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(The Journal of the All-India Veterinary Association)

A Monthly Record of Veterinary Science

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

★

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Editorial

DR. PANDE'S PRESIDENTIAL ADDRESS

None can dispute the fact that in the field of Science, the Indian Science Congress occupies a pre-eminent position in this land. It is therefore gratifying to note that the honour of presiding over a combined session of Medical and Veterinary Sciences this year, has been conferred on a Veterinarian. Our medical confreres, true to the culture of their noble profession, have not been slow in creating healthy precedents. They have realised fully well how very vital it is to work in collaboration with Veterinarians, if Science is to advance at a rapid rate. It is now second time within a space of six years that this honour has been conferred on a Veterinarian. Dr. S. Datta, D.Sc., M.R.C.V.S., D.T.V.M., F.R.S.E., F.N.I., presided over the 1953 session. And now Dr. P. G. Pande, M.Sc., M.R.C.V.S., Director, the Indian Veterinary Research Institute, Mukteswar, has been called upon to shoulder this high responsibility. We are sure the Veterinary profession as a whole, feels elated at this fine gesture of the sister profession of Medicine.

How happy has been the choice is evident from his Presidential address, which we publish elsewhere in this issue. Instead of pursuing the beaten track of zoonoses, which by virtue of their importance receive sufficient attention at the hands of the Medical profession, Dr. Pande has set for himself a specific subject, "The place of Veterinary Research in the Nation's plan for food production" and has dealt with it in a masterly way.

Dr. Pande makes it quite explicit when he says "Our food problem to-day is the problem of all problems and how the application

of Veterinary Research to solution of this problem in the country can materially strengthen our existing food resources is the theme of the present address." He clinches the issue very nicely when he says " It is the Science and Technology in all spheres which must form the spear-head of our struggle for the achievement of freedom from want and hunger."

Speaking of Live-stock as national wealth, Dr. Pande draws attention to the fact that they possess vast potentialities for development on scientific lines, " not only to meet the growing needs of the country, but also to build up a sizable export trade." He points out that even as things stand now the annual income from organic manure alone is estimated at 1,000 crores, as against 818 crores earned through iron, steel, coal, cotton textiles, jute and sugar, all put together !

With the " progressive increase of the total cattle population of the country without a corresponding increase in the available supplies of fodder and cattle feeds," Dr. Pande is of opinion that the inherent danger in pursuing such a policy is that it may lead to " bankruptcy of the cow and milk as a saleable commodity may altogether disappear from the market." He tabulates 1945 and 1951 figures in support of his statement.

Next he points out that increased availability of any food commodity leads to increased consumption and he poses the question ' What stands in the way of increased production of foods of animal origin ? " He answers it by saying that it is the general pattern of our agriculture that is responsible for it. He adds " No country in the world has achieved self-sufficiency in food, both quantitative and qualitative through cereals alone. Integrated agriculture aiming at production of foods of animal origin, therefore, has much to commend and our land resources have to be apportioned for growing food crops and raising live-stock." He does not mince matters when he says, " The present pattern of land utilisation has, therefore, to be re-orientated." He rightly observes " that cattle in India hold the most strategic position and that in the ultimate analysis, it is the efficiency of animals that determines the country's capacity for food production.

Then he outlines what is being done under the several national plans and what more should be done to increase production of milk, meat and eggs. Dealing with research as a basis for development, he catalogues a few instances of triumph of Veterinary Research, which

have benefitted the farming community in South Africa, Australia and India. Discussing the well-known methods of breeding for production, he emphasises the fact that proper dissemination of superior genes from high pedigree bulls, forms the corner stone in all such developmental work. He visualises a day when a few 'semen banks' would be established, where deep-frozen semen could be stored for a year or two. He considers the lack of feeds and fodders as a great bottle-neck. He pleads that cultivated fodder may also find its rightful place in all cropping schemes and that surplus monsoon-fed grasses may be processed to the maximum advantage of the farmer. He insists that research is indicated on the study of indigenous and some exotic grasses, their ecology, yield and nutritive value. He raises a smile when he says " Our fertiliser experts also have a problem to tackle and that is to look to some other directions for fertilisers than to appropriate all oil-cakes, molasses, blood, bone and fish meals which in all reasonableness should go to our cows for milk production."

Finally he concludes by saying that much remains to be done on the disease side, if sufficient funds and personnel are made available.

The address on the whole is a vigorous plea for a balanced development of crop husbandry and animal husbandry in the interest of the augmentation of Nation's food supply as a whole. We commend the address to the careful study of our readers.

LISTERIOSIS IN SHEEP

Cases of Listeriosis in imported sheep from Australia, causing abortion in ewes and Broncho-pneumonia in lambs are recorded elsewhere in this issue by Dhanda and his co-workers. It only confirms the findings of the previous workers that this disease should not be considered necessarily as a disease of the central nervous system. This naturally raises the question of vigilance that is required in importing livestock from other countries. It may be that we are having this disease already in this country as has been recorded by Viswanathan and Venkatraman (1950); even so, we may be introducing a new serological type, as has been pointed out by Dhanda and his co-workers. Lack of sufficient knowledge of the epidemiology of the infection makes it necessary to keep a careful watch, from public health point of view as it effects both a wide variety of animals and human beings.

A Great Scientist passes away

CECIL WARBURTON

1854 - 1958

[CONTRIBUTED]

We record the passing away of Cecil Warburton at Grantchester, Cambridge, England on 7-10-1958 at the ripe age of 104 years and 8 months. His is a familiar name to the Veterinary as well as Medical Entomologists. Generations of research workers in Acarology will remember Warburton through his valuable contributions to the volume of "Cambridge Natural History" dealing with Arachnida and to the monumental publication—"Ticks—A monograph of the Ixodoidea" which to this day remains the standard and authoritative work on ticks.

Cecil Warburton was born on 6-2-1854 at Salford, England. He graduated from Christ's College, Cambridge, later took his M.A. degree and thereafter joined the staff of his *alma mater*. He became the Zoologist to the Royal Agricultural Society in 1893 and was connected with it till as late as 1940. From 1899 he lectured in the University School of Agriculture till his retirement in 1932. He served also as a teacher in Medical Entomology in Molteno Institute, Cambridge from 1911 to 1932.

Acarology was the main field of research of Warburton. This specialisation brought him in contact with Dr. Nuttall and their association resulted in the bringing out of the invaluable monograph on ticks. He was sought after by workers from every part of the world for the specific identification of their collection of Ixodides. It is said that he used to visit the Molteno Institute till four years ago and evince great interest in the work carried on there.

Cecil Warburton devoted his entire lifetime to the advancement of science, which fact was probably the cause for his having remained unmarried.

V. S. ALWAR.

General Articles

A CASE OF LISTERIC ABORTION IN AN EWE WITH A SMALL SCALE SURVEY OF THE INCIDENCE OF AGGLUTININS TO *LISTERIA* IN THE SERA OF SHEEP

BY

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While carrying out routine bacteriological examination of specimens received from the field, the authors, during 1955, isolated a culture of *Erysipelothrix* (*Listeria*) *monocytogenes* from a uterine pus swab of an ewe which had aborted. As this was probably the first authentic case of abortion in any of the species of domesticated animals in our country from the uterine discharge of which a culture of *Listeria monocytogenes* was isolated, it is being recorded with a view to stimulate interest in the study of the problem of abortion in animals with special reference to *Listeria* infection.

History of the case

The material was received in the form of a uterine pus swab from the Central Wool Research Station, Pashulok from an ewe which had aborted. This farm had purchased some sheep from Australia and the ewe from which the material had been collected was from amongst the imported stock. In general, no nervous symptoms, commonly associated with Listeriosis, had been observed at this farm.

Bacteriological examination of the material

Examination of impression smears of the uterine pus swab revealed, apart from other pyogenic organisms, Gram positive, non-sporulating, cocco-bacillary and rod-shaped organism resembling *E. monocytogenes*. Examination for motility of a 4-hour old glucose broth culture of the uterine swab revealed characteristic cocco-bacillary forms showing tumbling motility; no vibrios were seen. The swab was streaked on tryptose blood agar plates which were incubated at 37°C aerobically, anaerobically and under 10% Co_2 tension. After incubation for 24 hours aerobically, many small alpha-haemolytic

colonies could be observed which on further incubation showed Beta-haemolysis. Small gram-positive rod-shaped organisms were observed in stained preparations from these colonies. Anaerobic and microaerophilic incubation failed to reveal the presence of other pathogenic organisms of significance such as members of the Clostridium, Vibrio or Brucella groups. Motility was demonstrated by examination of 4-6 hour old glucose-broth cultures (Seastone 1935). When stained for flagella, according to Leifson's method (1951), the organism was found to be peritrichous at 23°C and monotrichous at 37°C confirming the earlier observations of Seastone (1935), Paterson (1940) and Griffin and Robins (1944).

The techniques and methods followed in the biochemical examination of this strain were those of Graham *et al* (1943) and Kauffmann 1954). Biochemically, the strain exhibited the following reactions: Acid was produced within 24-48 hours in dextrose, maltose, glycerol, levulose, salicin and xylose. Slow acid formation was noted in lactose nd sucrose. Sorbitol was not fermented even after incubation for 1 days at 37°C. Mannitol fermentation was delayed upto the tenth ay. Dulcitol, trehalose, raffinose and inulin were not fermented. The rganism failed to produce indole, acetylymethylcarbinol, hydrogen ılphide or urease. It could not utilise citrate as the sole source of ırbon. M. R. and catalase reactions were positive and there was a ırtial reduction of methylene blue in broth culture. The organism ew in the presence of 6·5 per cent sodium chloride. Litmus milk owed evidence of slight acid production by about the 7th day but a aracteristic feature appeared to be the reduction of litmus in the upper ird column of the medium after 6 hours incubation of the culture 37°C.

Xylose fermentation, though feeble, was in accordance with the rlier observations of Graham *et al* (1943). The organism could not drolyse starch, cellulose or sodium hippurate nor did it grow in the esence of 0·075 mgm. of potasium cyanide.

Pathogenicity

The techniques and methods employed for the study of pathogeni-y were those of Osebold and Inouye (1954). The pathogenicity of strain was tested for mice, rabbits as well as for sheep and goats.

Mice:—Two swiss albino mice were given 24 hour old broth ture in a dose of 0·5 ml. intrapertoneally and two other mice 0·03 ml. odurally. The mice died in about 24—48 hours and a culture of *monocytogenes* was isolated from each of the 4 mice.

Rabbits:—Two rabbits were inoculated intraperitoneally each h 0·5 ml. of a 24 hour old broth culture of the strain. Both the

rabbits succumbed within 4 days. On post-mortem examination, focal abscesses were observed in the liver and kidneys and a culture of *Listeria monocytogenes* was isolated from both the animals. Later, 0·5 ml. of a 24 hour old broth culture was given intravenously to each of the two rabbits. Both the animals died in 24 hours. On autopsy, degeneration of liver and pneumonia were the prominent lesions. Bacteriological examination of the liver of the rabbits resulted in the isolation of a culture of *E. monocytogenes*.

On the lines of Osebold and Inouye (1954), reaction after instillation of the culture into the eye of a rabbit was also studied. The rabbit showed severe conjunctivitis and copious muco-purulent discharge which glued the eyelids together. Keratitis and opacity of the cornea developed by about the seventh day.

Sheep and goats:—Four healthy goats and 3 healthy sheep of local breeds were selected for this study. Their age varied from 3 to 4 years. The animals were housed in a clean shed for a month before exposure to infection. During this period, body temperature of all the animals was recorded daily both in the morning and in the afternoon. Swabs were taken from the rectal, genito-urinary and oral passages as well as from the conjunctiva at weekly intervals for bacteriological examination. Besides, agglutination test with *Listeria* antigen was carried out on their sera at an interval of 15 days. On the basis of the results of these examinations all the sheep and goats selected for pathogenicity trials were found negative for evidence of *Listeria* infection.

The technique adopted in artificial infection was similar to that followed by Osebold and Inouye (1954) and Gray, Singh and Thorp (1955). The infecting dose was prepared by growing the strain on tryptose agar at 37°C for 24 hours and after ascertaining it to be free from any contamination, the growth was washed with a few ml. of isotonic phosphate buffer solution and was centrifuged in order to sediment the organisms. The bacterial cells were resuspended in a suitable volume of isotonic phosphate buffer so as to match in opacity to tube 10 of Brown's scale. One goat and one sheep were each given the culture in a dose of 1·5 ml. by the intra-ruminal route and the remaining two goats and two sheep were given the culture intravenously each in a dose of 0·5 ml. The respective doses of the *Listeria* culture were repeated after 6 days and again after 11 days from the date of primary infection. After infection all the animals were kept under close observation and at intervals of 7 days, 19 days, 32 days and 48 days from the date of primary infection, their sera were subjected to agglutination test. Besides, the body temperature was recorded daily both in the morning and afternoon. The readings of body temperature 3 days before infection and three days

following administration of the primary dose of the Listeria culture are given in the graph reproduced below :

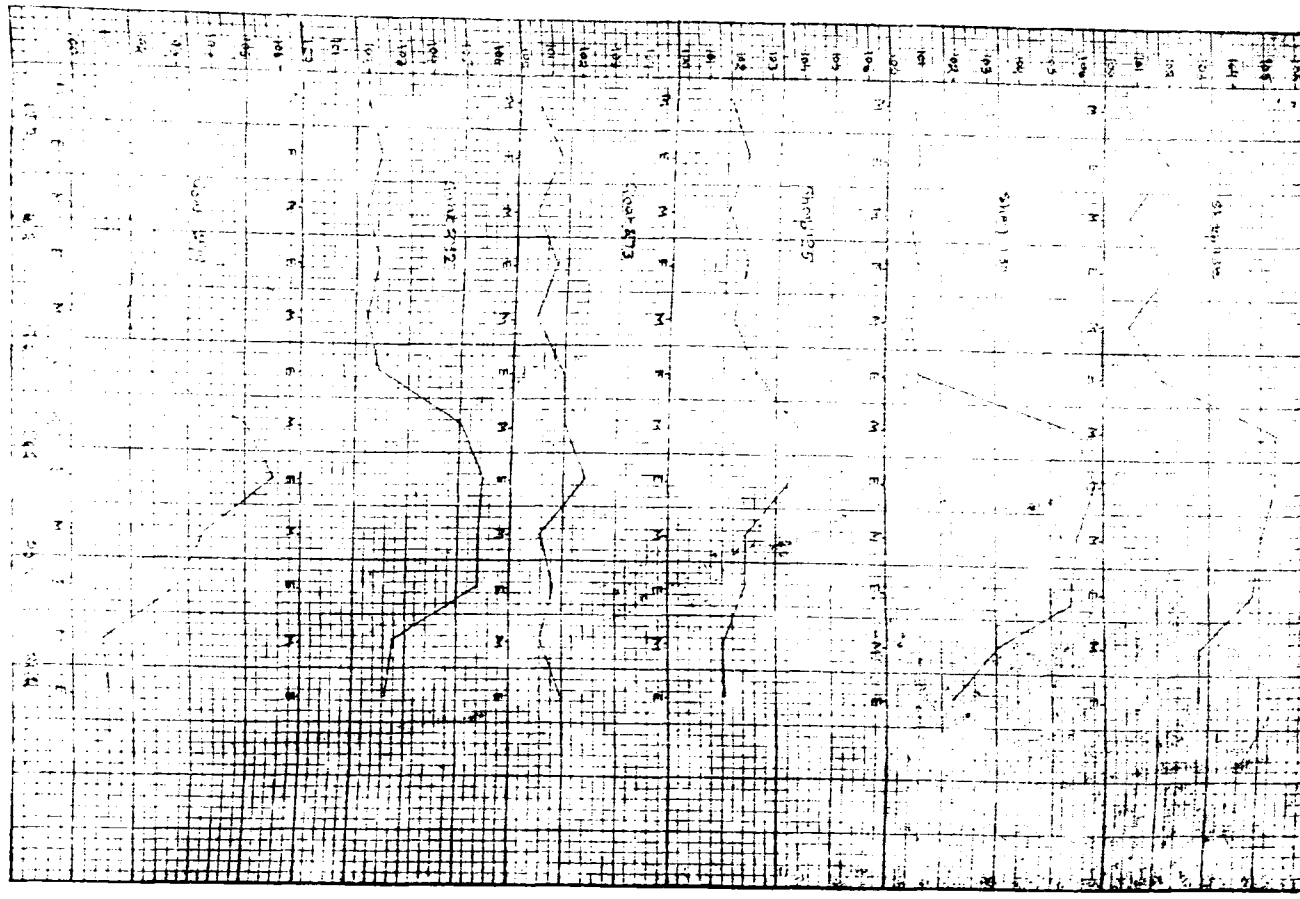

TABLE I

Mapping out results of bacteriological and serological examination of L. monocytogenes exposed goats and sheep.

Sl. No.	Particulars of animals	Route of exposure	Date(s) of exposure	Outcome	Reciprocal agglutinin titres of sera collected after primary infection					Results of bacteriological examination of tissues						
					7 days	12 days	19 days	32 days	48 days	Rumen	Spleen	Kidney	Liver	Lung	Heart blood	Brain	Spinal cord
1	Goat 279	Intra-ruminal	18-12-55 24-12-55 29-12-55	Destroyed on 6-2-56	800	100	200	800	25	ODC+	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC +	ODC — REC —
2	Goat 292	Intra-venous	18-12-55 24-12-55 29-12-55	Destroyed on 12-7-56	6,400	200	100	400	400	ODC+	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC + (14)	ODC — REC —
3	Goat 273	Intra-venous	18-12-55 24-12-55 29-12-55	Destroyed on 12-7-56	100	400	1600	200	400	ODC+	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC + (21)	ODC — REC —
4	Sheep 130	Intra-venous	18-12-55 24-12-55 29-12-55	Died on 21-1-56	800	200	100	200	Died earlier	...	ODC — REC —	ODC — REC —	ODC — REC + (56)	ODC — REC —	ODC — REC —	ODC +	ODC — REC —
5	Sheep 132	Intra-venous	18-12-55 24-12-55 29-12-55	Destroyed on 6-2-56	3,200	200	400	200	50	...	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC +	ODC +
6	Sheep 135	Intra-venous	18-12-55 24-12-55 29-12-55	Destroyed on 12-7-56	50	nil	50	100	25	ODC+	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC —	ODC — REC + (28)	GDC — REC —

Key :—ODC represents original direct culture.
REC represents reculture after holding the tissues in tryptose broth in a refrigerator over a period of thirty days and cultured at weekly intervals.
.....Not cultured.

It will be seen that all animals with the exception of goat 273 and sheep 135 showed a very high rise in their body temperature. Goats 273 and 292 showed opacity of cornea and symptoms suggestive of brain involvement. Sheep 130 exhibited incoordination of movement and died 24 days after the last infecting dose. The remaining animals were destroyed at varying intervals and their internal organs were subjected to bacteriological examination directly as well as after holding the tissues in tryptose broth kept at 4°C for varying periods of time. The results of bacteriological and serological examination are presented in Table I.

As the above studies were being pursued, material from several cases of bronchopneumonia in lambs was recieved from the Central Wool Research Station, Pushulok. Bacteriological examination of these specimens resulted in the isolation of as many as eleven strains of *E. monocytogenes* (Dhanda and Chandrasekariah, 1958). As stated earlier this farm had imported some of its stock from Australia and such a large number of isolations of Listeria cultures from the imported sheep and their progeny, during a short period of about a year, raised a fundamental issue as to whether the disease was spreading in our country through the imported animals or was already prevalent but not properly investigated. With this object in view, a small scale serological survey was undertaken to compare the rate of infection in the imported sheep of Central Wool Research Station, Pashulok, with the rate of infection in the indigenous sheep of the same farm as well as with the rate of infection in the indigenous sheep purchased from the districts of Naini Tal, Almora and Bareilly (Uttar Pradesh) by carrying out agglutination test with Listeria antigen (s).

The Listeria antigens for this study were prepared by growing separately, on tryptose agar contained in Roux plates, each of the following five strains of *Listeria monocytogenes* representing serotypes as indicated against each :

1. Strain NCTC 5349 — (Paterson type I),
2. Strain NCTC 7973 — (Paterson type II),
3. Strain NCTC 5105 — (Paterson type III),
4. Strain NCTC 5214 — (Paterson type IV), and
5. Strain R_2S (isolated by the authors from the uterine pus swab of an imported ewe of the Central Woll Research Station, Pashulok and typed as Paterson type IV (b). After holding at 100 C for 2 hours, the harvested cell suspension was washed thrice in 0·85 per cent saline and filtered through gauze. The suspension was then diluted with normal saline solution till it matched with Brown's opacity tube 4. Merthiolate was added to a final concentration of 1 : 15,000 as a preservative. The antigens were tested for their specificity on known positive sera

produced against each of the five serotypes of *E. monocytogenes* as well as against known healthy sera.

The agglutination test was carried out by making double-fold dilutions of the serum in 0·85 per cent saline and adding equal quantities of each of the five antigens. The tubes containing the serum and the antigen were incubated at 37°C and the results of agglutination were recorded after incubation for 24 hours as well as 48 hours.

Before starting this investigation, basal titre for 49 apparently healthy sheep was determined and found to be 1 : 20 or below. Osebold and Inouye (1954) subjected 16 samples of sheep serum to agglutination test with Listeria antigens and found 13 to give a titre of 1 : 10 or below. Two animals had titres of 1 : 25 while another specimen reacted in a dilution of 1 : 100. In our investigation 44 out of 49 (89·8%) serum samples collected from apparently healthy sheep gave a titre of 1 : 10 or below, 5 (10·2%) gave a titre of 1 : 20 and none showed a titre higher than that (Table II). In view of these findings, in the present study a titre of 1 : 40 or above, complete agglutination, has been regarded as a positive titre and titres lower than these have been classified as negative.

TABLE II

Showing titres for Listeria monocytogenes from 49 apparently healthy sheep sera.

Serial No.	Particulars of antigen	Titre			
		Complete 1/10 or below	Complete 1/20	Complete 1/20 Partial 1/40	Complete 1/40 and above
1	P. E. nil (R_2 S) Paterson type IV B	44/49 (89·8%)	5/49 (10·2%)	Nil	Nil
2	NCTC5349 Paterson type I	29/31 (93·5%)	2/31 (6·5%)	Nil	Nil
3	NCTC7973 Paterson type II	28 31 (90·3%)	3/31 (9·7%)	Nil	Nil
4	NCTC5105 Paterson type III	31/31 (100%)	Nil	Nil	Nil
5	NCTC5214 Paterson type IV	31/31 (100%)	Nil	Nil	Nil

Note :—Numerator denotes total number of positive reactors. Denominator denotes total number of sera tested.

Further, a study was made to find out if the Listeria antigens prepared by us gave any non-specific reaction with sera from cases of

Pasteurellosis in sheep. This work was carried out as the sheep of the Central Wool Research Station, Pashulok, were showing a high incidence of Pasteurella infection as well as Listeria infection, and, as such, it was necessary to ascertain the reliability of the Listeria antigens in picking up cases of Listeria infection.

Agglutination tests were carried out on serum samples of 12 sheep that had been vaccinated with an adjuvant vaccine prepared from three strains of *P. septica* isolated from cases of Pasteurellosis in sheep on the same farm. These animals were divided into three groups each of four sheep and animals in each group were challenged with each of the three homologous strains. The results of agglutination test carried out before and after infection are presented in Table III which would show that there was no diagnostically significant rise in the agglutination titre following immunisation and challenge with *P. septica* antigens.

TABLE III

Showing results of agglutination test on sera of twelve Pasteurella adjuvant vaccinated sheep before and after challenge with Past. septica.

Sl. No.	Particulars of antigen	Number of sheep showing agglutinin titres of				Date of vaccination	†Date of challenge	Dates of collection of serum
		Zero	1/10	1/20	1/40			
1	NCTC5349 Paterson's serotype I	6 3	6 7	Nil 2	Nil Nil	24-10-57	11-12-57	10-12-57 20-12-57
2	NCTC7973 Paterson's serotype II	Nil 1	11 6	1 5	Nil Nil	24-10-57	11-12-57	10-12-57 20-12-57
3	NCTC5105 Paterson's serotype III	8 1	4 8	Nil Nil	Nil Nil	24-10-57	11-12-57	10-12-57 20-12-57
4	NCTC5211 Paterson's serotype IV	12 2	Nil 10	Nil Nil	Nil Nil	24-10-57	11-12-57	10-12-57 20-12-57
5	P. E. 111 (R_2S	1	10	1	Nil	24-10-57	11-12-57	10-12-57 20-12-57
	Paterson's sero-sub-type IV b.	1	6	5	Nil			

Key:—The upper numbers in the columns against each serotype represent data before challenge and the lower numbers represent the data after challenge.

Agglutination test on imported sheep

After having ascertained the basal titre of apparently healthy sheep, and determined that *P. septica* infection did not complicate the interpretation of results of the agglutination test, serum samples collected from 37 imported sheep of the Central Wool Research Station, Pashulok, were subjected to tube agglutination test with the antigen prepared from R.S strain (Paterson type - IVb) which had been isolated from the uterine pus swab of an imported ewe from this very group of sheep. The results of the test are summarized in Table IV.

TABLE IV

Showing the results of agglutination test on 37 imported sheep of the Central Wool Research Station, Rishikesh.

Titre	Number	Percentage	Remarks
Negative	9	24·3	
1 : 50 (trace)	2	5·4	
1 : 50 (complete)	3*	8·1	*Trace reactions (+) observed in 1 : 100
1 : 50 (complete) and 1 : 100 (partial)	1	2·7	
1/100 (complete) and 1 : 200 (partial)	12	32·5	
1/200 (complete)	1	2·7	
1/200 (complete) and 1/400 (partial)	4	10·8	
1/400 (complete) and 1/800 (partial)	3	8·1	
1 : 1600 (complete)	2	5·4	
	37	100·0	

From the above table, it would be seen that as many as 26 out of 37 imported sheep (70·3%) showed positive agglutination titre against the Listeria antigen prepared from the R_2S strain of *Listeria monocytogenes*. The serum samples could not be tested against the remaining four antigens as quantities of the serum received were not sufficient for test against all the antigens.

Agglutination test in indigenous sheep

In view of this alarmingly high rate of infection in the imported sheep of the Central Wool Research Station, Pashulok, serum samples from 24 indigenous sheep of the same farm were subjected to agglutination test with antigens prepared from all the four serotypes of Paterson as well as against the antigen prepared from the strain R_2S isolated locally. The results of the agglutination tests are presented in Table V which would show that none of the animals tested gave a diagnostically significant titre.

TABLE V

Showing the results of agglutination tests on sera of indigenous sheep stationed at the Central Wool Research Station, Rishikesh.

Sl. No.	Particulars of antigen	Number showing titre								
		No. agglu-tination	Trace 1/10	Partial 1/10	Com-plete 1/10	Complete 1/10 partial 1/20	Com-plete 1/20	Complete 1/20 partial 1/40	Com-plete 1/40	Compl 1/40 partia 1/80
1	P.E. nil (R_2S) Paterson's type IV (b)	10 (41·7%)	4 (16·7%)	4 (16·7%)	Nil (nil%)	1 (4·1%)	4 (16·7%)	1 (4·1%)	Nil	Nil
2	NCTC 5349 Paterson's type I	15 (62·5%)	1 (4·1%)	6 (25·0%)	1 (4·1%)	1 (4·1%)	Nil	Nil	Nil	Nil
3	Paterson's type II NCTC 7973	10 (41·7%)	5 (20·9%)	4 (16·7%)	1 (4·1%)	3 (12·5%)	1 (4·1%)	Nil	Nil	Nil
4	Paterson's type III NCTC 5105	11 (45·8%)	3 (12·5%)	3 (12·5%)	4 (16·7%)	1 (4·1%)	2 (8·4%)	Nil	Nil	Nil
5	Paterson's type IV NCTC 5214	19 (79·2%)	1 (4·1%)	1 (4·1%)	2 (8·4%)	1 (4·1%)	Nil	Nil	Nil	Nil

Discussion

Olson (1945) and Ferguson (1951) suggested that *E. monocytogenes* might be a normal inhabitant of the bovine genital tract being present at so called "normal birth". This suggestion of conditional parasitism implied the harmless existence of *E. monocytogenes* in the genito-urinary tract at certain times, if not continuously. This hypothesis found elucidation when Sternberg (1953) isolated *E. monocytogenes* from the vaginal mucus of a cow, Gray and McWade (1954) from the cervix of a repeat breeder cow and Stoot (1956) from the cervix of a normal woman. A similar transient occurrence of this bacterium in cow's milk was reported by Wramby (1944), Potel (1953) and De Vries and Strikwerda (1956). The association of *E. monocytogenes* with a variety of infections where its role as a pathogen could not be established in a wide range of animal species led several investigators (Seeliger, 1952; Eveleth *et al*, 1953) to postulate the hypothesis of conditional parasitism. The role of this bacterium in human abortion has been studied intensively by Gray, Seeliger and Potel (1956) in Germany while Stockton *et al*, (1954) reviewed the problem of Listeriosis and abortion in cattle, sheep, goats and mares. Gray *et al* (1956) considered that Listeric abortion constituted perhaps the most hazardous form of Listeric infection from the

stand point of both animal and public health. However, the preliminary survey carried out by us has shown that although as many as 26 out of 37 (70·3%) imported sheep of the Central Wool Research Station, Pashulok showed positive agglutination titre against a Listeric antigen, not a single indigenous sheep out of 75 tested showed diagnostic titre against any one of the five antigens employed for the study.

In India, Viswanathan and Iyer (1950) isolated Listeria organisms from cases of circling disease in the State of Madras. Although these findings have not been confirmed so far by other workers, they point out that foci of Listeria infection may already be present in certain areas of our country and, as such, investigations should be taken up to study the problem of Listeriosis as it affects the livestock of our country so as to formulate suitable measures for its eradication before it assumes serious proportions. In view of this preliminary work, it seems that all animals purchased from abroad should be subjected to serological tests for Listeria infection and should be imported into our country only if they prove negative, otherwise, animals imported from abroad where Listeria infection is widespread may set up fresh foci of infection in areas which are hitherto free from infection or may introduce new serological types which may not be present in India. Studies are being pursued further along these lines, the results of which will be published in due course of time.

Summary

Isolation of a culture of *Erysipelothrix* (Listeria) *monocytogenes* from the uterine pus swab from a case of abortion in an imported ewe is reported.

2. Biochemical characters and pathogenecity of the organism for rabbits and mice as well as for sheep and goats are described.

3. Results of a small scale serological survey for detecting the presence of agglutinins in the sera of indigenous as well as imported sheep against Listeria are presented.

4. The importance of the problem of Listeriosis *vis-a-vis* animal and public health is discussed.

Acknowledgment

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A STUDY OF EYE CANCER AMONG BOVINES IN MYSORE STATE WITH SPECIAL REFERENCE TO ITS HISTOPATHOLOGICAL FEATURES, BIOLOGICAL BEHAVIOUR AND SOME FACTORS ASSOCIATED WITH ITS CAUSATION

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Carcinoma of eye in bovines, popularly known among veterinarians as eye cancer is fairly common in Mysore State. The term Cancer is used to mean a malignant tumour. Merillat (1936) stated that Cancer in animals was generally a disease of adults and the aged and that Cancer cell in animals was not so apt to run riot as it did in human beings and therefore it was not always correct that Veterinary Pathologists should copy the concepts of human pathologists in all cases of animal cancer. Olson (1947) pointed out that all factors controlling tissue growth were not clearly known; yet the normal restraint of cellular growth was seen very well in the process of repair of a skin wound in which the whole picture during earlier stages, though appeared disorganised, on complete healing became differentiated and organised and respective tissue ceased to grow; but cancer cells grew without any restraint serving no useful purpose.

Runnels and Benbrook (1942) out of 75 epithelial tumours studied, found 54 squamous-celled carcinomas of which 35 were located on the membrana nictitans but none of them metastasized and majority of them occurred in horses between the ages of 7 to 12 years. Frank (1943) reported that neoplasms of the eye were most common in cattle but usually only one eye was affected. Hereford cows appeared more susceptible and the tumours involved the nictitative membrane, the cornea and the eye-lids particularly the lower eye-lid, and if extensive, involved the frontal sinus occasionally producing exophthalmus due to the development of lymphocytoma in the orbital cavity posterior to the eye ball pushing it out. These neoplasms affecting the eye or its appendages were always found to be the squamous-celled Carcinomas. Thorp and Graham (1931) reported a periocular carcinoma in a Hereford cow which started as a small light red growth on the lower eye lid, but gradually enlarged and the enlargement was confined to the lachrymal and malar bones. Bullard (1936) reported six cases of malignant neoplasms of the eye in horses of which 5 were squamous-celled Carcinoma and one round-celled Sarcoma, all operated and there was no evidence of recurrence up to one year after operation. Schol (1935) described a carcinoma of eye in cattle which started from

membrana nictitans, but after surgical removal with the whole nictitative membrane, the condition never recurred. Vandenberg (1935) recorded a carcinoma of the third eye lid in a 13 year old mare which on removal, recurred after several days but when removed completely with the third eye lid, no more recurrence followed. Fox (1956) observed that squamous-celled carcinomas were the most common malignant neoplasms of the bovine eye and stated that the third eye lid (membrana nictitans) was the most frequent site of the initial appearance of the tumour and its rapid extension might quickly cover up the eye ball from view. Though some believed that the eye ball itself might be the starting site of the tumour, experienced workers had never seen such a condition and thought that eye ball very rarely got affected primarily.

Cancer of Eye in cattle in Mysore State had neither seasonal incidence nor regional distribution. It was more common in working bullocks fed in stalls on concentrates, straw etc. than in cows kept on only green grass through grazing and it was observed in plain cattle more than in cattle of malnad regions. The proportion of affected animals was higher in older animals and was very rare in buffaloes in Mysore State. As the condition developed very slowly the considerable damage caused ultimately to the cattle wealth by its incurable nature was not apparent to many cattle owners. If a little care were to be taken by the owners on the lines suggested by the veterinarians, not only this damage could be avoided but also a considerable degree of relief could be afforded to the dumb animals. Generally the earliest stage of the neoplasm always escaped the notice of the owner as well as the field veterinarian. There were instances however, where such observations were made and beginning of the cancer in eye was anticipated and later on a full fledged cancerous growth actually developed.

Cancer of the eye started usually from the nictitative membrane at the inner canthus of the eye. In the beginning severe watery discharge was observed from the eye and a red spot surrounded by a pale yellow zone was observed on the free edge of the nictitative membrane. Gradually the entire membrane became reddish and swollen and granular fleshy growth appeared at the free edge of the membrane and later on this growth extended slowly all over the inner aspects of the eye lids and covered up the whole eye ball rendering the animal almost blind. The growths became cauliflower like in appearance and blood red in colour. These bled easily on manipulation. Due to irritation the animals rubbed the eye against hard objects and external injury was often caused. This was usually followed by bacterial infection and owing to pus formation foul swelling discharge from the eye was observed. Gradually the entire eye was lost.

Some systematic work on eye cancer in cattle with reference to its biological behaviour, histopathological features and treatment was carried out in this laboratory. During the period of about 5 years, sixty neoplasms of the eye among bovines were studied in detail histopathologically while seventeen neoplasms of the eye were studied biologically by means of heterologous ocular transplanation with a view to ascertain their origin and nature. In this study, the eye cancers were all from the nictitative membrane of the eye and the beginning of the neoplasm was observed at the earliest stage as a hyperaemic spot surrounded by a paler zone and usually preceeded by severe lachrymation and conjunctivitis.

Histopathological examination revealed that among the sixty neoplasms 57 eye cancers had typical features of squamous-celled carcinoma with the presence of epithelial cell nests as shown in Fig. 1. and three so-called eye cancers revealed adenomatous structures with alveolar arrangement of cells and could be classified as benign adenomas as shown in Fig. 2.

These neoplasms of the eye starting from the nictitative membrane usually involved the eye lids, extended over the cornea and sclera and became extensive due to injudicious surgical interference. The neoplasm involved the frontal sinus in a few cases resulting in the exophthalmus of the eye ball and foul bloody discharge from the nostrils. Whether metastasis in the internal organs occurred in such cases could not be studied since the animals were disposed of by the owners when condition became worse.

All the Squmous-celled Carcinomas of the nictitative membranes in advanced stages were highly vascular and fragile with broad bases of attachment deep into the tissue. The histological picture consisted of diffuse collections or compact masses of squamous epithelial cells, irregularly and often incompletely separated by fibrous stroma into nest-like groups or strand like processes which infiltrated the surrounding healthy tissues. The blood vessels were found in the fibrous stroma. (Fig. 3.) The epithelial cells which constituted these squamous-celled carcinomas often varied widely in appearance in different parts of the same neoplasm, depending on the state of nutrition and certain other factors such as trauma and infection. The tumour cells were mostly polyhedral, although the morphology of individual cells differed greatly from that of cells of normal squamous epithelium. Majority of the tumour cells were immature and there were numerous mitotic figures, cellular infiltrations with lymphocytes and polymorphonuclear leucocytes was observed in the meshes of the supporting stroma especially in cases where extraneous infection of the neoplasm had occurred. In some cases necrobiasis was present due to inadequate nutrition brought

about by failure of the blood vessels to keep pace with the rapidly growing epithelial cells. In some squamous celled carcinomas of the bovine eye, the cells exhibited functional differences comparable to normal cells of the epidermis and as a result cornification was observed and in such carcinomas the cells were frequently arranged in nest like whirls or in a concentric type of arrangement and the centre usually appeared as a compact cellular mass in which definite individual cell outlines were absent or very faintly discernible but remains of atrophic nuclei were sometimes seen. Such concentrically arranged group of cells with peculiar hyaline appearance known as Epithelial pearls were usually more acidophilic in staining than the elements which constituted the remaining cell mass. (Fig. 4). Due to the presence of these epithelial pearls, some oncologists called this variety of squamous-celled carcinoma as " Pearl cell Carcinoma " or epidermic Carcinoma. The formation of these cornified centres was due to inability of the older or cornified cells to be eliminated.

Besides numerous mitotic figures, the enlarged neucleoli were observed in several cells. Though these neoplasms possessed most of the histological features of malignant growths their outward location mostly minimized the possibility of metastasis.

In addition to the histopathological study of these sixty neoplasms of the eye, biological study of seventeen tumours was mady by transplanation of surgically removed fresh cancerous tissues into the anterior chamber of the guineapig's eye by a special technique and records of the take of the implants were maintained. Out of seventeen neoplasms, only 15 were successfully transplanted while in case of 2, the eyes of guineapigs got infected and the resulting opacity of the cornea rendered the condition unsuitable for study. Among the 15 neoplasms transplanted successfully only 8 grew in the anterior chamber of the guineapig's eyes i.e. only about 50% of the bovine eye cancers histologically identified as carcinomas grew in the anterior chamber of a heterologous species (Fig. 5 and 6) indicating that assay of malignancy on the basis of histological features alone would be erroneous. From this study it was considered desirable that the diagnosis of malignancy of any carcinoma particularly bovine eye carcinoma should never be based only on histological picture unless confirmed by its biological behaviour in a heterologous species.

Surgical as well as medicinal treatment was tried on typical cases of eye cancer in different stages of development. It was found that cancer of the eye of cattle was as serious a condition as cancer of any other organ and when it was not detected early and treated accordingly it was incurable. So far in the experience of the author surgical removal of the growth in its earliest stage along with the healthy

A Study of Eye Cancer among bovines in Mysore State

By
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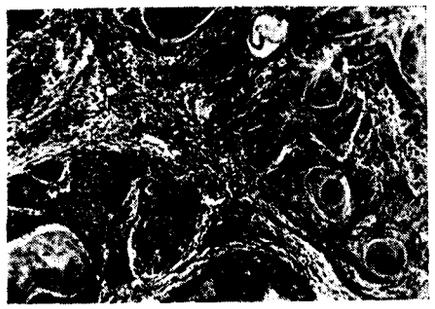

Fig. 1. Squamous celled carcinoma with epithelial cell nests. H.E. x 105.

Fig. 2. Adenomatous histological features with alveolar arrangements of cells. H.E x 350.

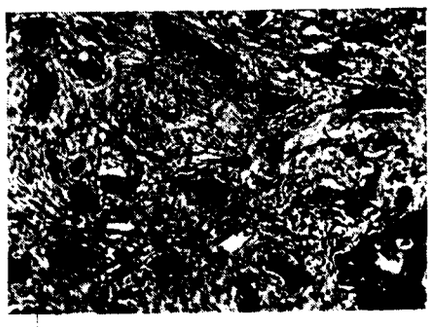

Fig. 3. Squamous epithelial cells irregularly separated by fibrous stroma. Infilteration in surrounding healthy tissue. H.E. x 105

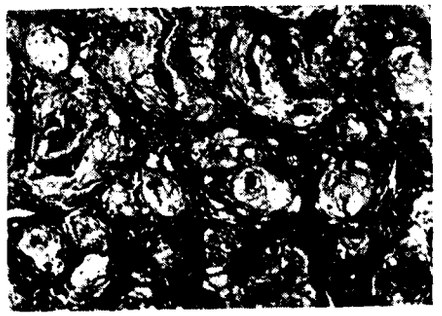

Fig. 4. Concentrically arranged acidophilic cells with peculiar hyaline appearance. H.E. x 120

Fig. 5. Carcinoma in the anterior chamber of the guinea-pig's eye, 14 days after transplantation.

Fig. 6. 3 weeks old growth of a transplant in the anterior chamber of the guinea-pig's eye.

Two Staining Methods for Actinomyces in Tissue Sections

By R. K. SUNDARAM

Section of Actinomycotic nodule stained by the first method. Note the differentiation between the centre and the clubs.

[*To face page 133*]

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nictitative membrane and cauterising the incised surface with silver nitrate was the only line of treatment found successful and resulted in a complete cure. It usually required no after treatment and it was less painful to the animal and the chances of success were more. On the other hand when the condition was allowed to develop, surgical interference, instead of doing any good, aggravated the condition as the cancer grew with vengeance when once it was disturbed because of the fact that in an advanced condition of cancer eye it was never possible to remove every bit of cancerous tissue and a few cancer cells that were probably left deeply situated in the healthy tissue were sufficient to grow profusely. Guard (1949) recorded his observations that complete enucleation of the eye had yielded good results whenever it was possible to keep the incision in the surrounding normal tissues but when the bone was involved, destruction of the animal was advised. Various medicinal treatments like injections of antimony compounds such as Anthiomaline and potassium antimony tartrate into the tumour tissue itself were tried and found useless.

Discussion

As regards factors associated with causation of cancer, certainly no disease brought out such a voluminous literature and yet remained mysterious from etiological point as cancer. During transplantation experiments it was observed that both cancerous as well as healthy embryonic tissues were successfully grown in the anterior chamber of the eye of a heterologous species but the latter exhibited cellular restraint and power of differentiation and organisation while the cancerous tissue did not. Therefore it was presumed that if such a restraint of cellular growth and power of differentiation and organisation could be eliminated by some means from the embryonic tissue, it would become a neoplastic one. But the gap was too big to be filled up unless agents which incited cells to become neoplastic were definitely known.

Although carcinogenic agents were known since 1775 and various etiological factors were advanced at different times, yet one definite factor could not be attributed to be the cause of all types of cancers. However, constant irritation, caused by various chemicals and parasites has been accepted as one of the most important factors associated with the causation of cancer. According to Olson (1947) Schistosoma haematobium induced cancer of bladder in man and Gongylonema, cancer of stomach in rats. Azo compounds caused neoplasia of the liver cells, Aniline dyes induced bladder carcinoma and oestrogens caused breast tumours.

Diet also played a part in neoplastic disease, high fatty diet increased the effect of Carcinogenic chemicals in mice. Trauma like long exposure to ultra-violet rays and x-rays, induced carcinoma of skin,

In Mysore State, as far as the Carcinoma of eye among bovines is concerned, the exact cause was not known but constant irritation, produced by some parasites, frequently observed in the eyes of cattle, seemed to be one of the most probable factors associated with its causation. In certain parts of Mysore State where a condition known as extraocular filariasis caused by some species of Thelazia, was very common, the incidence of eye cancer was greater. Severe lachrymation and conjunctivitis leading to opacity of cornea were invariably present in such cases. It was also observed that some animals treated for extra-ocular filariasis after a lapse of several months were again brought with cancerous growths in the eye but in none of the advanced cases of eye carcinomas any indication of the presence of worms could be found, although Rao (1943) reported from Madras, Thelazial worm in the sections of epitheliomatous growth of eye of a bullock. However, it was probable that constant irritation produced by these ocular parasites might be one of the factors associated with the causation of carcinoma of bovine eye.

Since virus also has been regarded as one of the etiological agents of neoplasms, experiments were conducted by triturating fresh cancerous tissues removed from bovine eyes in normal saline and injecting the cell free filtrates into the anterior chamber of the guineapig's eyes and also simultaneously in the inner aspect of the thigh. The experimental animals were kept under observation for 10 to 12 weeks but no growth was observed either in the thighs or the anterior chamber of the eyes of the experimental animals. The number of experiments carried out in this line were not sufficient to draw definite conclusions, however the results were not suggestive of any virus being an etiological factor. Bibens (1946) believed that vitamin 'A' deficiency might be the cause of epithelial tumours of eye in young Hereford cattle which were incapable of assimilating vitamin 'A' from its sources in various feeds and the condition was common in plain cattle kept on dry fodder for most part of the year. Besides, according to him the symptoms of avitaminosis 'A' resembled the symptoms of cancer eye in the early stages of development. The same worker recorded the disappearance of warts after 60 days of feeding with succulent food and also observed eye tumour to be very rare in cattle, fed only on alfa-alfa in winter. In Mysore State eye cancer in bovines was observed mostly in working bullocks of plain regions where the animals were stall-fed on concentrates, straw or hay for most part of the year. While in cows which were kept only in grazing the condition was very rare. Probably the cows maintained only on grazing as an economical measure received lot of green grass thereby having more chances of getting vitamin 'A' than working bullocks fed in stalls with concentrates, straw etc.

These observations support the view that vitamin 'A' deficiency though not the cause, might be the predisposing factor for the development of eye cancer in bovines.

Summary

1. Sixty neoplasms of the eye among bovines were studied in detail histopathologically and seventeen neoplasms of the eye were studied biologically by means of ocular transplantation in heterologous species.

2. The eye cancers were all from nictitative membranes of the eye.

3. Histopathological examination revealed 57 eye cancers to be squamous-celled carcinomas and 3 benign adenomas.

4. The histological picture consisted of diffused collections of squamous epithelial cells often varying widely in appearance in different parts of the same tumour depending on the state of nutrition and certain other factors like trauma and infection.

5. Typical "epithelial pearls" were observed and the majority of tumour cells were immature with numerous mitotic figures, enlarged nucleoli and cellular infiltrations.

6. In some cases necrobiasis was present due to inadequate nutrition, brought about by failure of the blood vessels to keep pace with the rapidly growing epithelial cells.

7. Seventeen bovine eye neoplasms were studied biologically by transplanting surgically removed fresh cancerous tissues into the anterior chamber of the guineapig's eye. Out of 15 neoplasms successfully transplanted only 8 grew in the anterior chamber of the guineapig's eye, thereby indicating that only 50% of the bovine eye cancers histologically identified as carcinomas were highly malignant.

8. Surgical and medicinal treatment was tried in several cases. But cancer of eye was found incurable, if not detected very early and treated. Surgical removal of the growth in its earliest stages along with the healthy nictitative membrane and cauterising the incised surface with silver nitrate was the only line of treatment which resulted in a complete cure.

9. Etiological factors of eye cancers were discussed and constant irritation produced by extraocular filariasis was considered as one of the probable causes, while vitamin 'A' deficiency as probable predisposing factor.

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TWO STAINING METHODS FOR ACTINOMYCES IN TISSUE SECTIONS

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Clinically, the diagnosis of actinomycosis does not present much difficulty, since colonies of the causal organisms, *Actinomyces* species, are almost always found in the pus in the form of characteristic, minute greyish to greyish yellow granules, the so called 'sulphur granules'. Crushed gently between a slide and a cover slip and examined under the high power of a microscope, such a granule presents the appearance of a central tangled mass of mycelial filaments surrounded by a gelatinous hyaline sheath or clubs. When this crushed preparation is stained by Gram's method, it is noted that the mycelial centre is Gram-positive and the clubs are Gram-negative. In sections of animal tissues from suppurative lesions also, the organisms are found in the form of typical colonies surrounded by clubs. For demonstrating *Actinomyces* in sections various staining techniques such as Gram Weigert's[1] modified Zeihl Neelson's[2], Plaut's[3], Mallory's[4] methods 1 and 2, Bauner's chromic acid leucofuchsin[5], Periodic acid-Schiff[6], etc., are in vogue.

The two methods for staining actinomyces in tissue-sections described in this article were found to be quite satisfactory for the purpose. It may be pointed out that the colour contrast between the various elements, *viz.*, the mycelial centre, the clubs and the surrounding inflammatory exudate, is very well brought out especially by the 1st of the two staining methods described hereunder.

Method 1.—In this method the strongly phloxinophilic property of the clubs is utilized to bring out the *Actinomyces* colonies and the host tissue in different colours.

1. Stain paraffin sections of formalin-fixed material for one minute in 2·5% aqueous phloxine (B.D.H.).

2. Rinse in water and stain for one minute in aniline crystal violet prepared as below :

Saturated alcoholic crystal violet	—	14 cc.
Aniline water	—	86 cc.

3. Blot and treat with freshly prepared Weigert's iodine for 30 seconds.

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4. Blot and differentiate in acetone for 5–10 seconds.

5. Wash briefly in water.

6. Stain for 1 minute in Loeffler's methylene blue.

7. Blot and treat again with Weigert's iodine for 5 seconds.

8. Blot and differentiate in acetone until no more clouds of blue colour come off (5–10 seconds).

9. Rinse in water.

Steps 6 to 9 extract phloxine completely from the sections leaving only the clubs or strongly phloxinophilic bodies stained red. The methylene blue used for the extraction of phloxine is also removed completely by iodine treatment and subsequent differentiation in acetone.

10. Check the staining under the microscope.

The mycelia should be blue black, the clubs rose pink and the surrounding tissue colourless or very pale pink.

If the surrounding tissue is also bright pink, repeat steps 6 to 9. If, on the other hand the clubs are also cloourless the entire staining procedure may be repeated, and the staining time in Loeffler's methylene blue reduced to 5 to 10 seconds or less. If the clubs after step 9 are coppery red instead of bright pink, treat sections for 2 seconds in 2·5% aqueous sodiumthiosulphate.

11. Wash briefly in tap water and stain in 1% aqueous methylene blue for 5 seconds.

12. Differentiate and dehydrate rapidly through graded alcohols, clear in xylol and mount in neutral balsam.

The finished section should have a faint blue colour to the naked eye. One may use a very dilute methylene blue or its azures solutions buffered to acid range, as a progressive counter stain so that phloxine is not further differentiated. When such a step is adopted it is necessary that the sections are dehydrated through acetone before clearing in xylol.

Results

Mycelial mass is stained violet, clubs are stained bright rose pink and all other tissue elements sky blue. Occasionally R.B.C's., and cytoplasm of degenerating cells may be stained pink.

Method No. 2.—When a large number of sections are to be stained and when individual attention to each slide is not practicable, the following variant of traditional Maximow's stain may be useful.

1. Bring paraffin sections of formalin fixed material to distilled water.

2. Stain for 24 hours in dilute Delafield's hematoxylin as per formula below :

Delafield's haematoxylin	—	2 drops.
Distilled water	—	100 cc.

3. Rinse in distilled water and stain in Maximow's stain for 24 hours.

Azure II (1 : 1,000 aqueous solution)	—	10 cc.
Eosin Y (1 : 1,000 aqueous solution)	—	10 cc.
Distilled water.	—	100 cc.

4. Rinse in distilled water and stain for one minute in aniline crystal violet.

5. Blot and treat with Weigert's iodine for 5 to 10 seconds.

6. Blot and differentiate in several changes of aniline oil until no more clouds of colour come off.

7. Rinse in several changes of xylol and mount in neutral canada balsam.

N.B.—If the Canada balsam is not neutral the Mycelial staining may fade away soon.

Results

The effect is just as with any other Azure eosinate method with the only difference that the mycelia are stained blue black and the clubs a shade brighter pink than the general plasma stain.

The Weigert's iodine treatment and subsequent differentiation in aniline oil remove any excess of Maximow's stain and as such no differentiation in 95% alcohol, preceeding crystal violet staining, is needed.

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STUDIES ON THE UTILITY OF VARIOUS BIOLOGICAL STAINS AS SEMEN STAINS

Part III

By

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In two earlier papers (Rao, 1958 a, b) the author reported the utility of various biological stains for staining semen smears. These stains were in the alphabetical series from A to D and E to H ranging from acid green to dahlia violet and from eosin to hickson purple. The present study is a continuation of the earlier work and covers stains in the alphabetical series from I to N with stains ranging from indigo carmine to Nile blue.

Methylene blue was used in the past as a semen stain fairly extensively Williams (1937) and Williams and Co-workers (1934) used Loeffler's methylene blue as a counter-stain for bull sperm, while Gelarie (1936) recommended the use of carbol methylene blue as counter-stain for sperm. Deakin recommended the use of methylene blue for staining bull sperm, the stain technique consisting of mixing up a drop of semen and a drop of the stain and drawing out a smear. Isenberg (1949) used methylene blue as a counter-stain for sperm after primary staining with carbol fuchsin. A methyl green-pyronin mixture was used for staining sperm by Greenberg ebal (1943). Rao and Berry (1950) used methyl green for staining bull sperm. Blom (1943) employed methyl violet for staining bull sperm. Nile blue sulphate was used for staining avian sperm by Van Drimmelin (1951) Rao (1952) recommended the use of mercurochrome for staining bull sperm.

Materials and Methods

The techniques used in this investigation are the same as reported earlier. The semen of the buffalo and the bull were used in this study.

Four techniques of staining were employed as reported earlier and these are;

1. Conventional method — Cv. Method.
2. Direct mixing method — D. M. Method.
3. Dipping and blotting method — D and B Method.
4. Ignition method — Ig. Method.

Results

Indigo Carmine :—This stain was found to be practically useless as a semen stain by all the four methods tried.

Indulin, w. s. :—5 per cent aqueous solution gave satisfactory results at 3 to 5 minutes exposure by the Cv. method, the sperm taking a dull black colour. 5 to 7 per cent indulin in isotonic solvent gave excellent results as a negative stain by the D. M. method (Rao, 1957). By this method sperm in fresh semen were differentiated into live and dead groups (Rao, 1956). 5 per cent aq. stain gave satisfactory results by the D & B method similar to those obtained with the conventional method. Saturated alcoholic indulin also gave satisfactory results by the Ig. technique.

Janus green B :—1 per cent aq. solution gave satisfactory results at 10 to 15 minutes exposure by the Cv. method, the sperm taking a dull black colour. Although clearing was not essential it greatly improved the preparations. 3 per cent stain gave better results by the D & B method and with cleared smears superior preparations were obtained. 1 per cent alcoholic stain also gave satisfactory results by the Ig. method, the sperm taking a light blackish green colour.

Light green S.F. :—With the Cv. method, clearing of smears was essential to avoid dark background staining. 3 to 5 minutes exposure with 1 per cent stain gave satisfactory preparations, the sperm taking a deep green colour. 5 per cent light green in isotonic solvent gave very good results as a negative stain (Rao, 1957). By this method sperm in fresh semen were differentiated into live and dead groups (Rao 1956). 1 per cent stain gave excellent results by the D & B method. Saturated alcoholic stain gave erratic results with Ig. technique; but when the slide was flooded with the stain solution sufficiently to allow it to burn for 10 seconds, uniformly good results were obtained. The preparations were very pretty, the sperm taking a deep green colour against a clear background.

Malachite Green :—This stain gave excellent results by the D. M. method using 5 per cent stain in isotonic solvent and also by the D & B method using 1 per cent aq. solution, the sperm in these preparations taking a brilliant green colour.

Manchester blue :—5 per cent aq. solution gave satisfactory results at 1 to 2 minutes exposure by the Cv. method, the sperm taking a dull violet colour against a clear background. The stain was unsatisfactory by the D. M. method. By this method sperm in fresh semen were differentiated into live and dead groups. Saturated alcoholic stain gave satisfactory results by the Ig. method, the sperm taking a light bluish violet colour.

Mercurochrome :—The following formulae of this stain were tried.

1. 1 to 10 per cent aqueous solution.

2. 1 per cent alcoholic mercurochrome prepared as follows :— 1 gm. of the stain was first dissolved in 10 c.c. of distilled water and to this 90 c.c. of absolute alcohol was added later.

3. 1 per cent aniline mercurochrome - aniline water was made by shaking together 2 c.c. of aniline oil with 98 c.c. of distilled water. The stain has to be filtered before use.

4. 1 per cent carbol mercurochrome - Carbolic acid water was prepared by shaking together 5 c.c. of melted carbolic acid crystals with 95 c.c. of distilled water. The stain solution has to be filtered before use.

All the formulae listed above gave excellent results by the conventional method, 15 to 30 seconds exposure giving bright red staining of sperm against a clear background. 1 per cent aq. solution was slightly superior to the other formulae. Staining beyond one minute is considered wasteful. By the D. M. method, this stain differentiated sperm in fresh semen into live and dead groups. 1 per cent aqueous as well as 1 per cent alcoholic stain gave excellent preparations by the D & B method. By this method the cytoplasmic cap and the terminal filament were clearly brought out. 1 per cent alcoholic stain also gave excellent preparations by the Ig. method, the sperm taking a deep red colour against an unstained background.

Methyl blue :—5 per cent aq. solution gave satisfactory preparations at 1 to 2 minutes exposure by the Cv. method, the sperm taking a bright blue colour against an unstained background. 5 minutes exposure gave very pretty preparations. 1 per cent aq. stain also gave satisfactory results at 3 to 5 minutes exposure. 7 per cent stain in isotonic solvent gave excellent negative preparations by the D. M. method (Rao, 1957). By this method sperm in fresh semen were differentiated into live and dead groups (Rao, 1956). 1 per cent aq. stain gave excellent results by the D & B method. Saturated alcoholic stain gave excellent results by the Ig. method, the sperm taking a deep blue colour with remarkable clarity of morpohology against a clear background.

Methylene Blue :—The following formulae were tried by the Cv. method.

1. 1 to 10 per cent aq. solution.
2. Loeffler's alkaline methylene blue (Loeffler, 1884).
3. Alcoholic methylene blue (Guyer, 1936).
4. Neisser's methylene blue (cited by Mallory, 1938).
5. Gabbet's methylene blue (Gabbet, 1887).
6. Aniline methylene blue: This stain is made up as follows :
   Methylene blue (Std. soln. in 95 per cent alcohol) — 10 cc.
   Aniline water — 100 cc.
7. Kuhne's methylene blue (Mallory, 1938).
8. Sahli's boramethylene blue (Sahli, 1885).
9. Goodpasture's acid polychrome methylene blue (Goodpasture, 1917).
10. Unna's polychrome methylene blue (Unna, 1891).

None of the formulae listed above other than Loeffler's alkaline methylene blue and Unna's polychrome methylene blue proved to be of any use as semen stains by any of the four techniques tried. Unna's stain gave the best results. The freshly made stain did not give any sperm staining even after 15 minutes exposure. Two weeks ripening was found to be sufficient. Clearing of smears was necessary to avoid background staining. 2 to 3 minutes exposure gave bright blue staining of sperm but 5 minutes staining gave much better preparations. Freshly prepared stain boiled for 10 minutes was sufficiently ripe and satisfactory for immediate use. With this artificially ripened stain 2 to 3 minutes exposure of cleared smears gave brownish violet staining of sperm and at 5minutes exposure reddish violet staining of sperm was obtained and preparations were excellent. The artificially ripened stain gave as good results as the naturally ripened one but there was some difference in the shade of colour taken by the sperm between the two methods.

Loeffler's alkaline methylene blue gave a light blue staining of sperm after 5 minutes exposure. Even exposures upto 15 minutes did not greatly increase the depth of staining. Clearing of smears was essential with this stain too. The other techniques of staining proved unsatisfactory with this stain.

Mythyl green :—1 per cent aq. solution for 1 to 2 minutes gave bright violet staining of sperm and longer explosures upto 3 to 5 minutes increased the depth of staining and gave better preparations. Clearing of smears though not essential greatly improved staining and gave superior preparations. There was no difference in the staining capacity between the 1 per cent aq. stain and 1 per cent stain made in 1 per cent acetic acid solution.

1 to 2 per cent methyl green in isotonic solvent gave brilliant green staining of sperm by the D. M. method. 1 per cent stain gave very good results with the D & B method, the sperm heads taking a bright green colour while the tails took a greenish violet colour. 1 per cent alcoholic stain gave excellent results with cleared smears by the Ig. method, the sperm taking a violet colour.

Methyl violet :—The following formulae of methyl violet were tried.

1. 0·5 to 3 per cent aq. solution.

2. 0·5 per cent solution in 95 per cent alcohol.

3. Carbol methyl violet (after Nicolle, 1895) — methyl violet was substituted for gentian violet in the original formula.

4. Carbol methyl violet (after Conn, 1946) methyl violet was substituted for crystal violet in the original formula.

5. Aniline methyl violet (Koch-Ehrlich) (Guyer, 1936).

6. Aniline methyl violet—This stain is made up as follows :

Methyl violet	—	1 gm.
Aniline water	—	80 c.c.
95% alcohol	—	20 c.c.

7. Ehrlich's aniline methyl violet (Mallory, 1938)—methyl violet was substituted for gentian violet in the original formula.

8. Stirling's aniline methyl violet (after Stirling, 1890) methyl violet was substituted for gentian violet in the original formula.

9. Aniline methyl violet (after Soc. of Amer. Bact., Cowdry, 1948)— methyl violet was substituted for crystal violet in the original formula.

10. Hucker's methyl violet (after Hucker, 1922)— methyl violet was substituted for gentian violet in the original formula.

All the formulae listed above gave excellent results very pretty preparation being obtained in about 15 seconds. Clearing of smears is essential to avoid intense background staining. The best results were, however obtained with Hucker's formula followed by the carbol formulae. With the former there was no danger of overstaining while with the latter exposures beyond 1 to 2 minutes gave very intense staining. With these formulae 10 to 15 seconds exposure gave a reddish violet staining of sperm. Both the carbol formulae gave about the same type of staining. The aniline formulae also gave excellent results requiring 15 to 20 seconds exposure. Exposures beyond 2 minutes are likely to cause overstaining. There is little to choose among the various aniline formulae. 1 per cent aq. stain and 1 per cent alcoholic stain

also gave excellent preparations at 15 to 30 seconds exposure and there was also no danger of overstaining even after 5 minutes exposure, particularly with the alcoholic stain.

1 per cent aq. and alcoholic stain also gave excellent results by the D and B method with cleared smears. The other formulae also gave excellent results with this technique but there is danger of overstaining unless the staining process is completed within a couple of seconds. 1 per cent alcoholic stain also gave excellent results by the Ig. technique using cleared smears.

Naphthol green :—The only technique by which naphthol green gave satisfactory results was by the D. M. method using 10 per cent stain in isotonic solvent. Excellent negative preparations were obtained by this method (Rao, 1957). Sperm in fresh semen were distributed into stained and unstained groups although the staining is very faint (Rao, 1956).

Neutral red :—1 per cent aq. solution gave satisfactory results at 10 minutes exposure by the Cv. method the sperm taking a deep reddish brown colour. No clearing of smears was necessary with this method. By the D and B method 1 per cent aq. neutral red gave a light brown staining of sperm with sufficient clarity of sperm morphology. Clearing of smears was essential by this method to avoid background staining.

New black :—1 per cent aq. solution gave very good preparations by the Cv. method with uncleared smears at ½ to 1 minute exposure, the sperm taking a deep moss-green colour. Longer exposures beyond 5 minutes are wasteful. In this preparation the sperm morphology was clearly delineated against an unstained background. The post-nuclear cap took a deeper colour than the acrosome and the division between the two regions was very clear. 3 to 5 per cent stain in isotonic solvent gave excellent negative preparations (Rao, 1957) and sperm in fresh semen were differentiated into live and dead groups (Rao, 1956). 1 per cent aq. stain also gave excellent results by the D & B method. 1 per cent alcoholic stain gave excellent results by the Ig. technique, the sperm taking a deep green colour, while the back ground took a light green colour. The background however, did not affect the morphological study. Clearing of smears improved the preparations.

Night blue :—1 per cent aq. stain gave satisfactory preparations at 3 to 5 minutes exposure by the Cv. method, the sperm taking a light blue colour. 1 per cent alcoholic stain was superior to the aqueous formula, 15 to 30 seconds exposure giving a light blue staining of the sperm heads while the tails took a deeper colour. Better preparations

could be obtained by longer exposures but beyond 3 to 5 minutes longer exposures are of no advantage. The background also took a light colour, which, however, did not affect the clarity of sperm morphology. 1 per cent alcoholic stain gave excellent results by the D & B method, the sperm taking a bright blue colour. 1 per cent alcoholic night blue gave exceptionally good results by the Ig. technique, and preparations were superior to those obtained with other techniques.

Nigrosin, w. s. :—10 per cent aq. stain gave satisfactory results at 2 to 3 minutes exposure by the Cv. method. The sperm took a dull brownish violet colour, the post-nuclear cap staining deeper than the acrosome while the background was clear. 5 to 7 per cent nigrosin in isotonic solvent gave excellent results as a negative stain (Rao, 1957) and sperm in fresh semen were differentiated into live and dead groups (Rao, 1956). 5 to 10 per cent aq. stain gave satisfactory results by the D & B method the background taking a greyish black colour while the lightly stained sperm were prominently visible by the negative effect of the dark background.

Nile blue B (Chlordydrate) :—1 per cent aq. solution gave deep blue sperm staining at ½ to 1 minute exposure by the Cv. method, 3 to 5 minutes exposure giving intense blue staining of sperm. Clearing of smears was essential. The D & B method gave excellent preparations with cleared smears using 1 per cent aq. stain. 1 per cent alcoholic stain also gave excellent preparations by the Ig. method. In uncleared smears the sperm took a bright blue colour against a ligth blue background, which did not affect the clarity of sperm morphology but with cleared smears, the preparations were far superior.

Summary

Various biological stains in the alphabetical series from I to N were studied to determine there suitability for staining semen smears.

Indulin w.s., light green S. F., malachite green, mercurochrome, methyl blue, methyl green, methyl violet, naphthol green, new black, night blue, nigrosin and nile blue gave excellent results as semen stains.

Indulin, light green, methyl blue, naphthol green, new black and nigrosin gave excellent negative preparations by the direct mixing technique. These stains as well as manchester blue and mercurochrome also gave live and dead differentiation of sperm by the same technique of staining using fresh semen.

Janus green, manchester blue and methylene blue also proved satisfactory as semen stains. The dipping and blotting technique was found to be very rapid and very efficient with many stains and gave excellent preparation in a few seconds. The ignition technique was also found to combine rapidity with efficiency of staining and gave excellent preparations with many stains.

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FORTY-SIXTH INDIAN SCIENCE CONGRESS

DELHI, 1959

SECTION OF MEDICAL AND VETERINARY SCIENCES

President :—P. G. PANDE, M.SC., M.R.C.V.S.

Presidential Address

THE PLACE OF VETERINARY RESEARCH IN THE NATION'S PLAN FOR FOOD PRODUCTION

Friends ! I am deeply conscious of the great honour you have done me in electing me as President of the Section of Medical and Veterinary Sciences for the 46th session of the Indian Science Congress. I have little scientific attainment to my credit to occupy this position, but your appreciation in this manner of the close ties that exist between Medical and Veterinary Sciences is no small source of pleasure and satisfaction to me and the profession to which I belong.

The subject that I have chosen for my address does not represent any specialised branch of study in the field of medical or veterinary science, but serves to focus our much-needed attention on the role of veterinary research in food production—a problem of no small magnitude.

Our country today is passing through a period of great and varied activities for the achievement of the various targets laid down in our national plan for community development. How to improve the lot of our poor masses and to provide them with food, shelter and a decent living is the problem engaging the attention of our leaders in the political and scientific fields. While the leadership and popular support which must at all stages be available in the execution of our plans are there, it is the science and technology in all spheres which must form the spearhead of our struggle for the achievement of freedom from want and hunger.

Agricultural production is supposed to be the core of the second plan and this must remain so till the period the country attains self-sufficiency in the matter of food. Unlike some advanced western countries, animal husbandry is looked upon as the basis of Indian agriculture and the husbanding of our animal resources when well-developed can contribute materially to the well-being of our people. Our food problem today is the problem of all problems and how the application of of veterinary research to solution of this problem in the country can materially strengthen our existing food resources is the theme of the present address.

Livestock as the National Wealth

India possesses the largest livestock population in the world and some breeds of cattle, buffaloes, sheep and goats possess vast potentialities for development, not only to meet the growing needs of the country, but also to build up a sizeable export trade.

Our animal wealth today in the shape of multiplication of numbers, the animal products for human use, the valuable organic manure and the animal labour for agricultural operations contribute very substantially to the economy of the country. If we make a comparison between certain industrial and agricultural commodities which loom so large in the public mind and our cattlewealth, it would no doubt be a big surprise to some of us that according to the figures available for the year 1954-55, iron, steel and coal, which are so vital to the country and on which so much emphasis is being laid by the Planning Commission, are valued at rupees 85 crores only. On the agricultural side, during the same year, cotton textiles contributed Rupees 500 crores, jute, Rupees 113 crores and sugar, Rupees 120 crores. Thus the total contribution from these industrial and agricultural commodities amounts to Rupees 818 crores which is less than the annual contribution made by valuable organic manure alone which is estimated at rupees 1000 crores.

Factors Determining Production and consumption of Foods of Animal Origin

Although the population of our country consists mostly of vegetarians subsisting largely on cereals, vegetables and pulses, the tendency towards eating of meat, fish and poultry products is fast growing. In the absence of any reliable data as to the relative proportion of vegetarians and non-vegetarians, the point can, however, be made without any fear of contradiction that there is an appreciable, yet unestimated proportion of Indian population that does not object to any type of flesh food. This view finds support in the figures of production and export of meat (1955), indicating that, barring a very small export taken by ships on touching our ports, about 90 per cent of a total annual production of 461,245·2 tons of meat is consumed within the country.

Meat, like any other protein-rich food, is a costly commodity regarded as luxury food, chiefly for the town-dwellers and those who can afford it. One of the many reasons, therefore, why a larger percentage of people representing those belonging to low income group has not taken to meat eating is the somewhat prohibitive cost of this food commodity. The *per capita* consumption of meat and its availability at cheaper cost to a larger section of meat consuming communities would depend upon its production which is closely related to the total livestock population and the quantity of dressed meat obtained from different animals. The general health and the bodily condition of livestock in this country are no more than poor. They are puny, undersized and half-starved due to chronic shortage of feeds and fodders. To crown all these are the numerous killing and chronic diseases which either bring

down the number of the different food animals or reduce them to a status of walking skeletons. The average dressed carcase yield, therefore, is very low in India as compared to some progressive meat producing countries of the world.

Regarding milk and the dairy products—another item of food of animal origin—it needs no elaborate statistics to indicate that the position on the production side is very precarious and consequently the *per capita* consumption is very low. According to Agricultural Marketing Survey in India (1957), based on milch cattle and buffalo population figures as given in the Livestock Census 1951, the annual production of milk works out at 468,459,000 maunds. The average available *per capita* of liquid milk in a population of 356·8 million people according to the 1951 census works out to 5 ounces a day. According to a recommendation of the Nutrition Advisory Committee of the Indian Council of Medical Research, a balanced diet for the Indian population to ensure maintenance of good health must contain, amongst other ingredients of food, 10 ounces of milk daily and this could be attainable only when the total milk production of the country is almost doubled. How can this be achieved? Certainly not by increasing the number of milch animals in the country whose land resources cannot be stretched further to support the ever-increasing human and animal population. If this was ever to be attempted in the face of the ban on cow slaughter, as some of the Gosamvardhan enthusiasts may feel inclined to do, the inherent danger is that this may lead to bankruptcy of the cow, and milk as a saleable commodity may altogether disappear from the market. This foreboding is rightly supported by population figures of milch cows and she-buffaloes in India in the 1945 and 1951 cattle census.

Variations in the number of cows and she-buffaloes during the year 1945 and 1951 and the resultant production of milk and milk products

	1945	1951	Percentage increase or decrease over 1945
Cows (lakhs)	411·01	470·34	+ 14·4
She-buffaloes (lakhs)	195·72	210·21	+ 7·4
Total ...	606·73	680·55	+ 12·2
Production of milk (lakh maunds) ...	4682·15	4555·08	— 2·7
Percentage of milk converted to ghee (lakh maunds)	43·3	39·9	— 8·3
Production of ghee (lakh maunds) ...	112·96	103·08	— 8·7

The above table would reveal the information that although during the period from 1945 to 1951 there has been an increase in the combined population of milch cows and she-buffaloes to the extent of 12·2 per cent, the total milk production in the country has gone down by 2·7 per cent. Of the many reasons accounting for this state of affairs is the " progressive increase of the total cattle population of the country without a corresponding increase in the available supplies of fodder and cattle feeds; this may be said to be the greatest limiting factor for increasing milk yield."

As regards poultry which term includes ducks, geese, turkeys and guinea fowls, the total number stands at 73·9 millions, but the net available market supply stands at 34·23 million birds. Based on total human population, therefore, the annual *per capita* consumption is 0·29 lb., but when the section of population having no objection to taking poultry meat is taken into consideration, the *per capita* consumption comes to 0·97 lb. This, on a statewise distribution and density of poultry population per 100 persons or per square mile, may not represent a true *per capita* consumption rate. The areas having the lowest *per capita* consumption are Saurashtra and Rajasthan where the density of poultry population also stands lowest. The Report on the Marketing of Poultry in India (1955) reveals that in areas where population density is greater, the *per capita* consumption is well over 2·9 lb. indicating that it is the availability more than the customs and the religious prejudices which determine the consumption of any food commodity. In Kashmir, till recently Hindus would not even touch a hen, but of late there has been a steady increase in the consumption of of poultry and poultry products, particularly the ducks, as the Kashmir valley provides ideal conditions for duck breeding, and thus the density per 100 persons is quite high. The population density of poultry depends upon various factors of which those which assert most markedly are (i) the epidemics such as those of Ranikhet disease, fowlpox and the various types of coryza on which little information is available in the country and (ii) the abnormal weather conditions causing high mortality and consequent decrease in the number.

A large percentage of our people have no aversion to taking eggs, and even if there is any religious prejudice to hen's egg, duck eggs are eaten freely without any such prejudice among the Hindus. India produces every year about 33,648 lakh eggs and if they were all put end to end, they would stretch more than three times round the world. In spite of the large poultry and duck population, actual records of the output of individual birds are very scanty. The *Desi* hens are estimated to lay on an average 53 eggs per bird in the course of a year and for the improved birds this has been estimated at 103 eggs. In the case of duck

eggs the average output per bird for the whole of India is 90 per annum. Owing to diseases taking a heavy toll of our birds and the fact that producers far removed from the market retain most of their eggs for their own consumption, only about 60 per cent of the hen eggs and 80 per cent of the duck eggs are put on the market. Of these a substantial proportion is lost to the consumer due to spoilage on account of bad weather conditions.

On the basis of total human population, the egg consumption *per capita* works out at 8 eggs per annum. When compared with the *per capita* consumption in the United States of America or Canada, the position is very far different as in these countries one person eats as many eggs per annum as 30 or 35 people in India.

This review of the production and consumption of foods of animal origin would show that with increased production their consumption would inevitably also increase and if these products are made available to a section of our people comprising about 50 per cent of the total population, an important step forward would be achieved in solving our food problem, as not only their consumption would ensure better health of the people but would also reduce the demand on cereals which are so much in short supply. The biggest question that poses itself, therefore, is; what stands in the way of increased production of foods of animal origin? This question can be dealt with more fully by examining the present pattern of agricultural operation, the specific problem fields where research work needs to be intensified, certain administrative matters and the pattern of University education in veterinary science as a whole.

The Pattern of Our Agriculture and Its Inherent Danger

The present shortage of foodstuffs in the country in spite of the "Grow More Food" campaign organized by the Government brings us to the painful realization that all is not well with the pattern of agriculture advocated in this country. This campaign, although a move in the right direction, suffers from the limitation that it aims principally at production of cereal foods with a view to meet the nutritional requirements of our people. No nutritional pundits can subscribe to this view; rather, it may have to be admitted that no country in the world has achieved self-sufficiency in food, both quantitative, and qualitative through cereals alone. Integrated agriculture aiming at production of foods of animal origin, therefore, has much to commend and our land resources have to be apportioned for growing food crops and raising live-stock. Under the present conditions when more emphasis is laid on the production of plant foods, such as cereals, pulses and edible oilseeds, the chances for the production of foods of animal origin are very little as out of a total of 400 million acres of

arable land, the share that goes under fodder cultivation is only about 12 million acres.

The present pattern of utilization of arable acerage without due appreciation of the needs of animals which must also depend upon the produce of the land may not lead to a healthy growth of our agriculture. Some people often make the criticism and others have to bear it that animal husbandry in the country has not made the desired progress as the productive capacity of our livestock is much lower than that of certain advanced western countries. There is no doubt that very much more has to be done in the field of animal husbandry, but as the animals have to be kept on the land, I would rather point out that it is really the land husbandry which must need be improved to cater for the relative food requirements of both humans and animals. The present pattern of land utilization has, therefore, to be reorientated simultaneously with the execution of the various plans of development in the field of animal husbandry so that the potential wealth of our livestock may be fully exploited for the development of our country's economy.

Although such items of food as milk, meat, eggs and *ghee* originate directly from animals, in the production of plant foods also, cattle in India hold the most strategic position as, for their production, animal labour is the most potent adjunct. In the ultimate analysis, therefore, it is the efficiency of animals that determines the country's capacity for food production.

Plan Targets of Foods of Animal Origin

"The object of the animal husbandry plan programmes is to increase the supply of milk, meat and eggs, a greater consumption of which is very essential to balance the present customary diets and to provide efficient bullock-power for agricultural operations in every part of the country".

Milk—It has been reckoned that the total milk output in this country at the beginning of her first five year plan was over 18 million tons which provides only 5 ounces *per capita* consumption. Thus, an appreciable increase in the supply of milk is an absolute necessity. To lay down a national target of milk production to be achieved within the span of the plan periods has not been found possible at this stage of development. As it is mainly through the key village schemes and the national extension and community development projects that the programme for cattle development pursued by the State Governments, only local and regional targets representing about 10 per cent increase in the total out-put of milk can be achieved. When the cattle development work has once been initiated in a few selected regions in each State, the intensive and sustained development that would follow with the opening

of more such regional centres is likely to result in an achievement of about 30 to 40 per cent increase in the milk output over a period of 10 to 12 years.

The essential corner stone for building up productive capacity of our milch stock is the dissemination of the superior genes from approved and pedigree bulls. Their number during the pre-plan period was insignificant and even now it is not so large, but by the end of the second plan period the programme is intended to produce 22,000 improved bulls, and in the final analysis of the execution of the plan, 950,000 improved bullocks and a million improved cows would also be made available. The operational areas of these achievements would be the numerous key village centres of which 1,258 would be established during the second plan period, in addition to 245 artificial insemination and 254 extension centres to be set up during the plan period. With the expansion of the increasing use of the artificial method of insemination, the country would soon attain self-sufficiency in the matter of high quality stud bulls. The attainments of these targets would provide a strong launching ground for achieving still higher targets of production in these fields.

The most important pre-requisite to taking up an intensive cattle development work is the creation of the necessary incentives amongst the cattle breeders. One of these should be the assurance of prompt monetary return to them through organised co-operative marketing facilities. Needless to say, such facilities would encourage the breeders to grow fodder crops on their fields to feed their stock so that better yields may be obtained from them. The second five year plan lays down a target of organising co-operative marketing facilities in 20 selected key village blocks on a pilot basis. But, if widely extended, these facilities would create the much-needed private initiative and enterprise in the field of animal production which alone can bring in the lasting results. These facilities, if I may add, hold the key to cattle development on the one hand and more production of milk on the other.

Other forms of grants and subsidies to some traditional cattle breeders or to private institutions where cattle breeding and milk production form a part of their function have been provided, but due to lack of full facilities, scientific knowledge and proper guidance, these undertakings have not shown much progress. Such private institutions are the Goshala and Pinjrapoles. Of these numbering 1,100 in the whole country, 346 are to be provided financial and technical assistance during the second plan period so as to the place their working on scientific lines and to convert them ultimately into profitable cattle breeding-cum-milk production units. The plan also provides for the grant of subsidies to private individual breeders for the rearing of 35,000 suitable male and female calves so as to use them on maturity for future breeding work.

Meat—Either due to religious sentiments or aversion towards flesh, meat eating at present is not popular amongst the Hindus. Nevertheless, with the growth of population, particularly in the urban areas meat production has, during recent years, increased enormously for internal consumption. To ensure production of meat under hygienic conditions, which at present are almost lacking in the slaughter houses under most of the municipalities, certain State Governments from their own resources are providing funds to some selected slaughter houses for their improvement and appointment of suitably trained staff to ensure proper inspection and passing out wholesome meat to consumers.

If today sentiments weigh heavily against meat production, as is often argued, what about the economic backwardness of our people which also to some extent determines the food habits ? Needles to say, perhaps, as to how sentiments and the popular customs may shape out during a period of ten years hence and the time is not far when the urge for better nutrition backed by economic forces may override the prevailing sentiments and meat may figure more prominently in the normal dietary of our people. It may be considered expedient, therefore, that during the third plan financial assistance may be provided for the improvement of at least one slaughter house in every large city or town.

At the present stage of planning for food, when the sentimental approach to the problem cannot be ignored, no target for meat production is to be found in the official documents of the first or the second five year plans. However, according to the report of the Nutritional Advisory Committee of the Indian Council of Medical Research the target requirement of meat for optimum health of the 313 million adult units has been estimated at 9·4 million tons annually. Unaided by any organised Governmental efforts, the total production of meat from buffaloes and pigs has been estimated at about 97 thousand tons, representing nearly one-hundredth of the total requirement.

At present the export of meat from India is almost non-existant. During the years 1954–55 and 1955–56, this country, exported beef and mutton to the value 2·5 and 2·1 lakhs of rupees, respectively. We may consider beef as a closed chapter in the meat trade of this country, but with her large livestock population of other species of animals, such as buffaloes, sheep, goats and pigs, India can build up a sizeable export trade in meat and meat products with the South-East Asian countries where frozen buffalo meat and piggery products are much in demand.

The only scheme pertaining to meat development as formulated under the second plan is the piggery development scheme which envisages, during the second plan period, the establishment of 2 to 3 regional pig breeding centres, bacon-factories and 10 pig breeding units on a

smaller scale where pure-bred boars of superior foreign breed or their crosses would be raised for distribution to about 120 piggery development blocks. Private enterprise has already taken a start in the pork export trade and this much needed State patronage if continued during the subsequent plan periods would put this new undertaking in food production on a much sounder basis.

Poultry and Eggs : During the first plan period little attention was paid towards development of poultry, but its importance as a source of nutritive food for the nation is now being widely recognised. Not only that, it is only in the poultry field where immense possibilities exist for developing the country's economy and contributing substantially to the nation's requirement of food of high nutritive value. In recognition of this, an All-India Scheme for the development of poultry has been launched at a total estimated cost of rupees 258·8 lakhs for establishing, during the second plan period, five regional farms and 300 poultry development blocks in an equal number of districts all over the country. A target of 2,000 breeding stock fixed for each of the regional farms will result in a turnover of 70 to 80 thousand day-old chicks for distribution to all the States in the region. The area of operation in the regions and the districts will be the numerous N.E.S. blocks and the Community Development Centres where State Planning Departments would provide facilities for the incubation of eggs and the rearing of day-old chicks for supply to the poultry keepers. The scheme also envisages distribution at concessional rate of about 2 lakhs of five month's old birds to village poultry breeders for whom the necessary training facilities would also be provided to enable them to take up poultry breeding on scientific lines.

It is often remarked that poultry keeping is not a profitable concern. Profitability would depend upon the productive capacity of birds but on this consideration no enterprise in the field of animal production can be looked upon as profitable. In parenthesis, I would like to pose a question : is crop agriculture all by itself profitable ? If that were so, chronic food scarcity would not be stalking over the length and breadth of the country.

One basic handicap in the production of foods of animal origin has been, from a very long time, the lack of appreciation on the part of our planners on the agricultural side, of what may be called balanced agriculture, and how it should be introduced amongst our farmers. If all food grains produced from the land, including even the coarse ones, have to be appropriated for the feeding of the hungry masses, and only an infinitesimal amount goes to the lot of our domestic animals, you can well imagine what can be expected from our domestic animals.

Recognising that a balanced approach to production of foods of all kinds is essential in the economy of the farming community, the other point that merits consideration is the recognition of applied researches, particularly in the field of animal production, and here a few illustrations of the value of research in this field may have some stimulating influence on the minds of people concerned with livestock research, administration and planning in this country.

Research at a Basis of Development

In countries where livestock and livestock products are yielding a good dividend to the producers, the position that these countries enjoy today has been brought up through the pioneering efforts of research workers over a number of years at some phenomenal costs. A perusal of the history of triumphs of veterinary research in these countries would be an eye-opener to most of our people on whose shoulders lie the task of developing our own livestock wealth.

Some Triumphs of Veterinary Research

Early European settlers in South Africa, before the Boer War, were finding agriculture and livestock farming a difficult undertaking. Heavy mortalities used to occur amongst the livestock grazing on the veldts which carried abundant pasturage. Lameness followed by recumbency and extreme emaciation were the prominent symptoms of this malady amongst cattle. This mysterious disease presented a great problem as the then known factors of disease causation, such as the micro-organisms (bacteria, viruses or the protozoa) could not be incriminated as the cause of this disease in spite of the meticulous adoption of approved laboratory methods. Another important point observed in the course of field investigation of this disease was the tendency on the part of the grazing stock to devour the decaying animal carcases strewn over the grazing areas. Bacteriological examination of the decaying carcases revealed the presence of an anaerobe, *Closdridium botulinum*, capable of producing a very potent toxin which has been proved to be lethal, on ingestion, to any class of animals or even man. This is just only half the story of this mysterious disease, as it has only explained the cause of deaths of the animals but did not explain the occurrence of the train of symptoms such as emaciation, infertility and the depraved appetite. It remained a zig-saw puzzle for some time till a systematic survey of the soil and the grasses of the veldts, on chemical analysis, revealed a serious shortage of phosphorus, one of the most important elements in cattle nutrition. These informations when put together would present the picture in full as follows: The poor content of phosphorus in the soil gave a poor yield of this mineral in the herbage and cattle grazing upon this poor pasture suffered from phosphorus

deprivation, resulting in infertility, bone fractures, poor milk yield and depraved appetite. Phosphorus hunger urged the grazing stock to go after the bones and flesh of the dead animals which provided rich sources of phosphorus and simultaneously also a highly potent toxin.

On the basis of these results, large scale use of phosphatic fertilizers on the veldts or the supplementary feeding of bone meal or other phosphorus bearing compounds to cattle brought about a miraculous improvement in health and the productive capacity of animals grazing the same veldts. These results, so to say, ushered in a new era of hope and prosperity to farmers and stock owners and a country where the settlers had to struggle hard for a living is now the proud exporter of the world's most profitable livestock which include sheep and cattle mostly.

The Australian continent, today the abode of the world's best Merino sheep, was less than half a century ago a place where arable agriculture yielded little dividend to the farmers and the grazing area being mostly overgrown with bushes offered little by way of livestock farming. How this change was brought about is in itself a history of the exploits of veterinary research spread over a number of years. As this country offered some vast pasturage in the hinterland and the coastal tracts, live-stock farming was the only pursuit to be followed by the early emigrants without much investment. The quality of grazing and the soil conditions placed a heavy premium on the sheep raising enterprise as the average wool production was low and being coarse, ash-coloured and brittle it had poor market value, the adult stock appeared anaemic and undersized and lambs born were prone to go down with ataxia, a demyelinating disease. No organised governmental efforts but private funds contributed by sheep breeders and the wool traders were mobilised to solve the problem of the brittle wool. A large scale field experimentation and laboratory studies financed entirely from these funds provided some strong indication that the deficiency of copper in the herbage was one of the factors responsible for these troubles. Supplementation of feed and the dressing of pastures with copper salts raised the breeding efficiency of and the production of fine quality wool from Australian sheep. As a result of these researches, copper deficiency areas have been mapped out in various parts of the world where sheep breeding is the major stock farming operation. Intensive studies on the role of copper in ruminant metabolism carried out during the past few years have revealed how important this trace element is in enzymic reaction of the living body.

Scouring, fading of the normal colour coat and even infertility are some of the syndromes attributable to copper deficiency in cattle, I may, by way of digression, inform my audience that we have done almost

nothing so far in the domain of trace element studies and how their deficiencies are not allowing full expression to the productive capacity of our animals. If Australia is a prosperous country today it is on account of the pioneering work of her veterinary scientists assisted by the funds placed at their disposal.

Veterinary research in this country also has made some notable contributions to nation's agriculture and food supply. Epizootics of rinderpest in cattle, buffaloes, sheep and goats which formerly used to sweep over the country and take a toll of about 2 lakhs of animals annually are gradually being brought under control by the use of goat tissue vaccine developed for the first time in this country at the Indian Veterinary Research Institute. An eradication programme now initiated in every State with the financial assistance from the Indian Council of Agricultural Research has made it possible to keep rinderpest out of the country. Similarly, a very reliable vaccine against Ranikhet disease of poultry, also developed at this Institute, is being widely used in our country and abroad for the control of this disease. Given an effective vaccine, the other main essentials are an effective organization and the necessary funds to lead an all-India campaign for the preservation of our poultry—the only other important source of protein food next to milk.

Our Research Organisation—Existing and Proposed

If application of research can pay such a heavy dividend to the farming community in the field of animal production, any plan for the production of such foods must lay a great emphasis on research so as to build up the proper personnel in specific fields, strengthen the existing laboratories and establish new ones where found necessary. In agricultural sector in general, but particularly in the field of animal production, only very meagre efforts are afoot towards the realisation of this project. This may probably be due to the present indecision as to whether the core of the plan is agriculture or the heavy industries, and which of these two is to receive the high priority. In the field of agriculture which term today in this country connotes only food crop husbandry, a number of research institutes and commodity research stations have been established. On the animal husbandry side there are two institutions of an all-India character, one, the Indian Veterinary Research Institute, Izatnagar/Mukteswar, and the other, the National Dairy Research Institute, Karnal. Besides, three regional Animal Nutrition Centres have recently been organised under the auspices of the Indian Council of Agricultural Research at Anand in Bombay, Haringhatta in W. Bengal and Bangalore in Mysore. Both the central institutions in their organisational pattern consist of research divisions adequately staffed to handle problems in their specific fields. In the States also investigations into problem fields at isolated places where convenience and facilities have been provided

have been taken up. Thus, each State in the Union has, with the financial assistance of the Indian Council of Agricultural Research in the initial stage, organised a disease investigation unit consisting of two or three components. Each, with a nucleus staff composed of the officer-in-charge and his laboratory assistant, has its own little laboratory isolated from the other as each has to deal with disease problems of some particular species of animals. Then again each State has undertaken one or more research schemes supported by the Indian Council of Agricultural Research or financed entirely by the State resources which also function as independent units. Administrative control and technical supervision of all these separate and individual research units are the responsibilities of the State Director of Animal Husbandry and Veterinary Services.

If our animals under the present conditions of feeding, management and veterinary aid are capable of contributing to the tune of rupees 5,000 crores annually—a very large percentage of our total national income—their productivity can undoubtedly be increased enormously if research projects are taken up on a more ambitious scale with increased physical facilities and personnel trained in specific problems.

In the field of veterinary research little work is being done outside the central institutes. Experience has shown that in a vast country like India with varying geo-climatic conditions, there is a need for organising research on animal husbandry at all three levels, *i.e.*, Central, State and Regional. While central institutes will undertake problems of larger interests demanding special technical skill and equipment readily available there, the Regional Research Stations would be entrusted with problems of regional importance and required to refer to central institutes such problems as may necessitate the application of special skill and technical acumen. These Regional Research Stations may be financed wholly by the Government of India and allowed to function as sub-stations of the Indian Veterinary Research Institute which would also in the interest of efficiency act as the supervising authority and co-ordinate the results achieved at the Regional Research Stations. Each of these must also have a live-stock farm attached to it for work on breeding and raising a profitable live-stock, conducting feeding experiments with the feeds grown in the region and giving trials to newer drugs and biologicals for control and treatment of livestock diseases. Such an arrangement would lead to the desired objective of decentralizing research on regional basis and at the same time ensuring central supervision of a high order.

Every State should have a Livestock Research Station of its own to conduct investigations into problems of local importance, provide a feeder service to the regional and central institutes and undertake

application of results of their own researches and those of the central institutes and their regional sub-stations. It is envisaged that a chain of research stations at the various levels and spread over the whole country will offer the only possible means of intensifying research and making available the results of researches for utilization in the field.

Some Priority Problems of Research

Since the establishment of the Imperial Bacteriological Laboratory (now known as the Indian Veterinary Research Institute) in 1890 at Poona for the control of rinderpest, veterinary research has turned into many directions but rinderpest has continued to occupy the central position of interest till the time when an effective vaccine against this disease had been evolved. The war declared against rinderpest may be said to have been won and its devastating effects on cattle population and ultimately on food production which formerly left people helpless would now remain buried as a past history.

Many contagious and killing diseases have also received attention at the Indian Veterinary Research Institute and, as a result, effective biological products developed and manufactured at the Biological Products Division of the Institute have contributed greatly towards the preservation of livestock wealth of the country. With the facilities and resources available at present, various other divisions forming an integral part of the institute are engaged on fundamental researches in animal nutrition, animal genetics and artificial insemination, poultry husbandry and parasitic diseases of livestock. In these fields there are problems of far-reaching importance and vital to the development of the country's livestock which require planning, trained personnel and the necessary funds.

Breeding for Production.

Veterinary scientists have "forged" some very important tools and techniques of which the method of artificial insemination is most important. Whereas, in some foreign countries this method has revolutionised cattle breeding for better production, in India, in spite of several centres working at present, a measurable progress according to expectation has not been achieved. Under the animal husbandry conditions obtaining in this country where cattle population is found in small groups in villages far removed from the artificial insemination centres, the progress of this work would continue to suffer from limitations of distance and timely accessibility of semen to the cow, or of the cow to the artificial insemination centre. It would be, therefore, a profitable item of research to devise some means of prolonging the keeping quality of semen, may be, to carry out experiments on methods of deep-freezing semen under our conditions and evolve some effective semen shippers to preserve semen during transit.

It may, perhaps, be rightly presumed that all the bulls that are today employed for the artificial insemination work in the country do not possess a high pedigree, but at the same time it may not be denied that, although in small numbers, such bulls would be available in every State. If researches on the items indicated above bear a fruitful result, each State would be able to establish a few semen banks where deep-frozen semen could be stored for a year or two. This may facilitate a large scale use of good quality semen for breeding more productive livestock.

Progeny testing of stud bulls is another item of work on which no attention has hitherto been given. A bull with a good pedigree is a highly desirable basic material for developing a breed, but more important for a breeder is to know whether a particular bull whose semen it is proposed to use is capable of transmitting the milk yielding characters inherited by him from his dam. This project is long overdue in view of the cattle development work having been taken up on a key village scheme basis for the last ten years all over the country. To say the least, the progeny tested bulls hold the key to the development of cattle in any country and financing research on this project may be looked upon as a sound investment.

Cattle breeding policy today is grading up the non-descript low-yielding stock with some well-defined milk breeds and developing the milk breeds by selective breeding in their home tracts. In certain very large tracts draft cattle predominate, milk production is very meagre and the problem that forces itself is what can be done for increasing milk production in these areas. Cross-breeding between some well-known draft cattle and the milch breeds appears to be the only feasible solution. No practical steps have been taken in this direction as cross-breeding between the known breeds of our cattle is a taboo with our official experts who would not like to violate the sanctity of the pure breed even if it were for putting more milk in our cow's udder.

Feeds and Fodders—a great bottleneck

Feeds and fodders present a three-dimensional bottleneck which the agrostologist, the nutritionist and the practical feeders have to get together to resolve. But the position as one may find it today is that the agrostologist is too much imbubed with the idea of pastures, the nutritionist advocates the doctrine of a balanced ration—all these in a country where land resources are being utilised for growing cereals and balanced diets are unthinkable even for man—and the practical feeder stands aghast before such jargons.

Our planning for feeds and fodders should more rationally be based upon the needs of the individual cattle owners who do not

generally maintain a large herd like the livestock farmers in the western countries and on the system of agricultural practices followed by our mixed farmers. With the onset of several irrigation projects, intensive agriculture with sound rotational system may catch up the mind of our agriculturist and in its wake the idea of pasturage may not be allowed to take root. What is, therefore, likely to follow is crop husbandry in all its phases where cultivated fodder also may find its rightful place. Cattle are maintained under stall conditions of feeding on bye-products of agriculture and the cultivated fodder. Increased yield of food crops and oilseeds through improved varieties of seeds, application of manures, irrigation and protection from pests and diseases will inevitably lead to increase in their bye-products, but all the same, research is indicated on the study of indigenous and some exotic grasses, their ecology, yield and nutritive value.

There is a growing awareness amongst the farmers of the importance of legume crops both as fodder and fertilizer and how many of them, either indigenous or exotic, could be adopted by the farmers both in *kharif* and *rabi* cultivation to provide useful fodder for cattle is the problem for the agronomist to tackle. Likewise, our fertilizer experts also have a problem to tackle and that is to look to some other directions for fertilizers than to appropriate all oil cakes, molasses, blood, bone and fish meals which in all reasonableness should go to our cows for milk production. If synthetic rice or other such foods originating from the Food Technological Laboratory could be available in increasing quantities and rendered more palatable, some coarse grains which at present support our people can more reasonably be diverted to feed our cows in milk. To those who are engaged in the laboratory study of grasses, such as the study of their chemical composition and the nutritive value, it may be pointed out that there is a vast array of indigenous grasses whose potentiality as fodder as not been fully investigated.

Preparation of silage and silage feeding of milch cattle has revolutionised the dairy industry in many countries. What type of grasses can be ensilaged is not really a question but how best the surplus monsoonfed grasses could be processed to the maximum advantage of the farmer is indeed a question to which our research workers would have to supply an answer.

Disease and Pests

Till such time as our farmers, on account of their economic backwardness, do not demand the application of prophylactic measures against the various livestock diseases on payment, the responsibility of protecting our cattle wealth devolves on the State organisations established for the purpose. Our veterinary scientists have made some very notable contibutions in the field of animal epizootics with the result

that many acute and killing diseases can now be controlled by the use of suitable biological products developed at the Indian Veterinary Research Institute. Nevertheless, the position that may have to be admitted is that there are still certain diseases of our livestock which undermine production and cause serious losses to livestock owners. In this context I refer to foot-and-mouth disease which although causing a low rate of mortality has a very damaging effect on milk production and working capacity of our animals. The situation arising from the ravages of some highly infectious and contagious diseases of livestock in India has not been appreciated to the extent so as to initiate disease-wise survey of the resultant monetary loss and mobilize all possible resources for suppressing them. In the absence of any reliable information of this nature with regard to foot-and-mouth disease and also in view of the fact that only a small percentage of our cattle populatian may escape infection, the monetary loss accruing from this disease alone may be considered as enormous.

It is the experience of all workers on foot-and-mouth disease that an animal once recovered from infection is likely to contract the disease again within a few days or months after recovery from a previous infection. In the face of such recurrent threats from foot-and-mouth disease, cattle development may be considered as well nigh impossible. This position can only be remedied if research on foot-and-mouth disease is intensified with enlarged facilities so as to envolve some suitable biological products which could be produced in large quantities at a cheaper cost and afford protection for a longer duration.

Specific abortions where micro-organisms are involved and several hitherto undetermined factors leading to reproductive failure in cattle pose a problem of far-reaching importance, but at the same time, both fruitful and challenging to veterinary scientists. Brucellosis or contagious abortion caused by *Brucella abortus* (Bang) is a disease of world-wide prevalence and almost a nightmare to milk producers even in this country. No organised farms where pedigree stock breeding for the purpose of supplying bulls for grading up the village stock is being undertaken is free from this disease. In view of the fact that an aborted cow remains a carrier of the disease and a very potent source of infection and a bull apparently healthy discharges the organism of the disease in semen, the danger from this disease to cattle breeding and milk production enterprise may really be considered as very grave. The methods of control as followed in other countries, which include slaughter or segregation of infected animals and vaccination of calves, may not be applicable in this country. Several countries have experienced difficulties with the use of the strain 19 vaccine in adult cattle. Its use, therefore, in calves and the adult stock must await

critical experimentation before adoption in this country. The other aspect of the problem of Brucellosis that needs investigation in this country, in view of the self-limiting character of the disease, is the significance of the ceased reactors and the possibility that it may offer for devising control measures.

Parasites and Parasitic Diseases

Some chronic and insidious diseases caused by parasites whose number runs into a legion put a very heavy premium on animal production. The poor health of our stock in certain regions highly conducive for the propagation and survival of the parasites may be attributed to a very large extent to the depredations of their various forms and species. To what extent the loss in the animal wealth of any country is accountable to parasitic infestations and diseases may be realised from the statement of Lord John Boyd Orr, an ex-Director General of the Food and Agricultural Organization of the United Nations, that if it was possible to control Fascioliasis (Liver-fluke disease) alone amongst the ruminants of a particular country, the resultant increase in the stock of meat and milk products would suffice to feed the population for a number of years. That may be an eye-opener to any one—scientists, planners or administrators—concerned in food production drives of the country. What is needed, therefore, is the building up an organization to deal effectively with these marauders, and what more, a stockpile of knowledge on the strategy of attacks launched by them.

Even if it is necessary to fortify the "frontiers of our territory" the livestock, by feeding them better so as to nullify the attack made by the parasites, in a warfare of this nature it would always prove advantageous to infiltrate a little deeper into the enemy lines to study their habits, haunts and habitats and ascertain some vulnerable points for attacking them. Studies on life-histories, bionomics, and ecology of the parasites would, therefore, be of an inestimable value in devising measures of control against them. Intermediate hosts the "fifth-columnists" on which several species of parasites lean for support during the period of their helplessness should also receive attention in our campaign. In spite of the necessary precautions to ward off attack by the various parasites they have their own subtle manners to establish a foothold in our animals. Phenothiozene was once thought to be an "atom bomb" against most of the parasites, but in spite of its killing effect it has proved injurious to the host in most instances. Newer and safer anthelmintic "missilies" for the host but more destructive to the parasites would, therefore, have to be forged in the laboratories—a task which our trained parasitologists may have to be charged with.

The priority problems on which research work needs to be intensified have been indicated together with the benefits that are likely to accrue from pursuing them. No nation can afford to remain unmindful of the technological development being pressed into service in all spheres of human activity. The present gap between the highly and the less-developed countries can be bridged only if means are provided for the fruitful utilization of the technical knowledge available.

Conclusion

Production of food is of vital importance to the nation. The problem needs to be tackled from all angles and the status of livestock, which forms the basis of agriculture in this country, needs to be strengthened. The present lop-sided attitude of agricultural policy needs overhauling to make possible the achievement of plan targets in the field of animal husbandry.

The vast value of livestock and their products can readily be increased ten-fold with the aid of scientific research and given the required technological aid to agriculture as a whole, it may not be altogether impossible to defy the present rate of growth in human populatation.

The oft-repeated pessimism that Indian cattle are low-producers needs to be modified in view of the very obvious reason that hitherto no serious efforts were made either to develop them or their productive capacity. Such pessimisms, to my mind, are often dictated by impatience from those who want the result in improvement of livestock within the same span of time as often obtained in the field of agricultural commodities. Livestock improvement is a long-range programme as the time between two generations is obviously long.

Livestock development plan visualises a three-pronged attack on breeding, feeding and disease control, all to be pursued simultaneously, if sustained results have to be obtained.

Livestock production is an enterprise of a highly specialised nature demanding services of experts in many related fields. Not only that, our people in every walk of life, be they simple village folk or the industrial magnates, would have to realize the importance of the role our livestock play in building up our country's economy.

Clinical Article

CARCINOMA OF THE HORN IN CATTLE

By

S. B. Tripathy, B.Sc., (VET.),

Veterinary Assistant Surgeon, Kendrapara, Orissa.

Five cases of Carcinoma of the horn in cattle were successfully treated at the Veterinary Dispensary, Kendrapara, Cuttack District in September and October, 1958 and they are recorded here for whatever they are worth. The history in each case was more or less identical — broke the horn in a fight or in an accident. The symptoms were again more or less the same — Cauliflower like growths with foul smelling discharge. Valuable animals are sometimes lost too early in life and it is but fair that we should do our best to save them wherever possible.

Success depends on the amount of patience and pains we take in observing asepsis, removing all infective debris and conducting the operation on the surrounding healthy tissue.

Case No. 1.—Bullock aged about 5 years. The area round the base of the horn was shaved, cleaned with soap and water and Tr. Iodine applied. 5 c.c. of 5% solution of Procain Hydrochloride was used for cornual block. Another 15 c.c. was injected subcutaneously around the base of the horn. An eliptical incision was made around the base of the horn, the skin was dissected clean and held apart with forceps. Then the horn with a small portion of the frontal bone was removed with a saw. Further diseased tissues were curetted. The part was next flushed with warm saline solution till only normal tissue could be seen and then stitched with Nylon. A spirit Acriflavine swab was applied and the animal allowed to get up and go with a bandage on. The animal made an uneventful recovery.

Case No. 2.—Bullock aged about 5 years. The cancer had gone deep into a portion of the frontal bone also. Great care was taken to scoop out all cancerous tissue and a thorough flushing with Normal Saline was given. The part was sutured with all antiseptic precautions. In addition Sulphamezathine Sodium Solution 33⅓%, 60 c.c. intravenously on the first day and 40 c.c. on the second and third days were given. Due to some discharge, the stitches were removed on the fourth day and the wound irrigated with Mag. Sulph solution and dressed with Codliver oil with Sulpha 1 : 4 and bandaged. This dressing was continued for 20 days. The wound was restitched at the end of this period and sealed with Collodium Flexile. Eight days after the stitches were removed and the part was quite healthy and the animal was discharged.

Case No. 3.—A cow aged 8 years. The same care in operation and stitching was bestowed. The owner took away the animal and brought it back after 10 days. The part was quite clean and the skin was well united. Removed the sutures and discharged the animal. In this case, it was only in early stages and had not gone very deep.

Case No. 4.—A bullock aged 4 years. Though an advanced case, the same amount of care in operation and stitching as in the previous cases helped me to reap the reward. Eight days later, the stitches were removed and the animal discharged.

Case No. 5.—A cow aged 3 years. This was an early case of cancer. The same line of treatment was followed and the animal was discharged ten days later, perfectly normal.

Such cases are generally given up as hopeless, but there seems to be an element of success if sufficient care is bestowed. I know I have nothing new to offer to the profession but I merely record my experience with such cases.

Abstracts

The use of Hexadecamethylene - 1 : 16 Bis (Isoquinolinium Chloride) in the treatment of Ringworm in Domestic Animals.—By T. N. GOLD and B. V. JONES.—*The British Veterinary Journal*, Vol. 114, No. 10, October, 1958.

In Great Britain ringworm occurs most frequently in Cattle, and equine ringworm is also not uncommon. In pigs, however, it appears to be rare and of little, if any, significance. The authors decided to undertake clinical investigations with a new anti-fungal preparation containing hexadecamethylene - 1 : 16 bis. The pharmacology, anti-fungal and antibacterial spectrum of this compound have been reviewed by earlier workers. The clinical trial of lotions containing the above drug in the treatment of ringworm in cattle, horses and pigs is reported by the present authors. From the outbreaks both T. *discoides* and T. *equinum* were isolated. Clinical cures were obtained rapidly in all cases treated. These results agree with those of other observers published on the treatment of cattle ringworm and would indicate the value of this antifungal compound in Veterinary practice.

A. MUKERJI.

The interplay of an immune substance with Tuberculopolysaccharide and its Antibody in Tuberculosis.—By FLORENCE B. SEIBERT.—*The Journal of Infectious Diseases*, Vol. 103, No. 1, July-August, 1958. (Author's summary reproduced).

Antibodies were found not to have a direct bacteriostatic or bactericidal effect on finely dispersed BCG organisms *in vitro*. Instead

of this the anti-polysacchride antibody was found to play an important indirect role in immunity by combining with freely circulating tuberculopolysaccharide, and so diverting it from occupying the effective groups of a naturally occurring antimicrobial agent, thus leaving them free to act on the tubercle bacillus.

An antimicrobial agent for tubercle bacilli was found to be present in the gamma globulin fraction, especially from normal sera. It was heat stable, and therefore, not complement, and its effect in serum was counterbalanced to a large extent by the presence of albumin, which is a growth stimulant. Moreover, its antimicrobial activity could be suppressed by the hapten, tuberculopolysaccharide, indicating that this component is probably the vulnerable site of the bacillus for attack. The question as to whether this antimicrobial agent may be lysozyme is discussed, since lysozyme had an inhibitory effect *in vitro* on the growth of tubercle bacilli similar to gamma globulin and is known to occur in serum.

The implications of these findings for the production of immunity in tuberculosis are discussed.

A. MUKERJI.

Coccidiosis in Domestic Mammals.—BY HORTON—SMITH, C. (1958), *Vet. Rec.*, **70.** 256-262.

All the pertinent particulars about this disease useful to the practising Veterinarian are summarised in this refresher article. The subject is introduced with brief notes on the life history of the coccidium and the various characters which guide its specific identification. A clear picture about the causative species, pathogenesis, symptoms and lesions of coccidiosis of all the domestic mammals including rabbits is furnished. Sulpadimidine (sulphamezathine), 4-4'-diamino diphenyl sulphone (dapsone), pthalylsulphathizole, mepacrine hydrochloride, sulphaquinoxiline and sulphaguanidine in cattle; nitrofurazone in pigs, sheep and goats and sulphadimidine in dogs and cats are listed as effective drugs. The value of cautious appraisal of the clinical findings and history in making a diagnosis and the importance of good hygiene in the control are stressed. The coccidia of laboratory animals are also named and treatment of the affection in them with sulphanilamides is suggested.

V. S. ALWAR.

Kumri of horses in India. Pathological report of a case.—BY SHOHO, C. AND KULASEGARAM, P. (1957). *Cey. Vet. J.*, **5**, 76-80.

The authors record their observations on the brain and spinal cord from a case of Kumri received from Calcutta—India. Visible

lesions in the spinal cord at the first and second cervical and the first thoracic segments as well as the histopathological appearances of the affected portions revealed the typical picture of cerebrospinal nematodiasis. Immature *Setaria digitata* is suggested as the probable causal agent.

V. S. ALWAR.

News and Views

The Central Leather Research Institute, Madras, is making itself a very useful institution. Its monthly Bulletin is highly informative and its periodic symposiums are all that could be desired. Now this Institute has given the correct lead and guidance in organising a Society called " The Indian Hides and Skins Improvement Society ". The very appellation explains fully well the objects of the Society. An organisation of this nature was long overdue. Perhaps it is modelled after its international counterpart and we wish the Association all success! We publish in this issue under our B.D.C. (Block Development Corner) the several items of "Do you know" published in their Souvenir on the opening day of their Association.

* * * *

Treason.—Indeed it is. Shri Bhimsen Sachar, the Governor of Andhra Pradesh in his Republic Day speech said " It would be treason to be idle or indolent in free India ". Let every son and daughter of India remember this. Do your work wherever you are placed to the best of your ability and all the time you can and nothing short of it. Let us be actively loyal to our motherland.

* * * *

The Four 'C's.—Shri Y. N. Sukthankar, the Governor of Orissa came out with another sparklet on the Republic Day. He called upon the people to resolve to attend to three 'C's—*Crops*, *Cattle* and *Children*. If we do this then the fourth 'C', the *Country* will look after itself ".

* * * *

Science and Applied Science.—His Royal Highness Prince Philip, the Duke of Edinburgh, said recently in India, " Science would only solve scientific problems and something or somebody else was needed to turn scientific facts to practical advantage. Science demands integrity of thought and an acceptance of the facts. Engineering and Technology demand ingenuity and a refusal to accept anything as impossible ". They are so inter-dependent that one cannot thrive without the other.

* * * *

Rats and Bandicoots.—Here is a bit of humour in the Rajya Sabha. " There are 240 crores of rodents (as per a random sample survey) in the country " said Mr. M. V. Krishnappa, Deputy Minister for Food. He added amidst laughter that in his own house, the ratio of human beings to rats was one to eight, while the All-India ratio was only one to six. Mr. Bhupensh Gupta asked a supplementary question " How many rats are there in the Central Secretariat? (*Laughter*). " Rats or Bandicoots " asked Mr. Prasad Rao. (*More laughter*).

* * * *

Paper Famine.—We agree entirely with what " Science " has said in a local daily under the caption " Soaring price of paper ". Here is an extract :—" As a publisher of a scientific journal, I wish to add that f the Government fail to set matters right, the situation will force the extinction of many a scientific journal, built at a great cost and sacrifice over a number of years. Some arrangement should be made with the mills for the direct supply of the requirements of such *bona fide* journals based on the quality, size and circulation of those publications ". Will Government pay heed? We despair!

* * * *

Shri U. K. Asanani, G.B.V.C.—Till recently the District Animal Husbandry Officer, Kutch, has been appointed as the Deputy Director of Animal Husbandry, Saurashtra and Kutch Region. We wish him all success in his new sphere of work.

* * * *

Dr. Franz Alexander who captained the West Indies Cricket Team, against India and Pakistan, is a Veterinary Surgeon by profession. There has been an all-round praise of his able captaincy. He has added lustre to the profession he belongs. It is no wonder therefore that he was felicitated at several of the Veterinary Colleges in India, by the members of the profession. We congratulate Dr. F. Alexander on his un-beaten record in India and wish him many more years of useful Cricket!

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.]

RURAL SURGERY

By

Dr. W. F. GUARD, D.V.M.,*

Professor and Chairman, Department of Veterinary Surgery, Ohio State University.

(From *Iowa Veterinarian*, Sep.-Oct. 1956).

Rural surgery in general requires considerable native ability to think and work under varying conditions without sacrificing basic principles so that one's services may not only result in recovery of the patient, but prove profitable to both owner and surgeon. Country or tricounty surgical clinics where one could have better facilities and obtain help if needed would be a great step forward in caring for some of the major surgery especially during the winter season.

However, with the growing tendency toward ultra-modern techniques in human hospitals, the problem of " how you going to do it down on the farm " becomes an ever-increasing economic problem. With the spectacular and too often premature reporting of so-called revolutionary wonder drugs, the tendency has been to hastily discard or ignore the old, and rather blindly expect far too much of the new. Practitioners in trying new products before their real value has been fully determined should be exceedingly careful to avoid erroneously adding inflation to the unfounded claims.

Cleanliness is Basic

It is the importance of giving attention to relatively simple procedures that I wish to briefly emphasize. The little details are important and yet too often neglected. Cleanliness, the basic principle of asepsis, is of primary importance in surgical success.

I have worked under both hospital and field conditions before and since the advent of the sulfas and antibiotics and know that efficient and relatively economical types of surgery are still practical under both conditions. My principal concern is to keep the overhead expense to a practical minimum without cheapening the service. Standard hospital techniques are not often applicable to farm conditions and one thoroughly

* Now assigned to the Rajasthan College of Veterinary Science and Animal Husbandry, Bikaner, as T. C. M. Expert Adviser.

indoctrinated in such routine finds it difficult if not impossible to adjust himself to practical procedures.

Sanitary Conditions Vary

" The small animal practitioner with a modernly equipped hospital is limited in the application of materials and techniques only by his clinical ability and the willingness of the owner to pay. The large animal practitioner doing most of his work on the farm finds the problem of confining and controlling different types of patients quite difficult and even satisfactorily impossible at times. He must also consider the variations in sanitary conditions, comfortable quarters, and the ability of the owner or attendant to supply the necessary assistance and aftercare. Recognition of all such factors should not discouage prospective large animal surgeons but rather should serve as a challenge to one's ingenuity and pride of accomplishment even when working under relatively adverse circumstances." (Guard—" *Surgical Principles and Technics* "—153—p. 12.)

Perhaps some classroom observations may have some significance. Our students usually have considerable training in small animal surgery before taking the laboratory course in large animal surgery. They bring their instruments in clean pans and clip, shave, and cleanse the fields of operation. Then there is bedlam for a while as I see one after another momentarily lay instruments on the operating table instead of replacing them in the pans. Excuse; they have an imaginary shroud there which would be real in actual practice. But they may not.

Country Style Technique

My next worry is seeing long strands of suture material dragging over the table, limb, or foot of the animal. We cut off the contaminated portion of the suture and demonstrate how to coil the free end in the palm of the hand and carry out the suturing without a break in acceptable technique—country style.

Another problem is to teach the necessity of directing others to give needed help so as not to contaminate your hands and if you unavoidably soil your hands, to take time out to properly cleanse them before proceeding with the operation. I feel that in general we need to put more emphasis upon the responsibility of the owners or management to provide sufficient help and acceptable sanitation. I was once called in consultation to perform a cryptorchid operation. The horse had been confined in a basement box stall, and his limbs and body were plastered with manure. The owner led him out and said, " Go ahead ; put him down and operate. I'm tried of fighting him." I refused to operate and suggested postponement until the animal had been properly

cleaned. The owner said, " Go ahead and operate, If he dies, that's my business." I told him that if that was the way he felt, to call on someone else to kill his horse. We left with the mutual understanding that the animal would be properly groomed. We returned later and performed the operation. Some time after that, the local veterinarian told me that the incident had made a better client out of the man.

Facilities Should be Adequate

It seems to me that it should be perfectly obvious that most of our state fair grounds should be equipped with a place for housing and treating animals under proper supervision. Veterinarians should not have to work on obstetrics or other major problems in crowded quarters with no facilities and hundreds of curious spectators. It is beneath the dignity of the profession to privately or publicly work under conditions that are generally recognized as so insanitary as to seriously endanger the life of the patient.

We often here and see remarks in the literature to the effect that many types of veterinary surgery and specifically abdominal and orthopedic surgery in the equine were hitherto (before antibiotics) impossible due to the great susceptibility of this animal to infection. Certainly such statements are in conflict with even the recent historic past concerning Veterinary Surgery. The " 11th and 12th Reports of the Director of Veterinary Research "—September, 1926—Pretoria, South Africa. describe in detail and show pictures of animals, including several horses, that had successfully survived spleenectomies. And for the record, there is hardly an old-time veterinary practitioner living today who has not successfully performed cryptorchid operations, open reduction and repair of inguinal, umbilical, and abdominal hernias, the successful replacement of prolapsed intestines, and ovariectomies upon the equine.

Aseptic Technic Acquired

The operations were generally successful if the operator possessed surgical skill and practised rigid application of cleanliness and other basic principles of surgery. It is only fair to recognize that some of the occasional fatal cases due to complication may have been saved had we had access to modern therapeutic aids to overcome or prevent invasive infections. On the other hand, we should fully appreciate that the " wearing of sterile rubber gloves, clean garments, a cap and a mask is truly impressive only when worn by one who not only knows how, but can and does apply aseptic principles even under very trying circumstances. The true surgeon must acquire a sense of automatic aseptic technique through arduous study and practice." (Guard—" *Surgical Principles and Technics* "—1953—p. 24.)

Hospitalization Overemphasized

In addition, the modern tendency has been growing in our colleges to overemphasize the necessity of hospitalization and all the modern techniques and expensive equipment, materials, and tests used in the most modern human hospitals. I have always been in favor of making practical application of all progressive knowledge that will tend to produce better results, ease our work, and yet not bankrupt our client. Human hospitals seem to operate on the policy that everyone should have hospital insurance, but this is hardly applicable to animal practice. Furthermore I recently had occasion to check upon the reason why laboratory charges for a patient were so high — $18 one day, $21 another, plus medicine and room. The business office clerk said, "Don't worry. It is not any more than the insurance company will allow." Is that why hospital insurance costs keep going up ? Does such policy unwittingly give encouragement to advocates of socialized medicine ? In veterinary practice the relationship of one's expenses, the time involved, and the total charge to the owner is of economic importance to both parties.

Antibiotics Not Always Needed

While I am convinced that antibiotics are a great asset when indicated, I deplore the faithless recommendations to administer antibiotics immediately following such relatively simple, uncomplicated operations as hernia or cryptorchidism in the pig. I still operate in the barns and have never yet used antibiotics following uncomplicated surgery.

In an article entitled, " *Basic Principles in Management of Open Fractures,*" (*JAMA, October* 1, 1955, p. 174, *Oscar P. Hampton, Jr. M. D., Department of Surgery, Washington University, School of Medicine*) the importance of basic principles and the limitations of antibiotics are emphasized. These same basic principles have a practical application in veterinary surgery on the farm. Hampton points out that open fractures are complicated due to several factors which I have briefiy summarized as follows : I) Possible blood loss and shock, 2) Loss of the hematoma from the fracture site, 3) Damage to soft tissue may retard and even limit return of function, 4) The principal hazards are those of secondary infection and failure of healing of the wound and the fracture. The much more common type of bacterial infection results from bacterial decomposition of devitalized soft tissue and blood clot resulting in suppuration. The necrotizing enzyme of the pus attacks living soft tissue and bone, producing a vicious cycle. To quote Hampton : " Basic Objectives of the Management of Open Fractures include the prevention or eradication of wound infection and healing of the fracture in good position without further death and loss of tissue.

It readily follows, that to achieve those objectives, underlying factors leading to wound infection must be eliminated. The wound must be throughly debrided."

Basic Principles Applied

Naturally these same objectives apply to all wounds. The wounded parts should be debrided, immobilized, and protected insofar as possible against secondary mechanical irritation. When one rigidly applies basic principles in any type of surgery, he can have faith in his work and assurance of good results whenever possible. Cleansing, that is scrubbing with warm water, soap or pHisoHexR, the entire field where the operation is to be performed and all remotely adjacent parts to be covered with a protective dressing, shaving around the immediate surgical area, and the debriding of all dead and aphyplatic tissue followed by irrigation must be meticulously carried out. A valuable lesson I learned while a student under Dean David S. White was that it is better to clean a field dry than to wash it dirty. Again quoting Hampton: "In surgery for civilians, suture of a clean, well-debrided wound of an open fracture is frequently feasible, particularly if the time lag after injury is not too prolonged. (Any wound may be closed primarily up to 12 to 16 hours after injury.)"

In general he states that, under such care, you will need not fear swelling and suture tension provided the area is properly debrided and protected. If one detects complications within a few days; wet dressing, odor, and possibly general symptoms such as a rise in temperature and off feed, it is obvious that you have not been successful in removing the source of infection and that open wound treatment is indicated. The closing statement in Hampton's article is quite significant: Quote "Antibiotics (purposely not mentioned heretofore to place them in proper perspective) may be administered systemically to prevent *invasive* infection of living tissue by bacteria presumed to be present in every traumatic open wound. *Systemically or locally administered antibiotics or their combination will not prevent the septic decomposition of dead and devitalized tissue* in a wound and *will not neutralize the necrotizing enzymes in undrained pus.* They cannot be used as a substitute for thorough debriding of the wound of an open fracture." (Italics are ours.)

Thoroughness In Application

It is worthy of note that during World War I, Dr. Rutherford B. Morrison, a British surgeon, defied general army medical orders by refusing to amputate all limbs having compound fractures and if his method of treatment had not been so highly successful, he would have been court-martialed and perhaps worse. His technique was to thoroughly cleanse and debride the parts and rub every exposed cell with sterile gauze impregnated with BIPP, then suture the wound, if possible, and put on a splint or cast. The results were wonderful and a testimony to Dr. Morrison's faith in his work. (Ref. Guard—"*Surgical Principles and Technics*"—1953—p. 24). I started using his technique in 1920, have never changed the procedure, and have nothing to regret. The secret is thoroughness in the application of the basic principles necessary to prevent or overcome contamination of the wound. My experience with this technique in compound fractures, orthopedic and other types of surgery has been too encouraging to even consider changing to the promiscuous use of antibiotics.

A point which I want to emphasize is that since we have plenty of proof that one can have success in the treatment of contaminated, compound fractures, aseptic surgery should seem relatively simple in comparison even in country practice.

DO YOU KNOW?

That the livestock wealth of India consists of 158·9 million cattle, 44·8 million buffaloes, 38·7 million sheep, 56·6 million goats, 1·5 million horses & ponies and 6·6 million camels & other animals.

* * * *

That the net contribution of livestock to our National income is well over 6,000 million rupees per annum.

* * * *

That India produces about 18·9 million hides annually. Of these 16·4 million (*i.e.*, 86·8%) come from fallen stock and 2·48 million from slaughtered animals.

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That about 24·6 million carcasses are available in the country every year; but due to non-utilisation of various valuable by-products from them, the country loses about 231·9 million rupees per year.

* * * *

That due to defective flaying, curing and storage of fallen hides alone, our total loss comes to 33·9 million rupees every year.

* * * *

That due to bad flaying of slaughtered hides alone, we lose 1·6 million rupees each year whereas due to bad flaying of fallen hides the loss amounts to 6·2 million rupees per year. Hence the total loss due to bad flaying alone amounts to 7·8 million rupees per year.

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That 2·5 million skins are damaged every year by careless and faulty flaying.

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The East India kips and skins worth about 230 million rupees are exported per annum.

* * * *

That in 1957, other leathers worth about 177 million rupees (24 million more than the 1956-figure) were exported.

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That in exporting approximately 2,630,000 pairs of shoes in 1957, we in fact exceeded the planned target fixed at 2,000,000 pairs for 1960–61.

* * * *

That India exports goatskins to the tune of about 80 million rupees every year.

* * * *

That our per capita consumption of footwear in India is 0·23 pairs in the rural and 0·28 pairs in the urban areas as against USA's 3·2 pairs. It has been estimated that even if one person in every three of India's large population buys a pair of shoes annually, the demand so created will consume all leathers from 12½ million cow hides and 10 million buff hides.

* * * *

That the present annual production of footwear in India is about 90 million pairs. The Planning Commission, on the basis of an estimated increase in demand in footwear by 18% during the Second Plan Period, has estimated that the additional number of footwear required will be abont 16 million pairs, thus bringing the total requirement of the country to about 106 million pairs by 1960–61, when 23 million hides and 26 million skins will be needed to meet this demand.

(*From the Souvenir issued by the Indian Hides and Skins Improvement Society.*)

Association News

The All-India Veterinary Association

THE RESERVE FUND

An event of great importance to the Veterinary profession in India, took place in August 1924. It was the birth of the *Indian Veterinary Journal.* Circumstances were positively hostile and yet the profession took that bold step and the lion - heartedness of the early pioneers cannot be too highly praised. Ever since then, the *I.V.J.* has toiled hard under very adverse circumstances. The *I.V.J.* lives to-day so that the profession could prosper and science advance.

And now the hat is sent round so as to place this journalistic venture on a sounder and firmer basis. The *I.V.J.* is a priceless possession of our profession. It has placed the Indian Veterinary Surgeon, on the map of the scientific world. Just pause and ponder over, how much we owe to the Journal both individually and collectively. Is it too much then to expect the profession to respond to the appeal issued for a Reserve Fund? We hope not.

Some enquiries have come to us asking us to indicate the extent of help expected. We do not want to put the members of the profession to any undue financial strain in these hard days. At the same time, a certain amount of sacrifice is needed to make this fund a great success, so as to make it worthy of our profession. So we feel that the following scale of contribution will be quite reasonable. It could even be paid in two or three instalments.

Class I Officers	...	**Rs. 100/- and above.**
Class II Officers	...	**Rs. 50/- and above.**
All others	...	**Rs. 25/- and above.**

It is our ambition that no Veterinary Surgeon in this land should remain without contributing to this fund. Brick by brick, this great edifice of our's should begin to rise higher and higher. On the success or otherwise of this venture, the solidarity of our profession depends. "*Pay and Prosper*" is the slogan we pass on to the members of our profession.

Jai Hind!

T. VINAYAKA MUDALIAR,
Editor, The Indian Veterinary Journal.

THE I. V. J. RESERVE FUND

LIST OF CONTRIBUTORS

		Rs. nP.
Amount acknowledged in February 1959 issue	...	3,678·81
Dr. M. M. Mahanta Shetti, Sindgi, Mysore.	...	10·00
,, S. K. Jambagi, Bilgi, Mysore	...	10·00
,, K. Venkataraman, Sivagiri, Madras, *1st Instal.*	...	15·00
,, A. Mukerji, Bengal Vety. College, Calcutta.	...	12·00
,, V. D. Sharma, Jammu Cantt, Kashmir.	...	10·00
,, G. Biswal, Principal, Vety. College, Cuttack, *3rd Instal*	...	25·00
,, Raghunath Koili, Bikaner, Rajasthan, *2nd Instal.*	...	5·00
,, B. M. Kuppuswamy, Saklespur, Mysore.	...	25·00
Total	...	3,790·81

Cheques, money orders and all correspondence should be addressed to the Editor, *The Indian Veterinary Journal*, Madras-17.

THE ALL-INDIA VETERINARY ASSOCIATION

Proceedings of the adjourned meeting of the Managing Council of the A.I.V.A., held on 7—2—59 in Bangalore, at 4 P.M.

Members present:—

1. Dr. M. S. Sastry, *President* in the Chair,
2. Dr. V. S. Kuppuswamy Mudaliar, *General Secretary*,
3. Dr. H. R. Rangaswamy, *Jt. Secretary and Treasurer*,
4. Dr. K. S. Krishnappa,
5. Dr. T. Vinayaka Mudaliar, *Editor, I.V.J.*

1. Read letters from Drs. Rao Bahadur V. R. Phadke, S. V. Mudaliar and G. Osman Khan, regretting their inability to attend the meeting, offering some suggestions and wishing success to the proceedings.

2. Read letter, dated 29—11—58 from Dr. T. Vinayaka Mudaliar regarding certain clarification required on the Rules of the A.I.V.A. and on certain other matters referred to below :—

Rule No. 5 was read and the role of the elected members was fully discussed. Subject to ratification by the General Body, the following resolution was adopted :—

> "Resolved to add "from affiliated branches" after 'elected members' under clause 1, Rule 5, so that it may read as 'elected members from affiliated branches' and to add at the end of Rule 5 'The above three classes of members will constitute the General Body of the Association along with the Office-bearers elected under Rule 8."

3. Read Rule No. 9 with regard to the quorum for the General Body meeting. In the light of the amendment proposed above to Rule No. 5, it is resolved that the quorum fixed may stand as it is and it may be taken up by the General Body at a later date, if found necessary.

4. Resolved to defer for the present, the question of disaffiliation of Branch Associations due to non-payment of affiliation fees, and otherwise for not conforming to some of the Rules of the parent body.

5. Resolved to permit the Editor, I.V.J., to publish the audited Statement of Accounts every year.

6. Read (1) the circular letter of the Editor dated 1-12-58 to a few members of the profession regarding the constitution of a Honorary Board of Editors to help him and (2) also the replies received from a few members.

> Resolved to constitute a Board of Honorary Editors consisting of 6 members with the present Editor as the Editor-in-chief. The Editor is requested to correspond with the concerned members of the profession on the matter and submit a panel of names after obtaining their consent and place the list before the next meeting for necessary action.

7. The existing provision for formation of Sub-Committees under Rule No. 10, for certain specific purposes, was discussed and it was resolved that considering the small size of the entire Managing Council *viz* 8, all subjects should be referred to the entire Managing Council and its decision obtained.

8. The existing provision to elect the Editor of the I.V.J., every year under Rule No. 8 was considered in all detail and it was resolved not to change the existing rule.

9. Resolved to invest the RESERVE FUND OF THE I.V.J., in Fixed Deposit for a period of one year at a time and if possible at not less than 4½% interest per annum. This may be done either with the Mysore Bank, the Vysya Bank or the Madras State Co-operative Bank at Madras.

10. Applications for Membership of the Association from Dr. W. F. Guard and Dr. I. D. Wilson were read and recorded. It was further resolved that both of them are admitted as direct members of the Association.

11. The question of arrears of subscription to the *I. V. J.*, from West Bengal was gone into in great detail. As the Director of Veterinary Services and Animal Husbandry, West Bengal, has since moved in the matter and has cleared nearly 50% of the dues and continues to take steps to clear the balance, it was resolved to defer further action in the matter for the present.

12. Read letter from the West Bengal Veterinary Association inviting the next All-India Veterinary Conference to meet at Calcutta in December 1959.

> Resolved to welcome and accept the kind invitation from the West Bengal Veterinary Association to hold the XIV A. I. V. Conference at Calcutta in December 1959. It was further resolved to request the West Bengal Veterinary Association to complete all necessary arrangements in this connection in good time and to duly announce the same in the *I. V. J.* sufficiently early.

13. Resolved that early steps be taken for the formation of a Branch of the All-India Veterinary Association in Kashmir.

14. Read para " Nomination of Veterinarians on Rajya Sabha and State Legislative Councils " from the extract of the proceedings of the Third meeting of the I.I.V.C., held at Bangalore on 5th and 6th November 1958 published in the I.V.J., 1959 February issue.

The matter was discussed at great length. Resolved that the I.I.V.C., be requested to recommend the name of Rao Sahib T. Vinayaka Mudaliar for a seat on the Rajya Sabha as this eminent member of the profession is well fitted to represent this scientific profession on the Rajya Sabha, in view of the fact that as a Livestock Development Officer in the Madras State he has rendered meritorious service for several years and in the professional and scientific matters he has been actively connected with the affairs not only in the Departmental work but also in the work of the A.I.V.A., and its official organ the *I.V.J.*, he being the present Editor of the Journal and also as a Member of numerous official and non-official Committees connected with the Veterinary and Animal Husbandry work in India.

15. The State branches of the A.I.V.A., be requested to hold frequent meetings in furtherance of the activities of the profession and to forward to the State Governments nominations of members of the profession as suitable representatives on the State Legislative Council.

With a vote of thanks to the Chair, the meeting terminated.

M. S. SASTRY,
President.

V. S. KUPPUSWAMY,
General Secretary.

797, 18th Cross Malleswaram,
Bangalore-3, 20-2-59.

Proceedings of a Special Meeting of the members of the profession and sympathisers held at 3-30 P.M., on 7—2—59 at the Bengal Veterinary College.

Maj. J. M. Lahiri, M.R.C.V.S., F.Z.S., Director of Veterinary Services and Animal Husbandry, West Bengal, was in the Chair.

Present :—Dr. Devraj Marwaha,
,, G. K. Gosh,
,, L. K. Biswas,
,, A. Chatterji,
,, M. M. Bhattacharya,
,, M. R. Ghosh,
,, P. C. Sen Gupta,
,, B. J. Banerjee,
,, J. L. Parimoo,
Sri Barin Gosh,
Dr. U. P. Shah,
,, A. N. Guha,
,, A. K. Banerjee,
,, N. K. Bhattacharya,
,, P. K. Bose, (Hqrs.),
,, B. R. Das Gupta,
,, N. C. Deb,
,, P. K. Bose,
,, D. P. Sadhu,
,, D. K. Ray,

Dr. Anjan Sinha,
,, P. K. Sinha,
,, B. B. Das,
,, S. Giri,
,, D. B. Chatterji,
Sri Mansur Ahmed,
Dr. (Mrs.) Sheila Bhattacharya
,, M. C. Mitter,
,, S. M. Dhar,
,, S. B. Basu,
Dr. (Miss) Geeta Banerjee,
,, P. Mukerjee,
Sri S. S. L. Srivastava,
Dr. I. Kuruvilla,
,, A. N. Chakravarty,
Sri A. Basuthakur,
Dr. B. B. Deb,
,, S. N. Chatterji,
Sri B. Mandal,
Dr. B. K. Das.

Maj. J. M. Lahiri impressed on all present that they were taking part in an important meeting, as the next All-India Veterinary Conference is to meet at Calcutta and that all members of the profession should muster strong to make the Conference a great success, worthy of the high traditions of Bengal. He added that the student population was eager to render what help it could and that their co-operation also should be enlisted.

Prof. Devraj Marwaha, as Organising Secretary said that the All-India Veterinary Association had already given its consent provisionally and that it was incumbent on them to plan properly and constitute an Advisory Committee with several other Steering and Executive Committees for the several items of work. In this connection Prof. Marwaha pointed out that as the Diamond Jubilee Celebration of the Bengal Veterinary College was already due, it would be a great advantage to combine it with this All-India Veterinary Conference as was done in the case of Bombay and Madras Veterinary Colleges. He emphasised the need for the College authorities, West Bengal Veterinary Association, Re-union Committee and the Students Union to combine in this common effort and make the Conference a great success.

Sarvasri B. K. Gose, A. B. Tahnkur, S. B. Basu and B. Mandal suggested that the Government should be approached for the grant of a substantial amount for the celebration of the Diamond Jubilee of the College, as was done in the case of Bombay and Madras, constituting a separate Diamond Jubilee Committee under the Chairmanship of the Principal of the College.

Next the following Committees were proposed and accepted :—

Advisory Board :—

Patron ... Hon'ble Dr. R. Ahmed, Minister-in-charge, Agriculture and Animal Husbandry.

Chairman ... Major J. M. Lahiri, Director of Veterinary Services and Animal Husbandry.

Vice-Chairman. Dr. K. C. Mukerjee, Principal, Bengal Veterinary College.

Members ... Dr. S. Datta, Dr. P. K. Bose (*Hqrs.*), Dr. S. Bhaduri, Dr. D. N. Das, Dr. R. Chetri, Dr. G. S. Banerji, Mr. Biren Sen, Dr. D. P. Sadhu, Dr. S. N. Nandy, Dr. I. Kuruvilla, Dr. J. L. Parimoo, Dr. B. J. Banerjee, Dr. P. C. Sen Gupta, Dr. M. C. Mitter.

Steering Committee :—

Chairman ... Dr. H. N. Ray.

Vice Chairman. Dr. M. R. Ghosh.

Organising Secretary ... Dr. Devraj Marwaha.

Members ... Dr. D. K. Ray, Dr. A. K. Chowdhury, Dr. A. Chatterjee, Dr. U. P, Saha, Dr. P. K. Bose (College) with powers to add.

Chairmen of different Committees

Reception	...	Major J. M. Lahiri.
Publication	...	Dr. Devraj Marwaha.
Exhibition	...	Dr. P. K. Bose (*Hqrs.*).
Excursion	...	Dr. P. C. Sen Gupta.
Finance	...	Dr. B. B. Chatterjee.
Medical Unit	...	Dr. D. P. Sadhu.
Management	...	Dr. D. K. Ray.
Publicity	...	Dr. A. K. Chowdhury.
Symposium	...	Dr. H. N. Ray.
Social	...	Dr. P. Mukherjee.
Volunteer	...	Dr. A. N. Guha.
Treasurer	...	Dr. A. K. Banerjee.

Resolutions on the above lines were proposed and carried.

DEVRAJ MARWAHA,
Organising Secretary.

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

Dated 1st March 1959.

T. VINAYAKA MUDALIAR,
Publisher and Editor.

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