplasmic cap was also clearly visible on most of the sperm. The depth of staining increased upto 3 to 5 minutes exposure and at this exposure excellent results were obtained. The 1 : 1 alcoholic dilution required 1 to 2 minutes exposure while the 1 : 3 dilution required 5 to 7 minutes staining to produce satisfactory results.

B. D. H. stain :—This stain gave very good preparations after ½ to 1 minute staining followed by washing in water, the sperm taking a greenish black colour. Longer exposures upto 3 minutes intensified the staining. When smears were washed in 95 per cent alcohol the sperm took a bright pink colour and preparations were excellent. With both the methods of washing stained smears, the cytoplasmic cap was brought out fairly clearly on most of the sperm.

Direct mixing method :—This method was unsatisfactory with all the three stains.

Dipping and blotting method :—With the 1 : 1 and 1 : 3 aqueous and alcoholic dilutions of the laboratory made stain, the sperm heads took a light pink colour while the rest of the sperm took a deep violet colour and sperm morphology was very clear. The 1 : 1 dilution gave results better of the two dilutions and the aqueous stain gave better staining. Clearing, though not essential gave better preparations.

With the Gurr stain cleared smears, the 1 : 1 aqueous dilution gave the best results, the aqueous dilution being superior to the alcoholic stain. With the alcoholic dilution the background took only a light colour and did not interfere with the morphological study. In all cases the sperm heads took a light red colour while the tails took a deep violet colour.

Experiment No. III

Suitability of methyl green-pyronin stain for staining semen smears

The following formulae of methyl green-pyronin were adopted to determine their suitablity as semen stains.

1. Unna-Pappenheim methyl green-pyronin stain (Pappenheim, 1899). The laboratory-made stain as well as the one manufactured by E. Gurr were tried. The latter stain was prepared by dissolving one gram of the stain in 100 c.c. of distilled water.

2. Saathof's modification of the Unna-Pappenheim method (Saathof, 1905).

3. Grawitz formula (McClung, 1958).

4. Methyl green-pyronin formulae of Greenberg *et al* (1943).

Three techniques of staining were employed as in the previous experiments.

Conventional method :—Of the different formulae tried by this method, the two formulae of Greenberg *et al* (1943) gave the best results. There was no material difference between the results obtained with the two formulae. ½ to 1 minute exposure gave excellent preparations. Although the depth of staining increased with longer exposure, 3 to 5 minutes need not be exceeded. The sperm heads took a light green colour while the tails stained reddish violet. The cytoplasmic cap on most of the sperm was clearly seen as a light pink structure at the anterior end of the head.

Grawitz formula gave the next best results. 1 to 2 minutes exposure gave very good preparations with the same general type of staining as with the above method. With longer exposures the depth of staining increased. With excessive washing in water the staining faded and washing should be done very sparingly and smears quickly dried by blotting.

Both the Unna-Pappenheim and Saathof formulae gave the same type of staining as those of Greenberg *et al* but were much weaker. With these formulae at least 5 to 10 minutes exposure was necessary to produce satisfactory results. There was not much difference in the type of staining between the two, but Saathof formula was slightly superior. The U-P stain manufactured by E. Gurr & Co. was found to be very weak and gave a very faint green staining even after 15 minutes staining and therefore not considered satisfactory for use.

Direct mixing method :—With this method all the formulae mentioned except the Gurr product were unsatisfactory. The Gurr stain gave a bright green colouration of sperm and their morphology was very clear, all sperm taking the stain.

Dipping and blotting method :—All the formulae gave good to excellent results with this method. Grawitz formula gave the best results and the sperm showed excellent differential staining, the heads taking a bright bluish-green colour while the tails took a deep reddish violet colour. The cytoplasmic cap was clearly defined as a light pink structure. The Gurr stain gave the next best results, the sperm taking a bright green colour. Both the laboratory-made stain and the Saathof formula gave fairly satisfactory results. The formulae of Greenberg *et al* were unsatisfactory with uncleared smears due to the dark background staining. When smears were cleared the results were excellent, the sperm heads taking a brilliant green colour while the tails took a deep blue colour.

Summary

The suitability of Ehrlich's triple stain, Ehrlich's triacid stain and methyl green-pyronin stain for staining semen smears was studied. The laboratory-made stains as well as those manufactured by some firms were studied.

Ehrlich's triple stain.—With the laboratory-made stain, ½ to 1 minute staining followed by washing in 95 per cent alcohol gave a bright pink colouration of sperm while those washed in water, gave a moss-green colour.

With the Gurr stain, after 1 to 2 minutes exposure followed by alcoholic washing, the sperm heads took a light green colour while the rest of the sperm stained bright red. With smears washed in water, the entire sperm took a moss-green colour.

With the B. D. H. stain after exposure for 5 minutes followed by alcoholic washing the sperm heads took a light olive-green colour while the tails stained a dull reddish safron. In smears washed in water the entire sperm took a deep green colour.

By the dipping and blotting method all the three formulae gave very good results.

Ehrlich's triacid stain:—The laboratory-made stain was very powerful and unsatisfactory for use as such. The 1 : 1 dilution of this stain either with distilled water or 95 per cent alcohol gave excellent results at ¼ to ½ minute exposure, preparations with the former being superior to those with the latter.

The Gurr stain was also too powerful to be used as such. The 1 : 1 dilution of this with distilled water or 95 per cent alcohol gave excellent results at ½ to 1 minute exposure, the aqueous dilution being superior to the alcoholic one.

The B. D. H. product was satisfactory for use as such without further dilution; ½ to 1 minute exposure gave excellent preparations.

By the dipping and blotting method the 1 : 1 or 1 : 3 aqueous or alcoholic dilution of the laboratory-made stain gave very satisfactory preparations, the aqueous dilution being superior. The 1 : 1 aqueous or alcoholic dilution of the Gurr stain gave excellent results by this method but clearing of smears was necessary with the former. The B. D. H. product also gave excellent results.

Methyl green-pyronin stain:—Four different formulae of methyl green-pyronin were studied. The two formulae of Greenberg *et al* (1943) gave the best results at ½ to 1 minute staining. With the direct mixing method the U-P stain manufactured by E. Gurr & G. gave excellent results. All the formulae of methyl green-pyronin gave good to excellent results by dipping and blotting method.

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EFFECT OF HIGH TEMPERATURE ON CHAETA NUMBER IN DROSOPHILA MELANOGASTER

By

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Introduction

Mather (1941, 1942, 1943, 1949) and Mather and Harrison (1948) reported the effect of Selection for chaeta number in Drosophila. These authors also noticed that the old media did not affect the chaeta number. Robertson and Reeve (1952) observed significiant effect of temperature on ratio of wing to thorax length and body size in Drosophila. In the absence of definite knowledge on the effect of temperature on chaeta number, the experiments already reported by Taneja (1956) were extended to complete this deficiency.

Method and Material

Drosophila Melanogaster O. R. stock earlier reported by Taneja (1956) was used for this study.

Flies were reared in half pint cream bottles containing ¾" depth of standard agar, corn meal and treacle medium. The surface of the medium was smeared with baker's live yeast made to a thin, pasty consistency.

Parents for the 6th generation from selection for higher chaeta number (Taneja, 1956) having laid eggs for 24 hours in each of the five bottles, were transferred to another two bottles every day, and allowed to lay eggs in each bottle for 24 hours. The first five bottles were cultured at temperature of 25 + 1°C. and the next two bottles were exposed to a temperature of 30 + 1°C.

Similarly the parents for 2nd generation for selection for lower chaeta number (Taneja 1956), having laid eggs in five bottles at a temperature of 25° ± 1°C. were transferred to a new bottle every day for 2 days and these two bottles were cultured at a temperature of 30° ± 1°C.

Chaeta number on the ventral surface of the 5th abdominal segment of each sex was counted. On all the flies born, the chaeta number was counted every day from each bottle for 4 days.

Investigation

(*a*) Effect of temperature on mean Chaeta number in the stock already selected for higher chaeta number.

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The mean chaeta number of the flies raised at temperature of 25° ± 1°c. and 30 ± 1°c. is presented in Table I. The standard error of the mean is calculated from the following formula. This formula has been evolved since the variance due to bottles was highly significant.

$$S.E. = \sqrt{\frac{\sigma e^2}{n} + \frac{\sigma b^2}{b}}$$

Where σe is the estimate of error variance

σb is the estimate of variance between bottles,

n is the number of flies in each bottle,

b is the number of bottles in each generation.

TABLE I

Mean chaeta number at high and low Temperature.

Temperature	Number of flies counted	Mean (female)	Number of flies counted	Mean (male)
25 ± 1°C	337	21·84 ± 0·34	318	20·10 ± 0·17
30 ± 1°C	70	21·54 ± 0·47	91	19·51 ± 0·27

Since the same breeding parents have been subjected to two different temperatures, the effect of their age will also have some influence which has not been accounted for in the analysis of the variance (Table 2). The results of the analysis of the variance (Table 2) indicate that the effect of the temperature is highly significant in the male but not in the female.

TABLE II

Results of the Analysis of Variance.

Source of variation	d. f.	M. S.
Female		
Between temperatures	1	5·200 N.S
Between bottles	6	92·040 **
Within bottles	399	3·232
Male		
Between tempreatures	1	25·060 **
Between bottles	6	11·420 **
Within bottles	401	2·665

** = Highly significant.
N.S. = Non-significant.

(b) Effect of temperature on mean chaeta number in the stock already selected for lower chaeta number.

Similarly the flies in the low line of selection (Taneja 1956) were also exposed to 2 temperatures. The mean chaeta numbers are reported in Table 3.

TABLE III

Mean Chaeta number at high and low temperature.

Temperature	Number of flies counted	Mean (female)	Number of flies counted	Mean (male)
25 ± 1°C	325	20·73 ± 0·16	307	19·34 ± 0·16
30 + 1°C	100	20·01 ± 0·16	100	18·63 ± 0·28

The results of the analysis of variance presented in Table 4. indicate that the variation between temperatures is highly significant for both sexes.

TABLE IV

Results of Analysis of Variance.

Source of variation	d. f.	M. S.
Female		
Between temperatures	1	39·550 ***
Between bottles	6	15·441 ***
Within bottle	417	2·835
Male		
Between temperatures	1	37·900 ***
Between bottles	6	13·705 **
Within bottle	399	2·167

** = Highly significant.

Discussion

The effect of high temperature has been very obvious in this experiment. It is observed that the female in the stock already selected for higher chaeta number does not show significant differences between the mean chaeta number in the flies reared at 25°C and 30°C while there are highly significant differences for both sexes in the stock already selected for lower chaeta number. Robertson and Reeve (1952) reported that when the flies are reared at a high temperature, the ratio of wing to thorax length is decreased and the body size is reduced while the ratio tends to be increased when the size is reduced by restricting the food

supply. These authors further mentioned that when the temperature is decreased after pupation has begun, the thorax length remains unaltered but the wing length may be considerably increased. Hence it is now clear that the polygenic characters are in general very susceptible to environmental fluctuations such as changes in temperature or quality of food.

Acknowledgments

The author expresses his thanks to Professor P. R. Mcmahon, New South Wales University of Technology, Sydney, for advice and criticism.

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General Articles

MORTALITY IN YOUNG CALVES IN INDIA

By

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Although losses from mortality in calves are known to be very serious in this country, very little systematic work has been done to obviate them. The damage to the livestock industry, particularly the dairy industry of the country through such losses cannot be underestimated. For the grading up of the country's livestock to attain certain standards of production, it is vitally important that the young heifer

calves from high yielding cows and buffaloes are reared into healthy and high yielding animals.

A thorough study of the dairy husbandry practices prevalent in the country at the present time may prove of some value in assessing the progress being made towards the improvement of the national herd. The milk supply of a large part of ubran population almost all over the country is mainly in the hands of the so called "milk producers". In general, these people have little interest in the dairy animals from the livestock point of view and consider them as highly specialised machines for the production of milk. They are not livestock breeders. To earn maximum margin of profit they purchase animals of high producing capacity for milk production in the cities, where the cost of maintenance of these animals is very high. The calf mortality at such places is very high evidently for want of proper nutrition as the calves are usually neglected and not properly fed.

For the successful operation of various plans and developmental schemes which are being formulated at various levels for the improvement of the native breeds of livestock, it is highly desirable that the problem of calf mortality, should be given the attention it deserves and steps taken to improve the situation.

Mortality Statistics

Before research work is directed on the causes of calf diseases in order to reduce the losses by advising necessary control measures, quantitative data both as to the extent and the causes of calf mortality are needed. Under the auspices of certain national bodies and on the initiative of individual workers, some field surveys on calf mortality have been undertaken with a view to estimate the extent of losses and the causes of mortality recorded at various places. The information these surveys provide is only limited, but from the practical point of view they have proved useful in many ways. Besides being instructive in connection with the application of judicious control measures on the basis of available knowledge on calf husbandry, the statistical analysis of the data of this survey of the management practices and environmental factors has brought out certain points of value in understanding the complex actiology of calf diseases.

For reference, calf mortality figures available from some foreign countries are reproduced in Table I. The other information of interest derived from these data will be referred to later.

TABLE I

Mortality rates in calves.

Author	Nature of herd and country	Size of survey observations	Prenatal loss-abortions, still births etc. (percentage)	Postnatal losses death after birth (percentage)
Ward (1946) *	Commercial herds *New zealand*	26978 births in 512 herds	4·3	8·1 upto one year.
Selby and Kuchman (1934) *	Commercial herds *U.S.A.*	574 herds		14·4 up to 1st calving
Regsdale *et al* (1926)	Experimental Station herd, Missouri, *U.S.A.*	943 pregnancies	8·0	5·6
Ingels and Cannon (1936)	Iowa State College Dairy herd, *U.S.A.*	1156 births		19·8 up to 6 months
Wing (1933)	Cornell University herd *U.S.A.*	644 conceptions (1889-1928)	7·6	9·5 up to 3 months
Slack and Harrison (1942) Savage and McCay (1942)	Cornell University herd *U.S.A.*	1352 pregnancies (1932-42)	12·5	12·1
Weaver *et al* * (1949)	Experimental station herd Michigan *U.S.A.*	1467 births (1933-1948)	5·5	7·1 upto 10 months
Jordan (1933)	Commercial herds Ayrshire, *Scotland*	784 female births in 26 herds		21·6 up to 1 year
Hector and Rowat (1948)	Commercial herds *Scotland*	1625 births		4·7 up to 2 months
Lovell and Hill (1940)	Commercial herds *England and Wales*	12544 female births in 335 herds	9·9	5·5 up to 6 months
Lovell and Hill (1940)	Commercial herds *Scotland*	1383 female births in 47 herds	7·9	11·4 up to 6 months
Withers (1952-53)	Commercial herds *England and Wales and Scotland*	4380 female births in 44 herds	6·5	7·4 up to 6 months
Minett (1946)	Military Farms *India*	1125 female cow calves		25·2
		118 female Buffalo calves		23·4

most deaths within first two months of life

* Cited by Sutherland (1950)

No such figures are available for the Indian herds. Minett (1946) recorded calf mortality figures from two military farms (only one of which is in India now) in relation to the meteorological factors. Military farms are known for their high standard of cleanliness. Moreover, very few heifer calves are reared at these farms and their figures of mortality can hardly be considered representative of Indian herds. It is not a usual practice in dairy farming in India to maintain up-to-date records and as such the calf mortality figures from these herds are not available.

The principal objective of the present study has been to collect the mortality figures from various Government farms in the country as a necessary prelude to the investigation into the group of diseases which accounts for the majority of deaths during the early calfhood life. The mortality information was obtained from the Farm authorities through their respective administrative heads of the Departments in the States by issuing a questionnaire. In the absence of any systematic investigations to determine the exact causes of mortality, the information on the causes of mortality, which was also sought, was not considered sufficiently reliable and so it has not been taken note of in this article.

Source of data for the present study

Calf mortality figures in this limited survey are from 56 cattle and buffalo herds kept at 35 farms. All of them are Government administered and so the standard of management and nutrition there is assumed to be fairly satisfactory and better than at the commercial herds. There could not be any relevant reasons to deprive the young stock of the generally prescribed standards of nutrition, housing and other requirements. They have a further advantage of easy access to free veterinary aid, a facility enjoyed by comparatively few commercial herds in India.

These farms are situated in eight different States in the Indian Union, namely Andhra (Two), Bihar (Three), Bombay (Four), Hyderabad (Five), Madhya Pradesh (Eleven), Madras (Four), Punjab (One) and Uttar Pradesh (Four). At 19 farms both Cattle and Buffalo herds (CB Farms) are maintatined. At 12 farms only cattle herds (C Farms) and at 4 farms only buffalo herds (B Farms) are kept. (Table - 2).

The mortality data from these herds have been supplied separately and so they have been dealt as separate herds.

The classification of herds is as follows :—

Cattle Dairy Herds.....15
Cattle Livestock & Breeding Herds.....18
Buffalo Dairy Herds.....15
Buffalo Livestock and Breeding Herds..... 8

TABLE II

Nature and Distribution of Farms and herds.

State	No. of Farms	Herds maintained			Total number of herds	
		Cattle (C Farm)	Buffalo (B Farm)	Cattle & Buffalo (C & B Farm)	Cattle	Buffalo
Andhra ...	2					
Bihar ...	3	3*	1	1	1	2
Bombay ...	5	2			4*	
Hyderabad ...	5	3	1	2	4	3
Madhya Pradesh ...	11		1	1	4	2
Madras ...	4	2		11	11	11
Punjab ...	1	1	1	1	3	2
Uttar Pradesh ...	4	1			1	
				3	5	3
Total ...	35	12	4	19	33	23

* One farm has two separate herds of different breeds. Fourteen of these farms (1 c, 1 b and 12 cb) are designated as Dairy Farms, 18 (10 C, 2 B and 6 CB) as Livestock and Breeding Farms and 3 (1 C, 1 B and 1 CB) as Dairy-cum-Breeding Farms. At two farms-one C Farm in Bihar and the other CB Farm in Uttar Pradesh—two different breeds of cattle are maintained separately.

(The four Dairy-Cum-Breeding herds (2C, 2B) are included in Dairy herds.)

The mortality figures of the two classes of stock, namely Dairy and Livestock and Breeding herds, in both cattle and buffaloes are put separately to indicate the difference in the rates of mortality among the two classes of livestock.

Birth and mortality figures from the majority of herds are for a period of three years ranging from 1950 to 1952 and 1951-53. Where period covered is more or less, it has been mentioned in parenthesis in the respective column.

Except one farm where only female calves are reared the mortality figures are for both male and female calves. Since the information was sought primarily to study the incidence of calf diseases leading to mortality, no clarification of distribution of mortality according to sex was asked for.

Except two herds for which the mortality figures collected are for a period up to three months of age, the rest are in respect of herds for a period up to two months of age only.

Comparision of mortality rates of dairy herds and Livestock and Breeding herds

In Table 3 birth and mortality figures from 15 cattle dairy herds are given. It will be seen that as many as 408 (15·46%) calves out

of a total of 2639 died before reaching the age of two months. Herd to herd variation in mortality is quite noticeable. There was no death in a total of 150 births at two farms as compared to 20 out of 39 (51·28%), 161 out of 803 (19·92%), 45 out of 210 (21·43%) and 32 out of 132 (24·24%) in four other herds.

Table 4 shows the birth and mortality rates in 18 cattle Livestock and Breeding herds. From the available data of 3299 births, it appears that the mortality rate was significantly lower (6·9%) in this class of livestock as compared to dairy stock. Though there was some variation in mortality rates in individual herds, it was observed that the extent of variation in them was not as prominent as in dairy herds. It may be difficult to account for the variation in the rates of mortality in the two classes of herds and for the comparative prominence of herd to herd variation in the dairy stock. Apart from the probable influence of different climatic and management conditions at various places, it may be possible that because of high stress laid on milk production in the dairy herds, the colostrum and the milk of dairy cows might have been deficient in certain essential constituents vitally needed by the calves for the development of resistance in neonatal life.

TABLE III

Births and deaths within 2 months of birth amongst cow calves in dairy herds.

Sl. No.	Births during 3 years 1951-1953	Deaths within 2 months of age in the corresponding period	Mortality percentage
1. Bombay	132	32	24·24
2. Bombay	75	9	12·0
3. Hyderabad	210	45	21·43
4. M.P.	65	1	1·54
5. M.P.	24	2	8·33
6. M.P.	21	3	14·29
7. M.P.	48	—	—
8. M.P.	30	3	10·0
9. M.P.	103	6	5·83
10. M.P.	72	6	8·33
11. M.P.	102	—	—
12. Punjab	808	161	19·93
13. U.P.	39	20	51·28
14. U.P.	579	81	13·99
15. U.P.	331 (1950-54)	39 (1950-54)	11·78
Total ... (15 herds)	2639	408	15·46

TABLE IV

Births and Deaths within 2 months of birth amongst cow calves in Livestock and Breeding Herds.

Sl. No.	No. of calves born at the farm during 3 years 1951–53	No. of calves that died within 2 months of age in the corresponding period	Mortality percentage
1. Andhra	179	15	8·38
2. Bihar	378	24	6·35
3. Bihar	288	15	5·21
4. Bihar	346	17	4·91
5. Bihar	41	3	7·32
6. Bombay	57	6	10·53
7. Bombay	65	7	10·77
8. Hyderabad	222	33	14·86
9. Hyderabad	69	—	—
10. Hyderabad	134	8	5·97
11. M.P.	63	12	19·01
12. M.P.	137	12	8·76
13. M.P.	103	8	7·77
14. Madras	50	1	2·00
15. Madras	26	—	—
16. Madras	840	26	3·10
17. U.P.	218	23	10·55
18. U.P.	83	11	13·25
Total ... (18 herds)	3299	221	6·9
33 herds	5938	629	10·59

Tables 5 and 6 show the mortality figures from the two classes of buffalo herds. The difference in the rate of mortality in the aggregate figures of the two classes of stock was again noticeable. The mortality was 35·9% in dairy herds as compared to 19·45% in the Livestock and Breeding herds.

Comparison of mortality rates of cow calves and buffalo calves

It may be further noticed that the mortality rate was considerably higher among buffalo-calves, more than double as compared to cow calves both class by class and in the total.

The comparable figures were as follows :—

	Cow calves Mortality percentage	*Buffalo calves Mortality percentage*
Dairy Herds ...	15·46 (15 herds)	35·9 (15 herds)
Livestock and Breeding Herds. ...	6·9 (18 herds)	19·45 (8 herds)
Total ...	10·59 (33 herds)	33·5 (23 herds)

Though the difference in mortality rate between cow and buffalo calves was quite noticeable from the aggregate figures of each group, yet

included in these were mortality figures from herds which were kept alone and might have been subject to variable climatic and management conditions. To obviate that source of error for any discrepancy in comparing the rates of mortality, mortality figures of cow and buffalo calves kept together at 19 farms are shown in Table 7. It will be seen from a reference to this table that except in one instance where mortality was more among cow calves and in another where mortality percentages were almost equal, the mortality rate in the rest of the 17 farms was higher among the buffalo calves. The difference in mortality rate in the aggregate figures of these 19 farms was in conformity with the aggregate figures of the total herds in each group.

TABLE V

Buffalo Calves – Dairy Herds.

Sl. No.	Births during 3 years 1951–53	Deaths within 2 months of age in the corresponding period	Mortality percentage
1. Andhra	221 (1952–53)	55 (1952–53)	24·89
2. Bombay	318	198	62·26
3. Bombay	94	18	19·15
4. Bombay	240 (1953)	145 (1953)	60·42
5. Hyderabad	189	39	20·63
6. M.P.	94	10	10·64
7. M.P.	97	11	11·34
8. M.P.	75	12	16·00
9. M.P.	92	19	20·65
10. M.P.	120	27	22·50
11. M.P.	78	31	39·74
12. M.P.	90	9	10·00
13. M.P.	153	45	29·41
14. U.P.	408	129	31·62
15. U.P.	759	339	44·66
Total ...	3038	1087	35·97

TABLE VI

Buffalo Calves – Livestock and Breeding Herds.

Sl. No.	Births during 3 years 1951–53	Deaths within 2 months of age in the corresponding period	Mortality percentage
1. Andhra	29	1	3·45
2. Hyderabad	120	14	11·67
3. M.P.	30	9	30·00
4. M.P.	55	12	21·82
5. M.P.	25	9	36·00
6. Madras	43	18	41·86
7. Madras	48	15	31·25
8. U.P.	159	20	12·58
Total ...	509	98	19·45
Grand Total ... 23 herds	3537	1185	33·5

TABLE VII

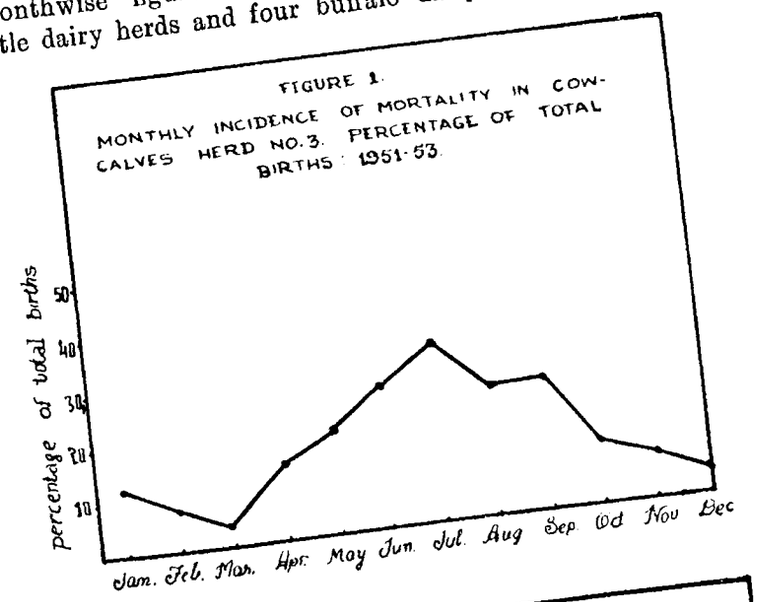
Sl. No.		COW CALVES: Total births during 3 years	COW CALVES: Total deaths during 3 years	COW CALVES: Percentage of mortality	BUFFALO CALVES: Total births during 3 years	BUFFALO CALVES: Total deaths during 3 years	BUFFALO CALVES: Percentage of mortality
DAIRY HERDS							
1	Bombay	132	32	24·24	318	198	62·26
2	Bombay	75 (4 yrs.)	9 (4 yrs)	9	94 (4 yrs.)	18 (4 yrs.)	19·15
3	Hyderabad	210	45	21·43	189	39	20·63
4	M.P.	65	1	1·54	94	10	10·64
5	M.P.	24	2	8·33	97	11	11·34
6	M.P.	21	3	14·29	75	12	16·00
7	M.P.	48	—	—	92	19	20·65
8	M.P.	30	3	10·00	120	27	22·50
9	M.P.	103	6	5·83	78	31	39·74
10	M.P.	72	6	8·33	90	9	10·00
11	M.P.	102	—	—	153	45	29·41
12	U.P.	39	20	51·28	408	129	31·62
13	U P.	579	81	13·99	759	339	44·66
LIVESTOCK AND BREEDING HERDS							
14	Andhra	179	15	8·38	29	1	3·45
15	M.P.	63	12	19·01	30	9	30·00
16	M.P.	137	12	8·76	55	12	21·82
17	M.P.	103	8	7·717	25	9	36·00
18	Madras	50 (2 yrs.)	1 (2 yrs.)	2·00	43 (2 yrs.)	18 (2 yrs.)	41·86
19	U.P.	301	34	11·29	159	20	12·58
		833	82	9·84	341	69	20·24
		2333	291	12·9	2908	956	32·87

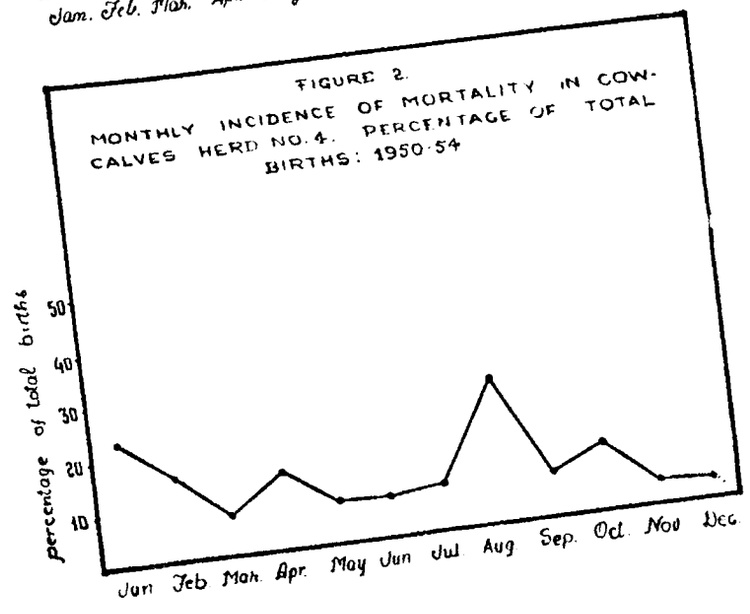
The exact reason for higher mortality among buffalo calves as compared to that among cow calves is not well understood. There appears to be some physiological difference in the capacity of calves of each species to adapt to environmental conditions. It is noticed that buffalo-calves are highly susceptible to digestive troubles leading to a higher mortality. Minett (1946) observed that digestive troubles accounted for 67·8% of the total deaths in buffalo-calves up to the age of 3 months, as compared to 19·5% in cow calves on the same farm. Amos (1946) considers that the milk with higher fat percentage may give rise to hard curd formation in the abomasum which is difficult to digest, consequently leading to digestive disturbances. Brash (1953) has advised addition of 10% water for every one percent of fat above 3·5. High percentage of fat in buffalo milk (7·9%) and tendency to overfeed and

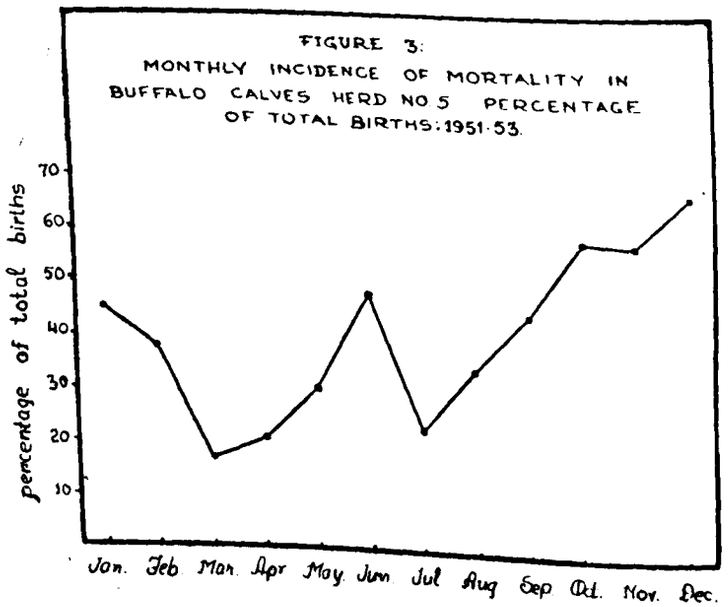
suck each other with habitual sluggishness, further aggravated by insufficient space and over crowding, common at most of the farms, are the probable reasons for higher frequency of digestive disorders in buffalo-calves.

Seasonal incidence in mortality

Monthwise figures of mortality have been collected from four cattle dairy herds and four buffalo dairy herds (Table 8 & 9.)







The number of calf-births in the corresponding periods could be collected from two cattle herds and one buffalo herd. From Government Milk Colony, Aarey, Bombay, the number of female calves received for rearing every month at the Calf Rearing Farm are given.

The figures available for study are not sufficient for statistical analysis but appear to be informative in the sense that these tend to indicate some variation in the mortality incidence, particularly in buffalo calves, which appears to be significant.

In the case of cow calves (Table 8 and figures 1 and 2), except for a slight increase in the number of deaths during July to September, 1952 (38·75%) out of 160 total deaths, the mortality rate during the rest of the year was more or less constant. July to September are the rainy months at all the places from where the information was collected. Mortality in first half of the year was lower (43·76%) than in the second half (56·24%). With buffalo calves, the position seems to be different. Out of a total of 755 deaths in five herds all over the year, 252 (33·36%) died during July-September, and 319 (42·26%) during October-December bringing up the total to 75·64% in the second half of the year. The difference appears to be more than a chance.

TABLE VIII

Monthly incidence of mortality in cow calves.

	BOMBAY		UTTAR PRADESH				Total of calves died in four herds.	Distribution of mortality incidence. Percentage of total deaths		
	1		2		3		4			
	1951–53 Number of Calves.		1950–51 to 1953–54 Number of Calves.		1951–53 Number of Calves.		1950–1954 Number of Calves.			
	Born	Died	Born	Died	Born	Died	Born	Died								
January ...	1	2	47	6 (12·7)	35	8 (22·9)	17	10·63		
February ...	3	1	42	3 (7·1)	19	3 (15·8)	10	6·25	21·88	
March ...	2	1	78	3 (3·4)	26	2 (7·7)	8	5·00		43·76
April ...	2	—	69	9 (13·0)	20	3 (15·0)	14	8·76		
May ...	—	1	32	6 (18·7)	24	2 (8·3)	9	5·62	21·88	
June ...	—	1	34	9 (26·5)	26	2 (7·7)	12	7·50		
July ...	3	—	36	12 (33·3)	43	4 (9·3)	19	11·88		
August ...	10	1	25	6 (24·0)	29	8 (27·6)	25	15·62	38·75	
September ...	2	1	48	12 (25·0)	33	3 (9·1)	18	11·25		56·24
October ...	2	1	51	6 (11·8)	15	2 (13·3)	11	6·87		
November ...	3	—	58	5 (8·6)	23	1 (4·3)	9	5·62	17·49	
December ...	4	—	68	3 (4·4)	28	1 (3·6)	8	5·00		
...	32	9	588	80 (13·6)	331	39 (11·8)	160	100	100	100

TABLE IX

Monthly incidence of Mortality in Buffalo Calves

	ANDHRA		BOMBAY				UTTARPRADESH				Distribution of mortality incidence percentage of total deaths		
	1	2	3	4			5						
	1952–53 No. of Calves died	1951–53 No. of Calves died	1953–51 to 1953–54 No. of Calves died	1953 Number of Calves died			1951–53 Number of Calves		Total No. of Calves died in four herds	Month	Quarter	Half yearly
							Born	Died				
January ...	2	19	2	21+12	6	6	40	18 (45·0)**	47	6·23	13·12	24·36
February ...	6	11	1	+ 2	7	7	24	9 (37·5)	34	4·50		
March ...	4	6	—	+15	5	5	18	3 (16·7)	18	2·39		
April ...	*	9	—	+27	10	10	29	6 (20·7)	25	3·30	11·24	
May ...	*	4	1	+27	14	14	20	6 (30·0)	25	3·30		
June ...	*	3	2	+16	18	18	25	12 (48·0)	35	4·64		
July ...	3	14	6	+26	16	16	65	15 (23·1)	54	7·15	33·38	
August ...	2	26	1	+35	26	26	113	39 (34·5)	94	12·45		
September ...	9	25	1	+ 7	9	9	133	60 (45·1)	104	13·78		
October ...	13	38	3	+ 7	6	6	128	75 (58·4)	135	17·88	42·26	75·64
November ...	12	28	—	+36	12	12	88	51 (57·9)	103	13·65		
December ...	4	15	1	+ 9	16	16	67	45 (67·2)	81	10·73		
	55	198	18	240	145	145	760	339	755	100	100	100

Lovell and Hill (1940), discussing the mortality incidence in Great Britain have concluded that "factors inimical to calf's life have a greater influence in the first two quarters of the year, chiefly it seems in the first quarter, and that their effect is more pronounced in Scotland than in England and Wales". Withers (1952) in a statistical study of calf mortality in relation to management and environmental factors has suggested that the seasonal swing in mortality during the early months of the year, is related to wide temperature variations and absence of sunshine common at this time in Great Britain. Earlier, Jordan (1933) attributed this higher susceptibility of spring born calves to infectious diseases, in Scotland to vitamin A deficiency in colostrum milk of winter fed cows. Hansen, Phillips and Rupel (1946) obtained evidence which suggested that factors other than vitamins present in "Summer Skim milk" influenced the survival of young calves. McCandlish (1939) considers that these seasonal changes may be associated with the character of milk curd formed in the stomach of the calf and that abnormal curd formation leads to digestive disturbances and even death as observed by Sheehy (1939) and Amos (1946).

In the absence of any recorded information about the feeding, management and environmental factors in India, it is difficult to assume any reason for the observed rise in the mortality rate in the rainy months in cow calves and rainy and winter months in buffalo calves. The general dampness due to heavy rainfall spread over a short period of time in tropical climate with usual unhygienic conditions in crowded calf pens and the practice of herding calves together without consideration of health conditions and age are some of the factors which would be highly favourable for the spread of infection leading to the precipitation of disease in more susceptible individuals. Seasonal variation in resistance to infection in domestic animals and man is a general observation. It appears that a number of environmental factors are involved. Apart from seasonal variations in the nutritive value of available feeds, field observations and controlled experiments have shown that the climatic environments have a definite effect on the behaviour, physiology and productivity of cattle and other farm animals (Findley, 1950). Since the new born calf for first few days depends for its nutrition and passive immunity on the colostrum and milk of the dam, the diet and the variation in the functional activity of the dam will have a direct bearing on the health of calf. Keener *et al* (1942) have shown that during severe winter the minimum carotene requirement of a calf may be more than twice as that during warm weather. This increased requirement may not be met with by natural feeding practices until preparturition diet of the dam or post-natal feeds of the calf are supplemented with vitamin A.

Causes of Mortality

The information obtained from the farms covered in the present enquiry regarding the relative incidence of calf diseases is incomplete and can hardly be taken as authentic. This is perhaps due to the difficulty of accurately identifying the disease conditions in young calves. It is, however, observed that diarrhoeic affections and pneumonia are responsible for most of the early calf deaths. This observation is in accordance with the generally acknowledged view. It is generally conceded that white scour is the commonest disease affecting young calves during first few days of life (Jensen, 1893; Mejelbo, 1934; Jordan, 1933; Miessner and Koser, 1931, 1934; White, 1943), while calf pneumonia is considered a disease of older calves (Jensen, 1903; Lamount and Kerr 1939) and is often preceded by gastro-intestinal involvement (Nocard, 1901; Smith, 1934; Sanders, 1940; Udall, 1946; Williams 1917). It is not uncommon to find both these conditions manifested together as in cases of pneumoenteritis virus infection recorded by some workers in other countries (Roberts, 1938; Gallo, 1942; Baker, 1943; Sorensen, 1950) and there is a growing belief that cases of this type of infection are much more wide spread in nature than what has been so far recorded.

The infectious agents commonly incriminated for these clinical manifestations are facultative potential pathogens with a ubiquitous distribution. *Bacterium coli* which is often isolated from cases of calf septicaemia is the normal inhabitant of intestinal canal. *Corynebacterium pyogenes*, *Pasteurella septica*, haemolytic cocco-bacilli are all found to be frequently associated with calf pneumonia. These organisms, from the limited information available on the record, are shown to be carried apparently normally by quite a fair proportion of older animals. *Corynebacterium pyogenes* was isolated from 18 of the 100 pairs of bovine tonsils (Francis, 1941) and from specimens of mucous membrane of the mouth of cattle (Ochi and Zaisen, 1936). Haemolytic cocco-bacilli, similar to those associated with pneumonia in calves (Jones, 1921 a, b,; Lovell and Hugres, 1935), were often recovered from the nose of healthy cattle and sheep (Bosworth and Lovell, 1944). These organisms appear to be of low initial virulence and the fact, that, in view of the ubiquitous nature of these, only a few calves contract the disease, varying in form and acuteness, while the others under the same herd conditions remain apparently unaffected, it is suggestive of under-current influence of some other factors like age, nutritional status, management efficiency, errors in diet, etc., in the aetiology of disease. Similarly the place to place variation in housing and management conditions, breeds of animals, nutritive value of available feeds and feeding practices, geographical and geological location and climate, may account for the variation observed

in mortality rates at various places. To assess the precise influence of one or more of these factors at a place or locality, identification of these factors at a place or locality, identification of these factors in relation to disease incidence based on extensive statistical study is necessary. For instance, information of much use was obtained in an extensive survey of calf mortality in 335 herds in England and Wales and 47 herds in Scotland (Lovell and Hill 1940). It was observed that losses occurred more in the first half of the year, especially in the earlier months than in the second half and that a slight increase in death rate occurred as one passed north wards and in Scotland it was significantly higher than in England and Wales. Withers (1952-53), after a study of mortality incidence in relation to management and environmental factors in Great Britain, has suggested that the high incidence in the early months of the year is related to the wide temperature variations and absence of sunshine common at that time. A considerably higher mortality rate was observed in herds where colostrum was pail fed (9·1%) than those where calves received it naturally from the dam (3·9%). Personal factor in calf rearing was judged to be of primary importance. Mortality was very high in young calves and over 80% of the total deaths occurred in the first months.

Regarding colostrum, though the observations of various workers about the relative significance of its constituents differ, there is sufficient evidence that it is of prime importance to the calf during the first few days of life (Smith and Little, 1922; Stewart and McCallum, 1931 a; Mc Ewen, 1950; Aschaffenburg et al, 1951). In this connection, Sato *et al* (1931) have called attention to the great variability in the chemical composition of colostrum. They carried out many analyses, and the range of values was :—

	%
Solids	12 — 27
Casein	3 — 6
Albumin	3 — 12
Fat	1 — 13
Ash	0·6 — 1

Apart from regional variations in composition due to different husbandry conditions and environmental factors (Parrish *et al*, 1949), a wide range of individual variations is known to exist under the same conditions of dieting and management (Stewart and McCallum, 1938 b). Vitamin A content of colostrum of 100 stall fed cows kept on the same plan of diet was found to range from 1181 to 35 International units, 100 c. c. In India, Sarkar (1948) estimated carotene and vit. A in the colostrum of 10 Hariana and 5 Sahiwal cows. The values ranged from 33·6 to 153·9 microgram for carotene and 63·2 to 571·8 microgram for

vitamin A per 100 c. c. Sen and Seshan (1938) have suggested the probability of avitaminosis A in a mild form under the ordinary conditions of Stock feeding in India being reflected in lower productivity and greater susceptibility to disease.

The great variability in the composition of colostrum with regard to factors essential for calf health suggests the importance and necessity of greater antenatal care and supplementing the diet of pregnant cows with vitamins, wherever the ordinary feeds do not seem to supply the necessary requirements.

Summary

The information on calf mortality was obtained from 56 herds of cattle and buffaloes distributed in eight widely separated States of the country.

The mortality figures given are upto two months of age from a total of 9475 calf births spread over a period of three years ranging from 1950–52 to 1951–53.

In 33 cattle herds 629 calves died in a total of 5938 that were born. In the herds covered in this survey the mortality was higher in the dairy herds (15·46%) than in the livestock and breeding herds (6·9%). In 23 buffalo herds 1185 (33·5%) died in a total of 3537 that were born. As observed in the case of cattle herds the mortality was higher in the dairy herds (35·97%) as compared to the livestock and breeding herds (19·45%).

From the limited information available, a seasonal variation in the mortality incidence was noticed. In cattle as well as in buffalo herds, mortality was higher in the second half of the year when compared to that of the first half. In the cow calves mortality was comparatively higher, i.e. 38·75% of the total, in the third quarter of the year while in buffalo calves the mortality was appreciably high in the third quarter (33·38%) but it was the highest in the fourth quarter (42·26%).

The probable causes of mortality in relation to breeds and season are discussed.

The literature on calf mortality in some of the foreign countries is briefly reviewed and in the light of the detailed knowledge on the subject in other countries, suggestions are made for the collection of similar data and carrying out of extension work.

Acknowledgments

We wish to thank the Director of Veterinary Departments of Andhra, Bihar, Bombay, Hyderabad, Madhya Pradesh, Madras, Punjab, Uttar Pradesh and the Milk Commissioner, Aarey Milk Colony, Bombay for supplying us with information about the farms under them.

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PULLET DISEASE—FURTHER OBSERVATIONS

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In an earlier communication D'Souza and Chandrasekharan (1956) reported the occurrence of 'Pullet Disease' (Avian monocytosis) in this country for the first time. Therein an account was given of the clinical, pathological and epizootological features of the disease. Since then two outbreaks occurred in the same flock affording further opportunity to study the disease with more details and this paper records these observations.

Materials and Methods

The two flocks were composed of 45 and 50 pullets each at the time of the outbreaks. Their feeding schedule and mode of husbandry were

similar to that mentioned in the previous paper (1956). The outbreak occurred in August – September 1956, and January – February 1957. In the first outbreak sixteen and in the second, three birds were affected. Out of these ten and three respectively died of the disease. Curative treatment with Terramycin was resorted to in ten pullets and preventive treatment with Terramycin was given to the unaffected birds.

Detailed protocols were maintained in respect of every bird affected. All the birds that died were subjected to a detailed autopsy, including Bacteriological examination wherever found necessary. Materials were collected in 10% formalin from heart, lungs, liver, kidney, pancreas, spleen and breast muscles for histo-pathological examination. Sections were cut at 4-6 μ and stained by Erlich's Haemotoxylin and Eosin method. In addition some of the liver sections were stained by Gomori's method for reticulum. (Lille, 1948).

Blood from ailing birds was drawn for haemotological examination and blood from ten normal birds of the same flock and age were examined for comparative study. The haematological data collected included sedimentation rate and packed cell volume measured with the aid of Wintrobe's Haematocrit tubes. Haemoglobin was estimated in Sahli-Adam Haemocytometer and counting of the red and white blood cells were done by the Phloxine-Formalin method of Wiseman (Olson Jr. 1952). Differential white cell counts were done after staining freshly made blood smears with Leishman's method using buffered distilled water at 6·4 pH. (Greater details of the technique used in haematological work will be furnished in a separate communication.)

Autopsy picture in respect of 23 cases (inclusive of ten of the original outbreak) is reviewed and histo-pathological changes in the organs are described.

Results

1. Clinical features

In general these were similar to those recorded in the earlier report. They included a rise of temperature between 107 to 110°F., Cyanosis of comb and wattles, inability to move about (Figure 1), soiling of the vent and the floor with watery thin stools and the short duration of the course of the disease. Out of the total of 19 affected in the two outbreaks, 13 succumbed to the disease and of these five were treated with Terramycin but died later.

2. Effect on the flock in relation to Egg yield and Food intake

As already pointed out the egg yield of the flock in which this disease was prevalent was lowered very much. 25 eggs were usually collected from each of this flock daily. On 4—9—56 (it may be noted from

Table I that 8 of the 10 deaths in first outbreak were after 4—9—56) only 8 eggs were collected and on the subsequent days the yield progressively came down to 7, 6, 4, 3, and 2. After this the egg yield again gradually increased following preventive treatment with Terramycin. Further the amount of food intake of the apparently normal birds was much reduced. Normally the birds of this flock consumed about 10 lbs. of mash and 10 lbs. of grains per day. During the period of the outbreak the reduction of the food intake worked to about 40% making allowances for the ailing and dead birds.

TABLE I

Details of the birds died are given below.

S. No.	Bird No.	Age at death	Date of first laying	No. of Eggs laid	Date of last laying	Date of attack	Date of death	Remarks
1	1941	8½ months	13-6-56	40	19-8-56	24-8-56	25-8-56	
2	1986	9 ,,	6-8-56	14	31-8-56	1-9-56	3-9-56	
3	1965	9 ,,	19-7-56	32	2-9-56	5-9-56	5-9-56	
4	1971	9 ,,	21-7-56	27	2-9-56	5-9-56	5-9-56	
5	1376	7½ ,,	—	—	—	6-9-56	6-9-56	Treated with Terramycin
6	1985	7½ ,,	5-8-56	17	2-9-56	5-9-56	6-9-56	do.
7	2202	8½ ,,	21-8-56	6	31-8-56	6-9-56	7-9-56	do.
8	1993	8½ ,,	15-8-56	14	4-9-56	7-9-56	7-9-56	
9	1426	7 ,,	—	—	—	8-9-56	8-9-56	
10	1937	11½ ,,	28-4-56	94	11-9-56	15-9-56	15-9-56	
11	2237	11 ,,	29-11-56	29	12-1-57	13-1-57	13-1-57	
12	1970	13½ ,,	20-7-56	104	3-2-57	4-2-57	4-2-57	} Treated with Terramycin
13	2241	12 ,,	7-12-56	22	2-2-57	4-2-57	4-2-57	} Terramycin

N.B.—1376, 1985, 2202, 1970 and 2241 were given Terramycin in dose of 250 mgms/per day. morning and evening in 2 halves.

3. Haemotology

The blood picture of the ailing birds was studied. However, due to the rapid course of the disease and occasional deaths resulting during the process of drawing blood, complete examination could not be done in all cases. A study of the blood picture from 10 normal pullets of the same flock was also done.

The table II gives the details of the Haemotological examination in the ailling birds and table III provides the average values obtained in respect of pullet disease and the normal birds of same age and feed.

On comparison with the normals it can be noticed that in pullet disease there was an increase of total r.b.cs., haemoglobin content, packed cell volume, mean corpuscular volume and monocytes, a slight increase of mean corpuscular haemoglobin and reduction in the mean corpuscular haemoglobin concentration. Differential W. B. C. count made from peripheral blood smears showed on an average 15% of monocytes (Figure 2) as compared with 5% in the normal birds.

TABLE II

Haematological data for birds ailing from Pullet disease.

S. No.	Bird No.	RBCs millions cmm.	WBCs cmm.	Haemoglobin gms%	Sedimentation rate mm.	Packed cell volume ccm 100 ccm. blood	Mean corpuscular volume c. μ	Mean corpuscular Haemoglobin rr.	Mean corpuscular Haemoglobin concentration %	Differential count				
										Heterophils	Lymphocytes	Monocytes	Eosinophils	Basophils
1	1985	2·89	—	11	·1	40	138	38·1	27·5	26	58	14	1	1
2	1376	3·69	—	12	·1	42	113	31·2	28·6	25	60	13	1	1
3	2202	2·85	—	10·5	·1	37	130	36·9	28·4	33	49	17	1	1
4	1986	2·03	—	6	·1	25	123	30·0	24·00	42	46	12	—	—
5	1970	2·20	40000	7·5	·3	22	100	34·1	34·1	28	54	17	1	—
6	2241	2·21	36000	6·5	·2	23	104	30·0	28·3	51	31	18	—	—
7	1965	—	—	—	—	—	—	—	—	43	49	15	1	—
8	1971	—	—	—	—	—	—	—	—	37	47	14	1	1

TABLE III

Comparison of the Haemotological data of pullet disease with those obtained in normal birds.

Details	Ailing birds average of figures for 6 birds	Normal average of figures for 10 birds
1. Red blood corpuscles	2·65 millions/c.mm.	2·45 millions/c.mm.
2. White blood corpuscles	38000/c.mm.	22000/c.mm.
3. Haemoglobin	8·9 gms. %	7·95 gms. %
4. Sedimentation rate	·15 mm.	·27 mm.
5. Packed cell volume	31·5 ccm/100 ccm.	26 ccm/100 ccm.
6. Mean corpuscular volume	118 c. μ.	105·6 c. μ
7. Mean corpuscular haemoglobin	33·4 *rr.*	32·9 *rr.*
8. Mean corpuscular haemoglobin concentration	28·5 %	31·5%
9. Differential count of leucocytes		
(a) Heterophils	34%	41%
(b) Lymphocytes	49%	51%
(c) Monocytes	15%	5%
(d) Eosinophils	1%	1%
(e) Basophils	1%	2%
	100	100

Autopsy picture: All the 23 birds on which autopsies were done were in very good condition and well nourished and in fact most of them showed a tendency towards adiposity. In all the birds the combs and wattles were cyanosed. On cutting open, the breast muscles showed signs of dehydration (dryness). They were pale in 7 cases and deeply congested in 5 cases. In the cases which showed palidity, minute haemorrhages were seen. Costal pleura in 7 cases, presented petechial haemorrhages. Also petechiae were found in the abdominal fat in 8 cases. Lungs were oedematous in 2 cases. Liver did not show any enlargement in any of the cases. In 10 cases liver showed minute discrete areas of necrosis which were of the size of a pinhead (Spottiness) (Figure 3) and in eleven cases the necrotic changes were more widespread and the foci confluent. Invariably both the surface and parenchyma were involved. In two cases liver was congested and fragile. Kidneys were found to be soft and fragile in one case, enlarged in another, and uratic streaks found in three more. Slight splenic enlargement was seen in 12 cases.

Intestines showed evidence of catarrh and congestion. In 7 cases the pancreas appeared somewhat swollen, lobulated and pale. The ova were found softened and flabby in almost all cases. In 13 cases they had ruptured, the yolk material coating all the abdominal organs. In one case degenerating yolk material was found free in the abdominal cavity while in another, three degenerating yolk materials were seen inside the oviduct (Figure 4).

4. Histological changes

Liver:—Sections or microscopical examination revealed the following changes—necrotic areas both focal and massive congestion of the vessels, presence of albuminous material in Disse's space, and retained bile pigments. Some sections showed evidence of fatty changes. Sections stained for recticulum showed fragmentation and occasional condensation.

Kidneys:—The changes noticed were varied and many. Degenerative changes of the tubular epithelium, swelling and increased nuclearity of glomeruli, dilatation of Bowman's Capsule; presence of hyaline casts in the tubules and dilatation of tubules were commonly seen. Besides these presence of uratic material, inflammatory exudate inside tubules, intertubular inflammatory oedema and congestion were seen in occasional sections.

In one section dark blue deposits mostly inside the tubules and in the intertubular tissue suggesting deposition with calcium salts were noticed.

Pancreas:—Sections were seen to be coated with albuminous material on surface (figure 5). Degeneration of the acinar epithelium which was mostly confined to the surface was also noted. In some sections what appeared as atrophy of acinar cells with loss of cytoplasm was noticed (figure 6). Occasionally eosinophilic intra-nuclear inclusions and proliferation of islet cells of Langerhans, were also seen.

Breast muscles:—Sections revealed loss of striation and hyaline changes occasionally of muscle fibres.

Spleen:—Reticulo-endothelial hyperplasia was noticed in sections in respect of those wherein splenic enlargement was seen. There was also slight hyaline thickening of the vessels of the organ.

Heart:—Occasional fragmentation of muscle fibres and mild oedema in between bundles were seen on sections.

Intestines:—Section showed catarrhal changes and desquamation of the epithelium. Most of the goblet cells were seen to be filled with secretion.

Pullet Disease — Further Observations

By
K. P. CHANDRASEKHARAN, BERTIE A. D'SOUZA and R. KRISHNAN.

Fig. 1. The ailing bird. Note the depressed and crouched attitude and blue colour of the head.

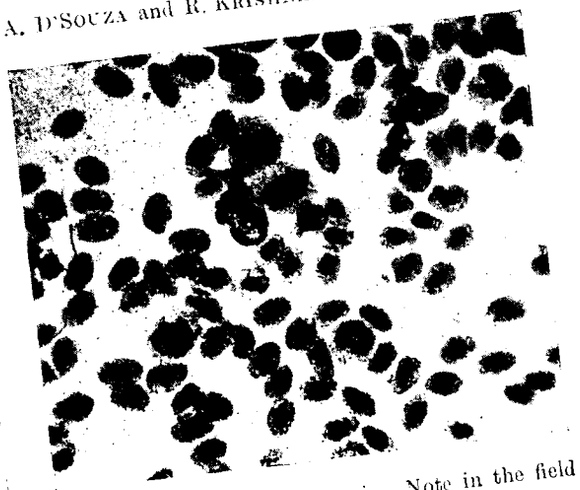

Fig. 2. Increased Monocytosis. Note in the field five Monocytes.

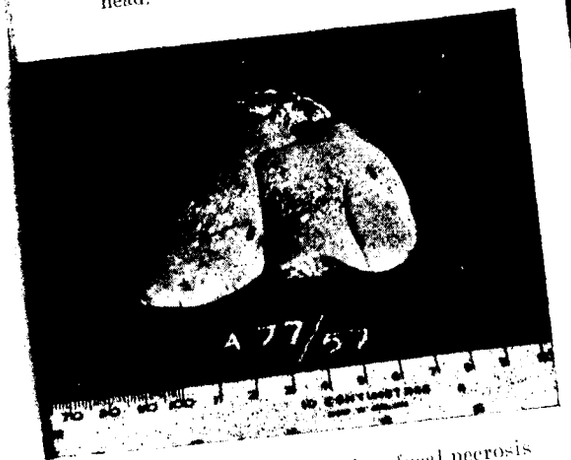

Fig. 3. Liver showing diffuse focal necrosis (Spottiness).

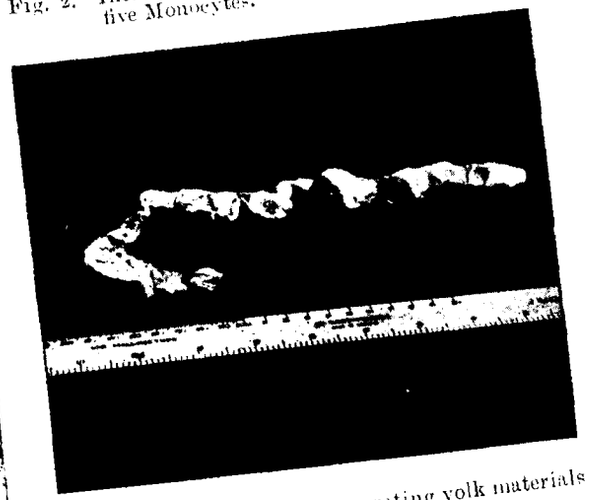

Fig. 4. Oviduct with 3 degenerating yolk materials retained inside.

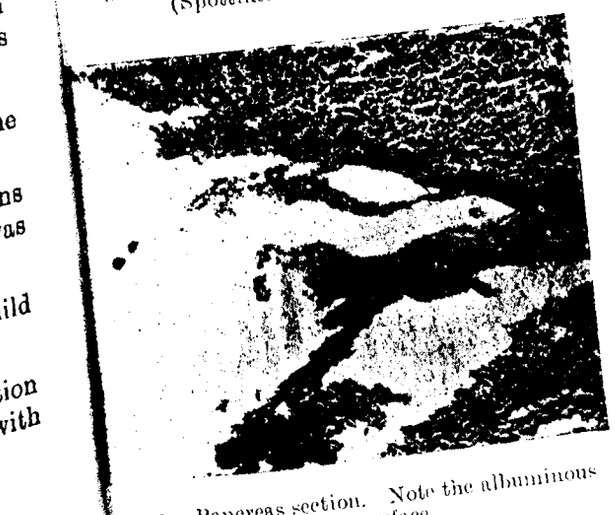

Fig. 5. Pancreas section. Note the albuminous material on the surface.

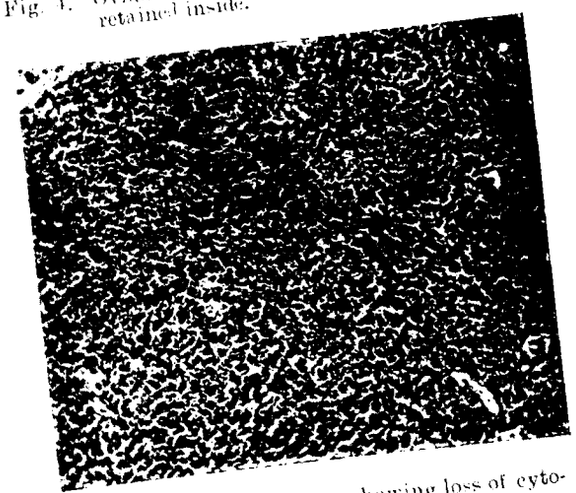

Fig. 6. Section of Pancreas showing loss of cytoplasm and atrophy of acinar cells.

Amoebic Dysentery in Dogs

By

M. S. GANAPATHY and V. S. ALWAR.

Fig. 2. Trophozoite.

Fig. 1. The Patient.

The following table gives the intensity of the microscopic lesions in the various organs.

TABLE IV

Table showing the details of histological changes in organs.

Details of the microscopic changes	No. of cases in which changes were		
	Mild	Moderate	Severe
(A) *Liver*:			
1. Necrotic areas	10	4	1
2. Albuminous material in Disse's space	5	2	—
3. Congestion	2	3	—
4. Fatty changes	2	2	—
(B) *Kidney*:			
1. Degeneration of tubular epithelium	1	9	2
2. Swelling and increased nuclearity of Bowman's capsule	4	3	—
3. Presence of uratic material	2	—	1
4. Inflammatory exudate inside tubules	—	1	1
5. Intertubular inflammatory oedema	—	4	—
6. Congestion	3	1	—
7. Hyaline casts inside tubules	1	4	1
8. Dilatation of tubules	2	—	—
(C) *Pancreas*:			
1. Albuminous material on surface	—	6	1
2. Degeneration of acinar epithelium	3	3	1
3. Intra-nuclear inclusions	2	—	—
4. Proliferation of islets	3	—	—
5. Atrophy of acini	5	—	—
(D) *Breast muscle*:			
1. Loss of striation and oedema	2	6	—

5. Treatment

Treatment was attempted for the birds that were noticed ailing. Terramycin was administered orally in 250 mgm. doses divided in two equal parts, and given morning and evening.

The table below gives the particulars of the curative treatment that was undertaken with the result.

From the above table it will be seen that out of 12 ailing birds treated 7 were cured giving about 60% cure with Terramycin.

Preventive treatment: Other birds of the flock also were given orally Terramycin at the rate of 100 mgm. per bird for 3 days successively. As already pointed out earlier, with this preventive treatment egg yield rose and also the food intake of the flock.

TABLE V

Bird No.	Date of commencement of attack	No. of days treated	Result	Remarks
1934	27-8-56	6	cured	
1948	5-9-56	4	cured	
1476	22-9-56	3	cured	
2502	22-9-56	3	cured	
1446	22-9-56	3	cured	
1494	22-9-56	3	cured	
1465	22-9-56	3	cured	
1376	6-9-56	1	died	
1985	5-9-56	1	died	
2202	6-9-56	1	died	
1970	4-2-57	1	died	
2241	4-2-57	1	died	

6. Discussion

The present communication records in further details of the earlier observations made of the disease. Data in regard to haemotological changes, autopsy and histological picture and effect on the egg yield in the flock affected are presented in greater detail. The outbreaks are reported in almost the same months of the year as the previous one showing thereby a tendency for annual and seasonal incidence of the disease. This is in conformity with the views of Jungherr and Matterson (1944) who found August to be the peak month of the year for the disease to occur. In the two outbreaks death of the birds occurred within 24 hours in almost all cases unlike the previous one where a few cases with renal involvement were observed. The rapid subsidence of the disease indeed could be attributed to the great efficacy of Terramycin as a preventive treatment. The severe prostration noticed in acute cases might possibly have been due to degenerative changes in muscles connected with locomotion and for which histological evidence was not wanting. The toxins elaborated by the etiological agent (virus ?) or endogenous toxins formed in the tissues in the course of the disease might be responsible for these degenerative changes. The sudden lowering of egg yield of apparently healthy birds of the flock was noteworthy and might be due to a specific action of the etiological agent on the ovarian tissue. The pathologic expression of this specific action is manifested by the peculiar softness of the ova which showed an extreme tendency to rupture on slight manipulation.

Though no specific investigations were conducted on the etiological aspect of the disease, epizootological considerations and amenability to treatment greatly dismiss hypothesis of nonspecific endogenous toxin in the causation of the disease. Indeed the above considerations leads one to suspect that in the etiology of the condition a viral agent might

be involved and that for the clinical manifestation " a non-specific stress factor " might be necessary. This view as expressed here, based on our experience with the disease, is thus in general agreement with that stated by Jungherr.

The haemotological data presented, though not so numerous, were obtained with utmost care and after perfecting the techniques involved. The differential monocytic count which is of great diagnostic value in our series, ranged from 12 to 19% of the total white blood cells. This was high compared with that of normal birds of the same age and given same feed. We note however, that compared with the figures of Mochizuki (1951) these were much low. But our figures should be judged in relation to that obtained with normal birds. Besides, in view of the great morphological similarity of large lymphocytes to monocytes we were constantly on the guard to avoid the inclusion among the monocytes any cells which even had a remote resemblance to the large lymphocytes. Further, it has been our experience to find in all cases of Pullet disease, a preponderance of large lymphocytes. Indeed, such a haemotological picture as was found consistently in pullet disease makes one to speculate on the possibility of a common origin for the two types of cells.

In respect of liver changes Jungherr in his article (Biester & Schwarte, 1952) mentions only focal necrosis (spottiness) whereas in a few cases we noticed massive necrosis and fatty changes.

Since pancreatic lesions were overlooked in our previous series special care was taken to observe them in the cases herein included. In most cases the organ appeared slightly swollen, pale, and peculiarly marbled. Section showed eosinophilic material with circular vacuoles evidently derived from the yolk on the surface. Also owing to extensive loss of cytoplasm suffered by the acinar cells at the peripheral portions of the organ they presented an atrophic appearance in section. Such a picture which could characteristically be seen in our series does not appear to have been noticed by Jungherr.

None of the kidney sections showed any pseudo giant cells in the tubules and we believe such a formation might possibly be from uratic deposits inside them. Increased glomerular nuclearity and dilatation of Bowman's capsule were constant findings. None in this series showed uratic infiltration, unlike the previous one, as all the cases were of the acute type.

Present study has shown that in clinical cases Terramycin is very effective if administered orally at the very onset of the disease, and that this antibiotic is also very efficacious in prevention of the disease in contacts in the course of the outbreak.

Summary and Conclusion

1. Two outbreaks of 'Pullet Disease' occurring in August-September 1956 and January-February 1957 were investigated. The outbreaks were successfully controlled by the prophylactic administration of Terramycin in 100 mgm. doses given orally every day for 3 days. The disease was found to occur seasonally.

2. Though the symptoms are very characteristic, confirmation of the disease should in all cases be done after a haemotological examination of the blood.

3. The disease caused sudden and steep fall in egg production of the affected flock. Thus it is of economic importance in that besides mortality, the egg loss is severe in the affected flock. It is believed that the disease specifically affects the ovarian tissue of the bird.

4. Epizootological considerations lead one to suspect that in etiology of the disease a specific viral agent, highly sensitive to Terramycin is involved and that for the clinical manifestation in the flock "A non-specific stress factor" appeares essential.

5. The haemotological data in respect of some of the ailing birds are presented. In cases of "Pullet Disease" as compared with the normal birds higher values were obtained in respect of red blood cells, white blood cells, haemoglobin, packed cell volume, mean corpuscular volume, and mean corpuscular haemoglobin. The differential counts showed an increase in monocytes and decrease in heterophil and lymphocytes.

6. The autopsy picture and histological changes in various organs are described in greater detail than in the previous paper.

7. In view of the widespread occurrence of the disease and because we have reasons to believe that the prevalence of the disease is overlooked by poultry breeders, it is emphasized that those engaged in routine poultry autopsies in the farms in this country should be familiar with the clinical, haematological and autopsy picture of the disease. The haematological examination being essential in diagnosis we stress that a sound knowledge of the techniques involved is needed for persons in charge of Regional Clinical Laboratories.

9. Terramycin being very effective both as curative and preventive after early diagnosis preventive treatment with this antibiotic should be instituted in the flock with the least possible delay.

Acknowledgment

We are thankful to Sri D. Pattabhiraman, Director of Animal Husbandry, Madras for allowing us to publish this article. Sri R. Ramamurthy and Sri T. Jayachandran, Assistant Lecturers in Animal Husbandry were helpful in recording the clinical data. The photographs included in the paper were taken by Sri Jambulingam, the College Artist and to him our thanks are due.

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SULPHAMEZATHINE SODIUM, (I.C.I. 33⅓% SOLUTION) IN HAEMORRHAGIC SEPTICAEMIA OF CATTLE

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Haemorrhagic Septicaemia among cattle and buffaloes in India, unlike the Shipping Fever or Stock-yard Pneumonia in U. S. A., is a peracute or acute disease, taking heavy toll among livestock annually. Due to the sudden onset and very short course, it gives very little scope for attempting any treatment. In most cases animals are found dead suddenly and it is imperative that treatment, to be effective, has to be commenced before the animals are clinically sick for more than rarely a day. In recent years, sulphonamides and antibiotics have been reported as highly effective against Pasteurella and useful in the treatment of

this disease. The sulphonamides are more economical than the antibiotics and in U. S. A. Sulphamezathine has been used in the treatment of the disease widely and with great success. The treatment is reported to be successful in most cases when commenced before the symptoms of pneumonia, hurried breathing, dyspnoea, cough, anorexia etc., have progressed.

It is felt that three types of *Pasteurella* are met with in outbreaks of Haemorrhagic Septicaemia among cattle in India, viz., Type B, C and D of Ochi's classification. While it is possible to prepare a good vaccine against Type B, types C and D are reported not to produce a vaccine of any practical value. The acute and peracute cases that usually die in about 24 hours are supposed or assumed to be caused by type B while the pneumonic types commonly seen in clinical outbreaks by Type C.

The Imperial Chemical Industries (India) Ltd., have recommended the use of their drug Sulphamezathine Sodium 33⅓% solution as the drug of choice against *Past. boviseptica* infection in cattle and buffaloes, and the dose suggested is 60 c. c. to 100 c. c. of the drug intravenously or sub-cutaneously, repeated in half-doses, at daily intervals, if required. The treatment has to be prompt to be successful.

Ameen (1953) in East Bengal tried the drug with considerable success in two white cattle and one buffalo clinically affected with Haemorrhagic Septicaemia in doses of 1 c. c. per 10 lb. body weight sub-cutaneously, with additional half-doses on subsequent days, and stated that Sulphamezathine is a specific curative agent for Haemorrhagic Septicaemia.

Jamil and his collegues (1955), working in Pakistan, studied the effect of Sulphamezathine sodium in the treatment of artificially infected cases of Haemorrhagic Septicaemia. In their experiments they noticed that Sulphamezathine was of little or no value in infected calves showing clinical symptoms of the disease. In such cases, doses as high as 30 c. c. per 100 lb. body weight were ineffective. If however the drug was administered after about 12 hours of infection with *Past. Septica*, that is, in animals showing only thermal reactions but not visibly sick, the drug tended to prolong the course of the disease, and in some cases further administration of the drug effected a cure. They also found that the results of treatment depended on the individual's response to the drug. In some cases, doses as small as 5 c. c. per 100 lb. body weight administered in a single dose about 12 hours post-infection effected a cure, while in others doses as high as 30 c. c. per 100 lb. body weight did not materially change the course of the disease. The drug, in doses of 10 c.c. per 100 lb. body weight, was found to have a definite repressive

effect when administered during the incubation period of the disease *i.e.* within about 8 hours post-infection, and in doses up to 20 c. c. per 100 lb. body weight usually suppressed the infection.

Short (1955) of the Imperial Chemical Industries (India) Ltd., feels that the difference between lack of response in calves experimentally infected and the good response in those naturally infected lies in the virulence of the infection *i.e.* the difference between the sudden introduction by syringe of a heavy infection and the comparatively gradual infection through the pharynx and lungs associated with the natural disease.

At the instance of the Imperial Chemical Industries (India) Ltd., a few experiments were planned and conducted at the Institute of Veterinary Preventive Medicine, Ranipet, to study the usefulness of Sulphamezathine Sodium Solution in the treatment of artificially infected cases of Haemorrhagic Septicaemia under laboratory conditions. The funds and the drug necessary for the study were provided by the Imperial Chemical Industries, Madras, and the study was made with the approval of the Government of Madras.

Materials and methods

Healthy buffalo-calves aged 2 to 2½ years and weighing between 160 to 300 lbs. were used in the study. The calves were infected with 2 to 5 lethal doses of *Past. boviseptica* culture (Mukteswar Strain 52) and the treatment with Sulphamezathine Sodium commenced soon after visible symptoms of infection were observed. The usual symptoms seen were rise of temperature, dullness, inappetence, diffuse painful swelling at site of inoculation, lameness of the limb close to the swelling, staring coat and drooping ears. Usually these symptoms appeared by about the 12th to 20th hour after infection. Half the number of calves showing the above symptoms were treated with the drug leaving the other half untreated as controls. In the first two experiments the dose of drug administered was 30 c.c. per cwt. body weight as recommended by the Imperial Chemical Industries, followed by half the initial dose on the subsequent 2 or 3 days. In the subsequent experiments, the initial dose of the drug was reduced to 15 c.c. per cwt. body weight followed by half the initial dose on subsequent days. Just prior to treatment the blood from the jugular vein of the animals treated was cultured in blood agar and nutrient broth tubes to know whether septicaemia had set in and the *Pasteurella* organisms had made their appearance in the circulating blood. In all, five sets of experiments were conducted using ten calves for four experiments and nine calves for the fifth experiment.

The M.L.D. of the H. S. culture was determined before each experiment, and it was found that 1 c.c. of a 10^{-5} dilution of a 24 hour-broth culture of Strain 52 in its Phase I invariably killed a buffalo-calf in 24 to 36 hours with symptoms of Haemorrhagic Septicaemia.

Experiment I

Ten buffalo-calves were used in this experiment. These animals were infected with 2 M.L.Ds of the H.S. culture injected sub-cutaneously. Only three calves reacted to the culture between the 18th and 20th hour after infection showing rise of temperature, inappetence, dullness, diffuse swelling at site of inoculation, etc. Two of these calves were treated with Sulphamezathine Sodium in the initial dose of 30 c.c. per cwt. body weight intravenously, followed by half the initial dose on the 2nd and 3rd days. The blood from these calves was cultured just prior to the treatment to know whether Septicaemia had set in. The third calf was left untreated as control. The remaining 7 calves did not take up the infection. The results are tabulated below.

Calf No.	Body weight in lb.	Dose of culture.	Time when symptoms were seen and treatment commenced	Result of blood test.	Dose of drug given	No. of days treated	Result
1	191	2 MLDs	—	—	—	—	Non-reactor
2	205	"	40 hours after infection.	Negative	55 cc.	2 days	Survived
3	235	"	—	—	—	—	Non-reactor
4	242	"	—	—	—	—	"
5	235	"	—	—	—	—	"
6	175	"	22 hrs after infection	—	Not treated	—	Died of H. S.
7	177	"	23 "	Negative	47·5 cc.	2 days	Survived
8	177	"	—	—	—	—	Non-reactor
9	231	"	—	—	—	—	"
10	199	"	—	—	—	—	"

Both the treated calves (Nos. 2 & 7) responded to the treatment with the drug and their blood was free from the organisms at the time of treatment. The untreated calf (No. 6) died in 36 hours of Haemorrhagic Septicaemia.

Experiment II

A second set of 10 buffalo-calves were used in this experiment, and they were infected with 5 M.L.Ds of the *Past. boviseptica* culture. Seven calves reacted to the infection showing thermal rise etc., between the 14th and 20th hour of infection. Four calves were treated with the

drug in the initial dose of 30 c.c. per cwt. body weight, followed by half the initial dose on the subsequent days. Their blood also was cultured just prior to treatment to know if septicaemia had set in. The three other reacting calves were left untreated as controls. One of the four treated calves showed *Pasteurella* organisms in its blood at the time of treatment and succumbed to the disease by the 26th hour of infection. The other three treated calves responded to the treatment and recovered, and their blood was free from *Pasteurella* organisms at the time of treatment. All the three untreated calves died of Haemorrhagic Septicaemia between the 24th and 42nd hour of infection. The results are tabulated below:

Calf No.	Body weight in lbs.	Dose of culture	Time when symptoms were seen and treatment commenced	Result of blood test	Dose of drug given	No. of days treated	Result
1	219	5 MLDs	16 hrs. after infection	Negative	57 c.c.	2 days	Survived
2	252	"	"	Not treated	—	—	Died of H.S.
3	255	"	"	Positive for *Past*	68 c.c.	—	"
4	252	"	"	Not treated	—	—	"
5	299	"	"	"	—	—	"
6	307	"	"	Negative for *Past*	82 c.c.	3 days	Survived
7	329	"	18 hrs. after infection	"	88 c.c.	2 days	Survived
8	253	"	"	—	—	—	Non-reactor
9	268	"	"	—	—	—	"
10	285	"	"	—	—	—	"

Experiment III

A third set of ten calves was infected with 5 M.L.Ds of the H. S. culture. On this occasion, all the ten calves reacted to the culture from the 15th hour onwards. Five of them were treated with a reduced initial dose of 15 c.c. of the drug per cwt. body weight followed by half the initial dose on the subsequent days. Their blood, as in the previous experiments, was cultured just prior to the treatment. The remaining five calves were left untreated as controls.

Three of the five treated calves showed *Pasteurella* organisms in the circulating blood at the time of treatment, and died of Haemorrhagic Septicaemia, two within 10 hours of treatment and the third on the 3rd day of treatment. The blood of the remaining two treated calves was

free from *Pasteurella* organisms at the time of treatment, but only one of them responded to the treatment and recovered, while the other calf nevertheless developed Haemorrhagic Septicaemia and died on the 5th day of treatment due to the disease. The heart-blood of this animal was positive for *Pasteurella* organisms. All the five untreated calves died of Haemorrhagic Septicaemia in 24 to 48 hours of infection. The results are tabulated below :—

Calf No.	Body weight in lb.	Dose of culture	Time when symptoms were seen and treatment commenced	Result of blood test	Dose of drug given	No. of days treated	Result
1	246	5 MLDs	17 hrs. after infection	Negative	33 c.c.	2 days	Survived
2	197	"	15 "	Positive for *Past*	26·5 c.c.		Died of H.S.
3	215	"	17 "	Not treated			"
4	213	"	15 "	"			"
5	213	"	15 "	Negative	28·5 c.c.	1 days	"
6	258	"	15 "	Positive for *Past*	31·5 c.c.	3 days	"
7	205	"	15 "	"	27·5 c.c.	—	"
8	197	"	15 "	Not treated	—	—	"
9	178	"	17 "	"	—	—	"
10	178	"	15 "	"	—	—	"

Experiment IV

A fourth set of ten buffalo-calves were infected with 5 M.L.Ds of the culture and the treatment was commenced a little earlier this time *i.e.* soon after the onset of the thermal reaction (10 to 12 hours after infection). Nine of the ten infected calves showed reaction to the infection. Of these, 4 calves were treated with the reduced dose of the drug at 15 c.c. per cwt. body weight as the initial dose followed by half the initial dose on subsequent days. The blood of these calves was also cultured just prior to commencement of treatment. The remaining four reacting calves were left untreated as controls. All the four treated calves responded to the drug and recovered in 3 to 4 days, while the four untreated controls died of Haemorrhagic Septicaemia in 24 to 36 hours after infection. Of the two non-reactors, one developed a late reaction by about the 34th hour and was treated with the drug, after culturing its blood. *Pasteurella* organisms were present in the blood at the time of treatment, and in spite of receiving a second dose of the drug on the second day the animal died of Haemorrhagic Septicaemia.

The results are tabulated below :—

Calf No.	Body weight in lb.	Dose of culture	Time when symptoms were seen and treatment commenced	Result of blood test	Dose of drug given	No. of days treated	Result
1	221	5 MLDs	11 hrs after infection	Negative for *Past*	29·5 cc.	2 days	Survived
2	214	"	10 "	Not treated	—	—	Died of H. S.
3	170	"	10 "	"	—	—	"
4	198	"	11 "	Negative for *Past*	26·5 cc.	2 days	Survived
5	201	"		—	—	—	Non-reactor
6	212	"	10 "	Negative for *Past*	28 cc.	4 days	Survived
7	162	"	10 "	Not treated	—	—	Died of H. S.
8	214	"	34 "	Positive for H. S.	28·5 cc.	—	"
9	210	"	10 "	Not treated	—	—	"
10	237	"	10 "	Negative for H. S.	31·5 cc.	2 days	Survived

Experiment V

Only 9 buffalo-calves were used in this experiment, and they were infected with 5 M.L.Ds of *Pasteurella* culture. Six calves showed reaction to the infection in 10 to 60 hours. Of these, four calves were treated with the drug in the initial dose of 15 c.c. per cwt. body weight after culturing the blood, followed by half the initial dose on subsequent days. Two of the reacting calves were left untreated as controls. All the four treated calves responded to the drug and recovered, and their blood was also free from the organisms at the time of treatment. The two untreated controls died of Haemorrhagic Septicaemia in 36 hours. Three calves did not react to the infection.

The results are tabulated below :—

Calf No.	Body weight in lb.	Dose of culture	Time when symptoms were seen and treatment commenced	Result of blood test	Dose of drug given	No. of days treated	Result
1	213	5 MLDs	15 hrs after infection	—	Not treated	—	Died of H. S.
2	217	"	62 "	Negative for *Past*	29 cc.	2 days	Survived
3	218	"	Non-reactor	—	—	—	—
4	224	"	Non-reactor	—	—	—	—
5	251	"	62 hrs after infection	Negative for *Past*	33·5 cc.	2 days	Survived
6	168	"	10 "	"	Not treated	—	—
7	280	"	Non-reactor	—	—	—	—
8	262	"	10 hrs after infection	Negative for *Past*	35 cc.	2 days	Survived
9	196	"	10 "	"	26·25 cc.	2 days	Survived

In vitro action: A study was made to see if the Sulphamezathine Sodium Solution (33⅓%) in the concentration recommended for treating cases of Haemorrhagic Septicaemia in cattle will have any bacteriostatic or bactericidal action on *Pasteurella* organisms *in vitro*. It was found that the addition of the drug to a 24 hour old broth culture of *Pasteurella* organisms in such proportion as the final concentration of the drug will be the same as in the blood of an animal treated at the dose of 30 c.c. per cwt. body weight, did not have any bactericidal effect upto a period of 120 hours as on periodical sub-cultures the organisms were found to be viable upto this period. By increasing the concentration of the drug, the survival time of the organisms was found proportionately reduced and when the drug concentration was increased eight-fold, it was capable of inactivating the organisms in 16 hours and when increased to fifty times it inactivated the organisms within a period of 5 minutes.

Quantity of culture	Quantity of drug	Concentration of drug	Result of sub-cultures on blood agar slants at intervals of							
			2 mts.	5 mts.	1 hr.	16 hrs.	24 hrs.	48 hrs.	72 hrs.	120 hrs.
19·85 cc.	0·15 cc.	(Corresponds to 30 cc/cwt. dose in animals) 247·5 mgms. %	+++	+++	+++	+++	+++	+++	+++	+++
18·80 cc.	1·20 cc.	(240 cc/cwt. dose) 1980·0 mgs. %	+++	+++	+++	—	—	—	—	—
12·50 cc.	7·50 cc.	(1500 cc/cwt. dose) 12,375·0 mgms%	+++	—	—	—	—	—	—	—
20·00 cc.	—	—	+++	+++	+++	+++	+++	+++	+++	+++

Note (1): +++ indicates growth and -- no growth.

Note (2): The concentration of the drug expressed as 247·5 mgms % is equivalent to the concentration of the drug that would be present in the blood of an animal treated at the dose of 30 cc/cwt. body weight and similarly the concentration expressed as 1980·0 mgms % corresponds to a dose of 240 cc/cwt. body weight and 12,375·0 mgms % to 1500 cc/cwt. body weight.

Discussion

An analysis of the results achieved shows that Sulphamezathine Sodium is useful in the treatment of Haemorrhagic Septicaemia. But the treatment has to be commenced fairly early *i.e.* before the disease progresses and septicaemia sets in. Out of 19 calves treated, 14 survived and 5 died. In the case of 4 out of the five calves that died, the disease had become septicaemic even at the time of the commencement of the treatment. Once the organisms appear in the circulating blood the drug appears to be of very little or no value in the initial recommended dose of 15 c.c. or even 30 c.c. per cwt. body weight followed by half the initial dose on subsequent days. All the animals that showed the organisms in the circulating blood at the time of treatment have died of Haemorrhagic Septicaemia and the drug had no action on the organisms. It is also interesting to note that all the calves except the one in Experiment III, which did not show the organism in the blood at the time of treatment, responded to the drug and recovered after 2 or 3 days treatment. Ameen (1953) has claimed good results with the drug in treating clinical cases of Haemorrhagic Septicaemia, but it is not known as to how soon after the symptoms were seen the animals were treated, and whether he examined or cultured the blood at the time of treatment. The experience of Jamil *et al* (1955) that Sulphamezathine was of little or no value in infected calves showing clinical symptoms of Haemorrhagic Septicaemia may be due to the fact that the disease in these animals had progressed fairly well and septicaemia had set in. But their findings that the drug, when administered after about 12 hours of infection or in animals showing thermal reaction only but not visibly sick, prolonged the course of the disease or effected a cure in some cases is in conformity with the results obtained here, namely that treatment to be effective has to be commenced fairly early and before septicaemia sets in.

We ought to consider the practical utility of the drug in treating cases of Haemorrhagic Septicaemia in actual outbreaks of the disease and under field conditions. Usually the disease is noticed in a village or a herd only when there had been some sudden deaths or when some of the animals are in the advanced stage of the disease. Though the drug may not be of much use in treating advanced cases, yet it would prove of great value in treating further cases in a herd or village as soon as they appear sick, or are found to have a thermal reaction. The drug might also prove very useful as a prophylactic in protecting valuable livestock in herds or groups of animals where a few deaths have occurred due to Haemorrhagic Septicaemia.

Summary

Sulphamezathine Sodium 33⅓% solution, I. C. I. Ltd., is found useful in treating cases of Haemorrhagic Septicaemia in cattle and buffaloes, in the recommended dose of 15 c.c. per cwt. body weight followed by half the initial dose on subsequent days, provided treatment is commenced sufficiently early *i.e.* soon after the onset of thermal and other symptoms and before the onset of septicaemia. The drug is found to be of no value in cases where the organisms have made their appearance in the circulating blood leading to septicaemic condition.

Acknowledgment

Grateful thanks are due to Dr. V. R. Rajagopalan, Director of Animal Husbandry (retired), Madras, for his continued interest and guidance in this study, and to the staff of the Institute of Veterinary Preventive Medicine, Ranipet, for technical assistance. Thanks are also due to the Imperial Chemical Industries (India) Ltd., for providing necessary funds and drugs for the study.

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SIMULTANEOUS IMMUNISATION OF CHICKS AGAINST RANIKHET DISEASE AND FOWL POX

By

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Veterinary Disease Investigation Officer (Poultry), Ranipet.

Introduction

At present chicks are vaccinated against Ranikhet Disease when they are 8 weeks old. They are not systematically immunised against fowl pox with fowl pox vaccine since the use of this vaccine has been under trial till recently. Now that it has been declared through a number of trials conducted, that the Beaudette strain of fowl pox vaccine could safely be used on chicks of 6 weeks of age and above, it is proposed to vaccinate systematically such chicks against fowl pox also.

Since the immunisation of chicks against Ranikhet Disease and fowl pox separately involved time and labour it was proposed to immunise chicks both against Ranikhet Disease and Fowl Pox with the concentrated mixed Fowl Pox vaccine and Ranikhet Disease vaccine. Accordingly vaccination trials were conducted with the above said mixed vaccine and the following are the details of such vaccination trials conducted.

During the year 1956-57, 481 chicks of 6 weeks of age and above were immunised against both Ranikhet Disease and Fowl Pox with the But ntrated mixed Komorove strain of Ranikhet Disease vaccine and disease ndette strain of Fowl Pox vaccine. The vaccination was done 14 survivle prick method in the web without disturbing the feathers at the diseas f vaccination. The particulars of vaccinations done and the ment of thation reactions observed, are given in Table I :

TABLE I

Particulars of Vaccinations done and reactions noted.

Centres of Vaccination	No. of chicks vaccinated, their breed, and age	Date of vaccination with mixed R.D. & F.P. vaccines	Ranikhet Disease post-vaccination reactions				Fowl Pox post vaccination reactions			Remarks
			Drowsiness	Diarrohoea	Paralysis	Mortality	Formation of takes	Whether any chick developed Fowl Pox lesions	Mortality due to Fowl Pox vaccination	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Narasingapuram	75 exotic chicks of 10 weeks and above	23-9-56	Cent per cent	—	—	—	All the vaccinated birds showed satisfactory takes at the site of vaccination done	Nil	Nil	The post vaccination reactions for both Ranikhet Disease and Fowl Pox have been quite satisfactory and the vaccinated birds have been brisk and feeding well.
2. Cheranmahadevi	15 exotic chicks of 8 weeks old	26-9-56	do.	—	—	—	do.	Nil	Nil	do.
3. Hosur Cattle Farm	12 exotic chicks of 10 weeks old	25-10-56	do.	—	—	—	do.	Nil	Nil	do.
4. A. A. Mission Poultry Farm, Katpadi	379 exotic chicks of 6 weeks and above	7-1-57	52.8%	—	6.3%	6.3%	do.	Nil	Nil	A mortality of 6.3% has been recorded as due to Ranikhet Disease vaccination reaction. Since the reactors have not been removed and nursed separately, the healthy chicks trampling on the reactors added to the percentage of mortality recorded here.

Particulars of the Challenge Tests.

Place	Chick No.	Date of vaccination with the mixed R. D. & F. P. vaccines	Date of challenge with R. D. virus (1 : 40 dilution)	Reaction.	Unvaccinated controls				Date of challenge with field scab virus	Reaction	Unvaccinated controls			
					Chick No.	Date of challenge	Strain of challenge	Reaction			Chick No.	Date of challenge	Strain for challenge	Reaction
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Livestock Research Station Hosur Cattle Farm	6900	25-10-56	18-1-57	—					16-2-57	—				
,,	6906	,,	,,	—					,,	—				
,,	134	,,	,,	—					,,	—				
,,	6953	,,	,,	—					,,	—				
,,	6897	,,	,,	—					,,	—				
,,	6961	,,	,,	—	2335	18-1-57	Field Ranikhet Disease virus (1 : 40 dilution)	The two controls died on 21-2-57 showing specific lesions of R.D.	,,	—	276	16-2-57	Field scab virus	++
,,	6863	,,	,,	—	2336	18-1-57			,,	—	277	16-2-57		++
,,	6901	,,	,,	—					,,	—				
,,	6860	,,	,,	—					,,	—				
,,	6958	,,	,,	—					,,	—				
,,	6856	,,	,,	—					,,	—				
,,	Leg Band	,,	,,	—					,,	—				

The general condition of the vaccinated chicks continued to be good. All the vaccinated chicks showed satisfactory 'Take' on the 10th day of vaccination and none of them developed pox in a generalised form.

Immunity tests conducted against both Ranikhet Disease and Fowl Pox

Challenge test against Ranikhet Disease:— Twelve chicks immunised at the Livestock Research Station, Hosur Cattle Farm on 25-10-56 were challenged on 18-1-1957, *i.e.*, after 2 months and 23 days of immunisation, with field Ranikhet Disease virus keeping suitable controls. The result of the challenge test was that the vaccinated birds withstood the challenge while the controls died on the third day of infection showing specific post mortem lesions of Ranikhet Disease.

Haemagglutination inhibition tests also were conducted with the serum collected from the above 12 chicks on 15-1-57, 2 months and 20 days after the immunisiation with the mixed vaccine to determine if they were immune to Ranikhet Disease. The sera gave positive inhibition titre to Ranikhet Disease virus.

Challenge test conducted against Fowl Pox:—To ascertain the immunity conferred, the twelve chicks were challenged on 16-2-57, 3 months and 21 days after the immunisation, with field scab virus keeping suitable controls. The vaccinated chicks manifested no lesions at the seat of vaccination while the controls developed typical lesions of Fowl Pox at the site of inoculation.

The results of the challenge test conducted on chicks immunised against Ranikhet Disease and Fowl Pox with concentrated mixed Ranikhet Disease vaccine and Fowl Pox vaccine are given in Table II.

It was gratifying to note that during outbreaks of Fowl Pox noticed subsequent to the mixed vaccinations done at Narasingapuram, Livestock Research Station, Hosur Cattle Farm and at American Arcot Mission Poultry Farm, Katpadi, the immunised birds have remained absolutely free from the disease although they were in close quarters with the pox-affected birds.

In conclusion I am inclined to feel that instead of vaccinating birds against Ranikhet Disease and Fowl Pox on different occasions, birds of 6 weeks and above could in future be safely immunised both against Ranikhet Disease and Fowl Pox by a single prick method in the web with the concentrated mixed Ranikhet Disease vaccine and Fowl Pox vaccine.

Abstract

"A PRELIMINARY REPORT ON THE RECORD OF VIBRIONIC INFECTION AMONGST CATTLE AND BUFFALOES IN BOMBAY STATE"*

By

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The authors, after reviewing the literature on the incidence of Vibriosis in other countries, have referred to the work done by Mohan (1954) in India who examined Vaginal mucus from 89 suspected cases of cows and buffaloes for the evidence of specific agglutinins against *Vibrio fetus* antigen and found out of those, 20 samples gave positive titres of varying degrees. He further sent some samples from this positive lot to Weybridge where only one sample was found to be strongly positive for Vibriosis on agglutination test. Incidentally, this was the first suggestive record of Vibriosis in India, although the actual organism could not be isolated from any one of these cases.

The present authors studied the cause of frequent abortions among buffaloes at the Aarey Milk Colony in Bombay. Materials from 20 cases of abortions were collected during September to December, 1956, which were subjected to various bacteriological tests. An organism resembling Vibrio was isolated from the placenta of a buffalo which aborted in the 4th month of pregnancy. Typing of this organism, however, is still at hand. Sera from 14 cases, which gave negative titre to Brucella antigen, were tested against Vibrio antigen of Denmark strain and 12 out of them gave positive results with varying titres from 1 in 100 to 1 in 400. Control Sera from animals with no history of abortion gave negative results against the same antigen. The authors also prepared antigen from the strain isolated by them and tested it against sera from 8 cases and obtained positive titres in tube agglutination test in 3 samples, the titres varying from 1 in 200 to 1 in 400, and also obtained positive results on Plate agglutination test in the remaining 5 samples. Vaginal mucus samples from 15 cases were subjected to mucus agglutination test and only one sample out of these gave positive result.

The authors pursued their investigations among cattle in the North Satara District where infertility and frequent abortions were prevalent, and were successful in isolating Vibrios from two infertile

* Published in the "Bombay Veterinary College Magazine" Vol VI, 1957.

cows with complaints of granular vaginitis. The strains, on bacteriological examination, were found to be indistinguishable from *Vibrio fetus*. However, the authors reserve their final verdict with regard to the identity of the strains so far isolated by them pending the typing which is still under progress.

(A. MUKERJI.)

Clinical Article

AMOEBIC DYSENTERY IN DOGS

(A Case Report)

By

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Madras Veterinary College, Madras.

Introduction

Natural infection with *Entamoeba histolytica*, though widely prevalent in human beings, is not so commonly encountered in animals. This may be attributed to the fact that amoebiasis is primarily a disease of man and generally animals become infected from that source, only when opportunity exists for the ingestion of the infective material. Besides the infection in monkeys, pigs and rats, amoebic dysentery in dogs has been reported from Egypt, Panama, China, Cochin-China (Ray, 1945) and U.S.A. (Morgan and Hawkins, 1949). In India, reports of this disease in animals are very few and far between although its incidence in human beings is estimated to be 19·9% (Lapage, 1956). Ware (1916) was the first to record amoebic dysentery in India among hounds in Ootacamund. This was followed by the reports of Rao (1922) in Madras and Royd (1931) in Bangalore. Rao *et al* (1954) recorded the infection in bullocks, monkeys and a lioness belonging to the Zoological Gardens, Bombay.

Since the report of Rao in 1922, amoebiasis in domestic animals does not seem to have been recorded in Madras; at any rate definitely not during the last ten years, though 21·9% of the human population here are known to be infected (Chatterjee, 1952). Recently a case of amoebiasis in a dog was met with and the opportunity is availed of to record the same.

A 2½ year old male dog (Golden-Retriever-Cross—Case No. 9534) was admitted in the college hospital on 18-3-1957 with the following history:

The dog was passing blood-tinged stools since six months. The condition was not amenable to symptomatic treatment given till then.

Whenever taken out for exercise, the animal used to strain and pass drops of blood. It was learnt that the owner was himself a patient suffering from chronic amoebiasis.

Physical examination

The dog was poor in condition with a dry harsh coat. The temperature was 102°F. The pulse was regular, hard and full rate 86/mt. The mouth was clammy and foul smelling. Palpation revealed tenderness over the entire abdominal region. On rectal examination no foreign bodies like pieces of bone could be felt. The mucous membrane of the rectum was thickened and rubber-like to touch. The contents were mucus coated and blood stained with an offensive smell. The prostate was of normal size. Proectoscopic examination revealed a corrugated and thickened mucosa with streaks of haemorrhage.

Laboratory findings

Microscopic examination of the blood smear was negative for protozoan parasites. The blood picture was slightly anaemic and there was evidence of leucocytosis. The erythrocyte count was 4·9 million/cmm. and that of leucocytes 32,400/cmm. Haemoglobin was 8·5 grm percent. The differential count showed a preponderance of polymorphs (90%). Biochemical examination of urine revealed traces of albumin with no other abnormality. Microscopical examination of a fresh specimen of stools containing mucus shreds revealed a fair number of vegetative, a few pre-cystic and very few cystic forms of *Entamoeba histolytica*. Iodine preparations as well as stained smears were also examined. In the direct examination, the trophozoites were seen actively throwing out finger-like pseudopodia and moving vigorously in a definite direction. When the motility of the trophozoites slowed down considerably, the internal structures were clearly visible. The ectoplasm was clear and the granular endoplasm showed different shades of pink colouration depending upon the number of erythrocytes ingested. The nucleus was clearly seen in the eccentric position with central karyosome. As many as eight R. B. Cs were present inside. No bacteria were noticed within the protozoa. Measurements ranged from 15·6 μ to 31·2 μ with an average of 23·3 μ. The trophozoites were seen alive upto eight hours, after which time they were found to disintegrate. The pre-cystic forms were more or less spherical and measured 15·6 to 23·4 μ. Each of them showed a nucleus and a prominent glycogen vacuole. The cysts were quadrinucleate and measured 12·8 to 15·5 μ. The finding of cystic forms in the dysenteric stools corroborated the observations made by Rao (1922).

Treatment

The dog was put on a course of Enterovioform 2 tablets (0·25 gram each) three times a day. The feed consisted of arrow-root kanjee, egg and glucose. Even after four days of treatment, the condition of the animal remained the same. The dog was passing voluminous, brownish, foetid stools coated with mucus and dark blood. There was a rapid loss of condition. As this line of treatment was found unsatisfactory, it was decided on 27-3-57 to administer Emetine. Accordingly 1/2 a grain of Emetine hydrochloride dissolved in 1 c.c. distilled water was given intramuscularly. In addition, 2 tablets (1 grain each) of Emetine Bismuth iodide were given orally. This treatment was continued daily. During the next three days, there was a steady clinical improvement in the condition of the animal. The motions were formed and the quantity of blood and mucus was decreased. There was a considerable reduction in the number of amoebae and none could be detected from 29th onwards. However, on 31-3-57, there was a sudden setback. The animal passed large quantity of bright red blood with very little stools and mucus. In spite of every effort to arrest the haemorrhage, the condition deteriorated and the dog died in extreme exhaustion.

Post-mortem examination

There was a severe haemorrhagic enteritis. No patent ulcers were seen in the large intestines, probably the infection had not proceed to such an extent.

Histopathological examination of the large intestines revealed extensive destruction and disappearance of the surface epithelium, extravasation of blood in the lamina propria, prominent globlet cells and destruction of glandular cells; submucosa showed patchy infiltration with inflammatory cells chiefly plasma cells and mononuclears, besides engorgement of the vessels.

Discussion

It is very likely this dog picked up this infection from his master. The presence of cysts in the stools indicates the possibility of the dog infecting new hosts. Considering the higher incidence of human amoebiasis in Madras, it is surprising that only very few cases of infection have been reported in dogs. It is hoped that repeated examination of the stools of dogs having chronic dysentery may bring to light more and more of this malady.

Acknowledgment

It is our pleasant duty to thank Sri Bertie A.D' Souza, Principal, for the keen interest evinced in the case. Our thanks are due to Sri C. K. Velayudhan Nair, Professor of Pharmacology and Therapeutics

and Sri K. P. Chandrasekharan, Professor of Pathology for their helpful suggestions. To Sri S. Ramamirtham and Kumari C. M. Lalitha, Assistant Lecturers, for their technical assistance and to Sri M. R. Jambulingam, the college artist, for the photograph and photomicrographs, our thanks are due in no small measure.

N.B.—Since writing the above note, another case of amoebiasis in a dog was met with (Case No. 1231) in the college hospital during May 1957. Fresh specimens of stools containing mucus and blood on microscopical examination revealed a large number of actively moving trophozoites and a few precystic forms of *E. histolytica*. The follow-up was not possible as the case discontinued attending the hospital from the second day.

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News and Views

Dr. M. Ahmed Hussain, Senior-most member of the staff of the University College of Veterinary Science and Animal Husbandry, Osmania University, Hyderabad, has been appointed as Principal from 1st October 1957 in place of Dr. M. Habib Khan who has proceeded to Libya on an F. A. O. assignment. He qualified himself from the Madras Veterinary College in 1932 and joined the Civil Veterinary Department, Hyderabad, as a Touring Assistant Veterinary Surgeon and rose to the present position by sheer dint of hard work, sincerity and merit. He was promoted as a District Veterinary Officer in 1943. And when the College was established in 1946 he was recruited as the only Gazetted Lecturer. Since the inception of the College he has been in charge of the Department of Physiology, which he has well organised. His present promotion is a fitting climax to his long and meritorious service extending over 25 years.

* * * *

Dr. P. Gopinath Nair, B.Sc., G.M.V.C., B.V.Sc., M.Sc., PH.D., returned recently after taking his M. Sc., and Ph. D., from Ohio University.

Before returning to India he worked as a Research Assistant for nearly four years at Ohio State University and as an Instructor for some time at Michigan State University. He travelled extensively in U. S. A., U. K., and other West European countries.

* * * *

Dr. V. Umamaheswaran, B.V.Sc. Dr. Med-Vet (Hann.), has recently returned from West Germany after qualifying for Doctorate in Veterinary Medicine from the Richard Götze Institute, Hannover (W. Germany) under Prof. Dr. Rosenberger. He had also an intensive training in the Surgical and other Clinics of the same College. He is now working in the Department of Surgery at the Madras Veterinary College.

* * * *

They go abroad :— We are glad to note that :—

Sri K. N. Govindan Nayar, G.M.V.C., Professor of Physiology, Madras Veterinary College, has gone abroad to the U. S. A., for advanced training in " Modern Methods of Instruction and Research in Comparative Physiology " at the Tennessee University under the T. C. M. Plan.

Sri G. R. Murkibhavi, G.B.V.C., P.G., Lecturer in Medicine, Bombay Veterinary College has proceeded to U. S. A., for higher studies under the T. C. M. Plan.

Sri R. D. Katiyar, Assistant Disease Investigation Officer, (Sheep and Goats), Rishikesh, U. P., has proceeded to Kenya for higher studies in the general investigation of diseases of sheep and goats under a F.A.O. Fellowship.

Each one of them is an experienced officer in his line and we feel sure this foreign training would do them immense good. We wish them *Bon-voyage* and safe return !

* * * *

Hosur Cattle Farm :— Who says the Veterinarians are not fit to run Livestock Farms ? Here is an unsolicited testimony from an unbiased member of the old Indian Civil Service who had seen Hosur Cattle Farm " Then and Now " :— " On the way back to Hosur, you may deviate through the wide grass park-land and the magnificent avenues of the Hosur Cattle Farm at Mattigiri. This is one of the triumphs of Independent India - in the sense that I can remember the Director of Agriculture and myself walking round it thirty years ago and solemnly telling one another - " if India gets independence, this is one of the places which will certainly collapse and fail ". We had the old arguments which at the time seemed cogent. Indians worship cows but they won't look after them, they allow them to starve or to perish

of a dozen avoidable diseases; Indians are not good with animals, they don't really care for them, this is an animal farm which depends on the animal-loving British for its success..... Well, we were wrong. The Farm has not collapsed and failed; on the contrary, it has gone forward pretty far. Even the dogs, cemetery has been added to-by Indians, and you can't go further than that."—Hilton Brown under "Odd Corners" in *The Mail*, 6—10—57.

* * * *

We feel proud of the above compliment as we have ourselves worked on that farm for well over nine years in various capacities and had worked hard to maintain and even improve upon the then existing 'European' standard of the farm. We have even contributed to the dogs' cemetery which he refers to. Our lovable lady companion, Bull-Terrier 'Biddy' aged nearly 14 years, lies buried there under a modest tomb and it is a place of pilgrimage to us periodically.

* * * *

Mr. Hilton Brown was a distinguished member of the old Indian Civil Service. After nearly 20 years of absence, the lure of India has brought him back and he has been contributing articles to '*the Hindu*' and '*the Mail*' under the captions "India regained" and "Odd Corners". They make delightful reading. Mr. Hilton Brown has always been a prolific writer. We congratulate the Animal Husbandry Department, Madras, for continuing to maintain and improve upon the high standard of that farm. Hats off to Hosur Cattle Farm!

* * * *

A Record Cow.— Farmers in many parts of the world may envy Mr. George Page, who farms about 180 acres at Wilmington on the Sussex Downs, United Kingdom, for his remarkable cow, Bluebell.

Bluebell, at the ripe age of 32, has thirty calves to her credit, including three sets of twins, and is expecting another later in the year, which, like the last, will be the product of artificial insemination. She still gives more than three gallons of milk a day, and used to give eight, and has passed all the tests a milking cow in Britain should try to pass.

No wonder Mr. Page is not worried about her pedigree, although some breeders might not think very highly of it: her father was a true Dairy Short-horn bull, but her mother was a Friesian Dairy Shorthorn cross.

The Mail 9—9—57.

* * * *

Horse hoof for sale at £ 2,500:— For sale at a price of £ 2,500 is one of the hooves of Eclipse, the most famous horse in the history of the British turf.

The horse, bred in 1764 by the Duke of Cumberland, raced only 18 times, but he never lost a race. He also won £ 158,000 in prize money—a great sum of money in those days.

One of his hooves was turned into a gold and silver mounted snuff box, with a miniature of King George IV on the lid. It has been in the possession of the family of Mr. Frank Roper, a Jamaica farmer and racehorse breeder, for 120 years. Now nearly 80, Mr Roper is looking for a collector 'who will treasure it.'

Only one other hoof of Eclipse is known to exist, and that is in the possession of the English Jockey Club.

The skeleton of Eclipse is now in London's Natural History Museum. *The Mail* 9—9—57.

Such is human sentiment! It takes many forms under different climes.

* * * *

Prizes for Research Rs. 5000/- each.—With a view to create an incentive for research work and recognise outstanding work done by research workers in the fields of agriculture, animal husbandry and allied subjects, the Indian Council of Agricultural Research has decided to institute 11 prizes of the value of Rs. 5,000 each. These prizes will be known as "The Rafi Ahmed Kidwai Memorial Prizes for Agricultural Research" and one prize will be awarded annually for outstanding research work done in India in each of the following subjects:— Agronomy, Agricultural Engineering, Agricultural Chemistry, Agricultural Botany, Agricultural Zoology (including fisheries), Horticulture, Animal Breeding, Animal Nutrition, (including Physiology and Bio-Chemistry) Animal Diseases, Dairying, and Agricultural and Animal Husbandry Economics and Statistics.

The prizes will be in the form of gold medals or cash or both and the first prize in each subject will be awarded for outstanding research work done in the country either individually or jointly during the calendar year, 1957, and thereafter for such research work carried out during each subsequent calendar year.

All those engaged in research work in India in the fields of agriculture, animal husbandry and allied sciences are eligible for competing for these prizes. Applications should be submitted in quintuplicate in the prescribed form which can be had free of cost from the Additional Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi.

All applications should be sent in a sealed cover and addressed to the Additional Secretary, Indian Council of Agricultural Research, Queen Victoria Road, New Delhi, so as to reach him not later than April 30, 1958. *The Indian Express*, 13—10—57.

Animal Husbandry Workers should in no way lag behind others.

* * * *

Registration of Veterinary Practitioners:— A bill to provide for the registration of Veterinary Practitioners in the State of Madras has been published in an extraordinary issue of the Fort St. George Gazette today.

The statement of objects and reasons says: The need for the establishment of a Veterinary Council for the registration of Veterinary Practitioners on the lines of similar statutory bodies existing for the allied professions has been repeatedly urged by members of the veterinary profession. At present there is no agency to control and regulate the practice of the profession or to maintain a register of practitioners. The Government therefore consider it necessary to undertake legislation for the purpose. The bill gives effect to this object.

The Indian Express 14—10—57.

* * * *

Indian Science Congress:— Indian Scientists of world repute and many eminent foreign delegates are expected to attend the 45th session of the Indian Science Congress to be held at the University premises from January 2nd to 8th, 1958.

Prof. M. S. Thacker is the General President of the Conference and Dr. A. L. Mudaliar is the Chairman of the Reception Committee.

* * * *

Best Village Level Worker:— A motor-cycle will be presented to the best Village Level Worker in the country. Other awards of prizes are also in the offing for State level, district level and Block Development level workers. Let this be properly publicised.

Block Development Corner

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

MIXED FARMING - I

By

T. Vinayaka Mudaliar, G.M.V.C.,
Retired Livestock Development Officer, Government of Madras.

You have often heard of *mixed farming* in recent years. You have heard it said that it is the only panacea for all the ills of Rural India. I dare say you nodded your head with all your innate modesty and perhaps with a derisive smile on your face! For it is nothing new to Rural India. She has practised it from the dawn of Times. It is the culture of India to practise her virtues without much publicity and not

to grow bombastic over her achievements. If mixed farming has not developed intensively in India, the reasons are to be sought elsewhere and not to lack of knowledge on the subject. The Indian ryot is a born economist and not all the Planning Commissions can hold water against his native shrewdness.

What the authorities mean now is the intensification of your old methods and adoption of new ones wherever found feasible. After all, we cannot claim to be the sole repositories of all knowledge in this world. We have perhaps as much to give as we have to take. Whatever might have been the reasons in the past, there is no justification now if you do not practise mixed farming on an intensive scale. Opportunity is knocking at your door and you have none to blame but yourself if you do not take advantage of it.

An army of specialised Officers are working all the 365 days in your village itself. It is not a question of your going in search of them but they have come there in search of you. Money, they have in plenty to spend on the development of your area. What more is needed then, excepting your active and full-hearted co-operation. Come forward and take up the village leadership.

As you know, mixed farming is only keeping yourself *mainly* occupied with agriculture and in addition paying *enough attention* to dairying and cattle raising as a side line. To these may be added sheep and poultry raising and goat rearing. An average ryot has been doing all these things but the ever-increasing economic stress has however forced him to give up some of these side-lines. With no extra labour and with women-folk to take a hand in dairying and poultrying, with odd pieces of land not fit for cultivation being utilised for pasture and grazing, with leisure hours, if any, fully occupied, with cattle-yard manure enriching the soil and preventing depletion, with the cattle supporting the land and the land supporting the cattle and both supporting the man with rich produce, with good cattle labour, with enough of milk and milk-products and improving the health of the family and perhaps leaving a small cash return, is probably the ideal to be aimed at under mixed farming. It is bad economy to give up these side-lines and as a long-term policy it may prove disastrous. Where are these side-lines to thrive if not in rural areas? With so little additional effort and expense this ideal under mixed farming could be achieved only in rural India. What is needed is intensified effort.

Let us take first the main branch of Mixed Farming *viz.* agriculture. Have you been sharing your knowledge with the Experts who are now staying in your village with regard to proper preparation of the land, selection of seed material, frequency and extent of irrigation, adequate manuring, preservation of cattle yard manure, growing of

green manure crops, preparation of compost, use of artificial manures, rotation of crops, growing of fodder for your cattle and avoidance of wasteful practices such as burning away of cattle dung, continuing to maintain surplus and un-economic animals, which drain away your fodder reserve etc., etc. If you have not, I can only say you are throwing away a golden opportunity. It is a combination of all the above methods that would mean intensification of agriculture for better returns. Otherwise, mixed farming is a myth, if this basic industry is neglected.

In my next article, I shall take up Animal Husbandry, perhaps with a better right to talk about.

PISCICULTURE AS A RURAL INDUSTRY IN MADHYA PRADESH

By

Fishery Section, Bilaspur Division, (M.P.)

Pisciculture in Bilaspur District, Madhya Pradesh, was started in the year 1952 in only one tank at Bilaspur having a water area of nearly 19 acres. This was stocked with the fingerlings of *Calta*, *Rohu* and *Mirgal* brought from Calcutta, the only *fast growing varieties of fish economical for commercial purposes*. Encouraged by its success, six more tanks were stocked with the same varieties of fish at Bilaspur and at Ratanpur, an interior village in Bilaspur District, during the year 1953–54 at the following cost :—

1.	Lease money	Rs.	600·00
2.	Cost of fry	Rs.	1500·00
3.	Transport charges	Rs.	100·00
4.	Cost of watchmen	Rs.	1200·00
5.	Incidental charges	Rs.	200·00
	Total	Rs.	3600·00

At the end of the first year (1954–55) the total receipt from the first tank itself was Rs. 4588·00. The receipts and expenditure for the last three completed years are given below :—

		Receipts.	*Expenditure.*
1954–55	(one Tank)	Rs. 4588·00	Rs. 3600·00
1955–56	(five Tanks)	Rs. 9000·00	Rs. 4500·00
1956–57	(do.)	Rs. 16000·00	Rs. 4000·00

The crop from one more tank is yet to be exploited.

The receipts from this industry are so very attractive that the shrewd ryots of the locality have taken to it much better than expected, in Chattisgarh Division.

THE INDIAN VETERINARY JOURNAL

Vol. XXXIV No. 6

Pisciculture as a Rural Industry in Madhya Pradesh

By

Fishery Section, Bilaspur Division, M.P.

Fig. 1

Dragging a net from one side to avoid escape of fish.

Fig. 2

Successful fishermen with their source of livelihood (*Rahu* and *Catla*.)

Fig. 3

A healthy fisherman's pride.
Three years old *Catla* weighing nearly 22 pounds.

Fig. 4

A rich haul of 12 maunds from Bhima tank in the interior.

[To face page 436]

KERALA VETERINARY COLLEGE HOSTEL BUILDINGS, MANNUTHI, TRICHUR, opened by Sri C. Achutha Menon, Minister for Agriculture and Finance, Kerala State, on the 16th September 1957.

Dr. V. UMAMAHESWARAN, B.V.Sc., Dr. Med. Vet. (Hann.), Department of Surgery, Madras Veterinary College, who has recently returned from West Germany.

Apart from its economic aspect, fish is a protective food of high proteinacious value so essential for growth and health. Although the country is not able to produce at present the required quantity of fish, yet by the end of the Second Five Year Plan, our estimated requirements may probably be met, provided all the sources of Inland Fishery in fresh water tanks are fully exploited.

Obituary

Shri V. S. RAO

We note with deep regret in the *Times of India* dated 10th September 1957, the sad and sudden demise of Shri V. S. Rao, G.M.V.C. He was a highly successful private practitioner in Bombay, and earned a good name in Canine practice. He was the Honorary Secretary of the Bombay Kennel Club and was also in the service of Bombay Pinjrapole where from he retired about three years ago. He acted as a Judge at Dog Shows in Australia and at Ootcamund in Madras State. He returned from England only last year after a short visit. He was highly popular with dog owners and in Masonic circles.

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

Book Reviews

A Handbook of Animal Physiology.—By E. M. Pantelouris, B.Sc., Ph.D. 1957. With 58 drawings 255 Pages, Price 25*s*. Publishers: Messrs Bailliere, Tindall and Cox., Ltd., London.

The book is a treatise on Animal Physiology intended for beginners on the subject. Before attempting a detailed study of any subject it is absolutely necessary to have a thorough understanding of the fundamental principles involved in the same, and Dr. E. M. Pantelouris has presented in his book the basic principles of animal physiology in a very understandable and concise form. He has brought out the very important fact that the phenomena of life are identical in all living organisms and that the difference lies only in their power of adaptation developed during the various stages of evolution.

The arrangement of the book is very well done in five parts dealing with the different aspects of physiology. A novel feature of this book is the presentation of a list of text books at the end of the book.

The book will be of very great use to students, research workers and teachers of this subject. K. T. K.

Veterinary Toxicology.—By R. J. Garner, M.A. (Cantab.), M.V.SC., F.R.C.V.S., A.R.I.C. 1957. pp. 415. Price 35*s*. Publishers: Messrs. Bailliere, Tindall & Cox, Ltd., London.

Lander's Veterinary Toxicology has been the only one of its kind in the field of Veterinary Toxicology and has been both the text-book as well as the reference book for all concerned—Veterinary students, teachers and practitioners. The last edition of this book was published in 1945 and subsequently reprinted to meet its growing demands. Since its publication in 1945 the science of Veterinary Toxicology, as stated by the author in his preface to this volume, has passed from an almost static to an intensely dynamic phase largely through the introduction of an ever-increasing range of chemical pesticides. This has necessitated at this juncture, more than ever, a complete revision of the old Lander's Veterinary Toxicology particularly to include such of those materials accumulated during the past one decade and are of interest to Veterinarians. The author in his attempt in bringing out this new book has definitely succeeded in this respect and the fruits of his labour, I am sure, will be enjoyed by every interested veterinarian.

The new book has assumed a different shape in as much as much of the original text has been re-written and re-arranged. In the volume under review most of the botanical descriptions of poisonous plants which have been unnecessary under the context, have been omitted; the chemical diagnosis is relegated to a separate section and the newer subjects like pesticides and radioactive substances have been included as separate sections. While the deletion of unnecessary botanical descriptions has helped in restricting the size of the book, the relegation of chemical analysis of poison to a separate section and inclusion of separate chapters on pesticides and radioactive substances, have greatly enhanced its usefulness.

Though the author has included the contents of the first 38 pages under "Part I—Introduction", it is felt that the real introduction to the text has been too short. At least the chapter on 'Introduction" as it appeared in the original book could have been retained.

No comment is necessary on the get up of the book and the allied matter connected with it in as much as this book has been one of many such scientific ones published by the well known Bailliere, Tindall & Cox, Ltd., London.

C. K. V.

Canine Surgery.—(A Text and Reference Work):—Edited by Karl Mayer, B.S., D.V.M., J. V. Lacroix, D.V.S., and H. Preston Hoskins, V.M.D., Fourth revised and enlarged edition. 1957. The work of Thirty-eight North American Authors. Publishers: American Veterinary Publications, Inc., Evanston, U.S.A. Price $ 18.

If proof is needed to substantiate the statement that Surgery is an art rather than a Science, the thirty-one chapters presented in the above publication provide ample evidence. This book would appear to cover every aspect of the surgical problems encountered by the Veterinary Surgeons engaged in clinical practice in North America. It is indeed a valuable contribution for purposes of study and for day to day reference both by the students and men in active practice.

The shortage of fully qualified and competent assistants in Veterinary practice appears to be universal, making it obligatory for the average Veterinary Surgeon to be his own assistant, anaesthesist and technician, thereby limiting the full scope of surgical advances in animal practice. And yet the fact remains that almost all surgical advances of the present day are built on experimental studies in animals, particularly on dogs.

Perhaps it may be possible to expect that in future editions of this valuable book, actual descriptions of surgical details will receive greater attention than the elaboration of other features. While it will be of definite value to furnish details of regional anatomy with particular reference to the surgery undertaken, as well as details regarding choice of a particular anaesthetic, its mode of administration, etc. chapters devoted to general descriptive anatomy, physiology, processes like healing and repair, anaesthesia, etc. appear to be a little out of place in a book of this kind. The book could be made a little more handy with the deletion of such chapters. The description of operations on the ear, abdomen, genito-urinary system, anus and rectum, is very well presented and the authors deserve full praise for their contribution.

M. N. M.

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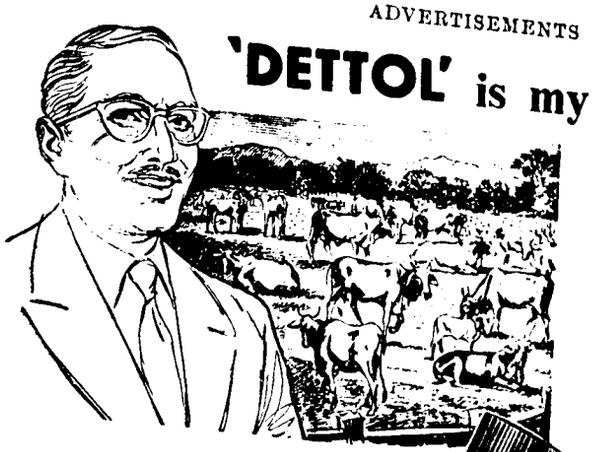

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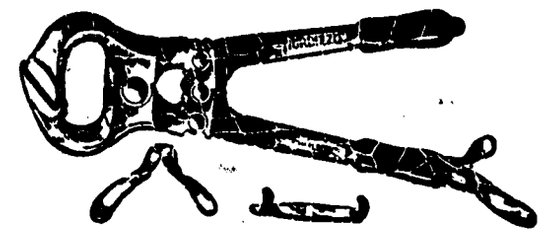

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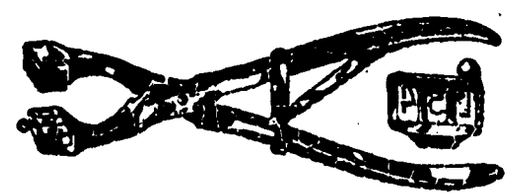

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