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THE
INDIAN
VETERINARY
JOURNAL



Vol. V.	EDITOR : P. SRINIVASA RAO, G.M.V.C., Veterinary Surgeon, MADRAS.	No. 2. October 1928.
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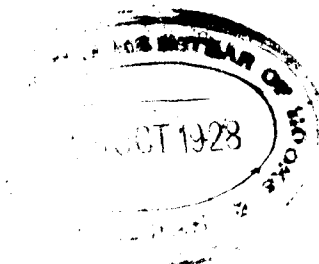
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October, 1928

No. 2.

The Indian Veterinary Journal.

(The Journal of The All-India Veterinary Association).



Editor :

P. SRINIVASA RAO, G.M.V.C.,

Veterinary Surgeon, Madras.

Office: 26, WALLAJAH ROAD, MOUNT ROAD, MADRAS (S. INDIA)

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NOTICE

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PUBLISHED FOR THE ALL-INDIA VETERINARY ASSOCIATION.

EDITOR:

P. SRINIVASA RAO, G.M.V.C.,

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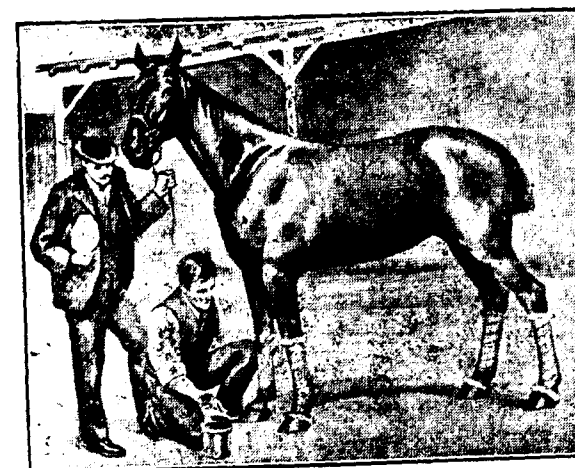
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(The Journal of the All-India Veterinary Association)

Vol. V.]

OCTOBER, 1928.

[No. 2.

CONTENTS

I. EDITORIALS.	PAGE
THE ROYAL COMMISSION REPORT	... 105
GONE TO ENGLAND	... 108
II. NOTES	... 109
III. GENERAL ARTICLES.	
THE CONTROL OF LIVER ROT OF SHEEP.—By R. F. Montgomerie B. Sc. (Edin.) F.R.C.V.S.	... 113
FURTHER STUDIES IN THE ETIOLOGY OF MILK FEVER.—By Professors Henry Dryerre and Russel Greig	... 123
SOME ANATOMICAL PECULIARITIES.—By D. K. Sen	... 139
IV. CLINICAL ARTICLES.	
AN INTERESTING CASE OF STREPTOTRICHOSIS IN A COW.—By Rai Sahib Debaker Dey, P.V.S. (India), M.R.A.S. (England) F.R.H.S. (London.)	... 140
TUBERCULOSIS IN AN ELEPHANT.—By A. B. Bopayya, G.M.V.C.	142
A CASE OF DYSTOKIA.—By Abdul Wahab Hameed, G.P.V.C.	... 146
A CASE OF INTUSSUSCEPTION IN A PUP.—By K. S. Pillay	... 148
MANDIBULAR FISTULA.—By H. E. Kingman	... 149
ANAPHYLAXIS IN CATTLE FOLLOWING INJECTIONS OF ANTIAN- THRAX SERUM	... 150
TREATMENT OF WORMS IN HORSES.—By Dr. G. W. Browning	... 151
V. NOTANDA.	... 152
VI. THERAPEUTICAL NOTES.	
TREATMENT OF MALIGNANT JAUNDICE IN DOGS	... 154
TREATMENT OF OVARIAN HÆMORRHAG	... 154
TREATMENT OF EPIZOOTIC LYMPHANGITIS WITH MERCURIC IODIDE	... 155

CONTENTS

	PAGE
QUININE AND UREA IN PROLAPSE OF THE RECTUM ...	155
ACTION OF COCAINE WITH CHLOROFORM ...	155
EPINEPHRINE, A TREATMENT FOR PURPURA HÆMORRHAGICA.	155
CALCIUM CHLORIDE FOR ASCITES Etc. ...	156
INJECTIONS OF SODIUM CACODYLATE AGAINST BOILS ...	156
GLUCOSE FOR HYDROCYANIC ACID POISONING ...	156
INJECTIONS OF GLUCOSE WITH INSULIN FOR SHOCK DUE TO ACCIDENTS ...	156
MILK OF RABID COWS CONTAINS VIRUS OF RABIES ...	156
MALLEIN OPHTHALMIC TEST ...	156
VII. EXTRACTS.	
STUDIES IN BOVINE LYMPHANGITIS.—By V. Krishnamurti Ayyar I.V.S. ...	157
CONVULSIONS IN DOGS.—By Captain Will C. Graffin ...	178
TRANSMISSION OF SURRA AMONG ANIMALS OF THE EQUINE SPECIES.—By Kelser (R.A.) ...	182
THE DESTRUCTION OF TICKS BY HAND DRESSING ..	184
VIII. ASSOCIATION NEWS.	
MINUTES OF THE PROCEEDING OF THE THIRD ANNUAL CON- FERENCE OF THE VETERINARY GRADUATES' ASSOCIATION, ASSAM, HELD AT SHILHAPUR, ON THE 26TH DECEMBER 1927.	186
APPENDIX A.—SPEECH MADE BY BABU SRISH CHANDRA GHOSE G.B.V.C., CHAIRMAN RECEPTION COMMITTEE ...	200
APPENDIX B.—SPEECH MADE BY HEZLETT Esq., C.I.E. I.C.S. COM- MISSIONER SURMA VALLEY, IN OPENING THE CONFERENCE ...	208
APPENDIX C.—PRESIDENTIAL ADDRESS BY RAI SAHIB BHARAT CHANDRA CHAUDHURY. ...	210
IX. COMMUNICATIONS.	
A CALL FOR CO-OPERATION.—By M. V. Pillai, G.B.V.C. ...	214
DIRECT RECRUITMENT IN THE MADRAS C. V. D.—FAIR-PLAY ...	216
X. REVIEW.	
INCOMPATIBILITY IN PRESCRIPTIONS.—By Santosh Kumar Mukherji M.B. ...	217



Mr. K. Kailasam Ayyar, G. B. V. C.
Circle Officer, C. V. D. Madras.
who has gone to England for higher studies

THE Indian Veterinary Journal

Vol. V]

OCTOBER, 1928

[No. 2

Editorials

THE ROYAL COMMISSION REPORT

WE feel certain that the profession would have read with interest what little had appeared in the newspapers in way of extracts from the report of the Royal Commission, regarding "Diseases of Livestock and their control." We are now in receipt of an authenticated copy of the full report. Veterinary problems have been exhaustively dealt with by the Commission. It is an admirable report in more ways than one. Certainly there are suggestions here and there which may be considered as inimical to the interests of the hardworking subordinates of the Civil Veterinary Departments. Perfection is impossible in a work of such magnitude. But we feel sure that such suggestions were the outcome of the lack of presentation of the high efficiency of the present Veterinary Assistant Surgeons. However there are the Government and the Veterinary Advisers to safeguard the interests of their subordinates. In other respects the report contains excellent proposals and we hope that the Government will move quickly in the matter of giving effect to them.

Most of these proposals will not be new to the readers of the Indian Veterinary Journal. We have ourselves urged such reformations in service from time to time in the pages of this journal. We have cried ourselves hoarse on "The field being vast and the labourers few." Here is what the Commission says, "A comparison of the number of these (Veterinary Assistant Surgeons) with the total cattle population

reveals that there is only one of them to every 100 thousand cattle; but even this single practitioner cannot be regarded as a wholetime officer for cattle, as there are a number of other domestic animals requiring his aid.....These figures sufficiently show the inadequacy of the existing arrangements for controlling contagious diseases and attending to animals suffering from ordinary ailments and from injuries.....No satisfactory progress can be made in combating contagious diseases of livestock, or even in dealing with the other ailments of cattle, unless the staff of the Veterinary Departments in all provinces is very greatly expanded." So they have proposed an enormous increase in the number of Veterinary Assistant Surgeons and the superior staff. Roughly nearly four times the present number is recommended. The Commission admits that even that increase may not meet the demand but they rightly consider that their proposals "represent a very large increase on the provision now made for Veterinary aid."

We have been urging that a four-year-course is a desideratum in all the Veterinary Colleges. The Commission had gone a step farther in suggesting a five-year-course at a Central College and a two-year-course at other colleges. This is a proposal which we respectfully consider again to be due to want of correct estimation of the high standard of efficiency found in the Veterinary Assistant Surgeons of the present three-year-course and an half-year-course of Post Graduate studies. Conditions in India do not warrant a five-year-course of studies. The corollary proposal of the Commission to reduce the standard at other colleges will be highly detrimental to the interest of the profession. The products of such colleges will neither be qualified Veterinary Surgeons nor quacks. They will be half-baked Veterinary Surgeons causing great disturbance in the systemic equilibrium of the profession and its efficiency. We don't know how the future entrants will take up the proposal but our own view is that by such a step we will be courting trouble of no mean consequence. Our heart bleeds to think of such a fate overtaking the beautiful institutions in Madras, Bombay and Calcutta built at tremendous sacrifice by some of the British Veterinary Surgeons and the eminence to which some of the alumni of those colleges have risen. No; we refuse to believe

that Government will indulge in this questionable task of building with one hand only to pull down with the other. If more men are wanted for field work, the better course will be to improve the prospects of the profession and attract more number of men and make provision for training a greater number of students at each Veterinary College. Within a few years time the required number will be available.

Perhaps the Commission have proposed a five-year-course with a view to recruit men for the proposed Deputy Directorships and District Veterinary Officerships. We do not believe in concentrating knowledge or talent only in a few of the superior service and letting loose in the country the two-year-course men. We suggest that the knowledge should be wide-spread and be of benefit to the people at large. Hence a four-year-course would suffice and men of outstanding merit, ability, capacity and character should be promoted to higher services.

The Commission is right in laying stress on the adoption of the Sero-Virus method of inoculation against Rinderpest. We have ourselves pleaded strongly for it, and in the Commission's own words "What is possible in Mysore is not impossible in British India."

The proposal "To establish in each province 'A Veterinary Reserve Corps' of selected Veterinary Assistants who could be called up for duty in any part of the province when an epidemic occurred" was tried in the Presidency of Madras some years ago under the caption "the Mobile Corps." Though it had done some good work, it cannot lay claim to the same amount of efficiency as expert Veterinary aid available locally whenever wanted. At best it can only be a measure of expediency.

When we wrote in these pages that there ought to be one Officer of the Provincial Gazetted rank in charge of each district, critics were not wanting who considered our proposal as too ambitious. But now we are glad to find that the Commission has put forward an identical suggestion. Over these District Veterinary Officers there will be Deputy Directors in charge of Circles and the present Veterinary Adviser will be styled as Director of Veterinary Services. The Commission has discussed the pay and prospects of these posts, but its

silence on the same matter where the subordinate service is concerned is significant. It is just here we feel the report is lacking in human sympathy. The really distressed people on whom the success of the profession depends receive no word of encouragement. If a Royal Commission is too big to deal with the welfare of a few hundreds of *subordinate men*, we hope the Government at least will be more merciful and come to their rescue at an early date.

We have said it often and we repeat it again that an ill-paid, discontented service is hardly the machinery for efficient work. Between stomach and science it is but human to take care of the former. There may be honourable exceptions, but we talk of the general rule. What can a poor Veterinary Assistant Surgeon do if it takes him all his time to adjust his family budget, to find himself only at the end of the month with a deficit balance. The next month begins and the life cycle is repeated! We urge that this question is most important and that due consideration must be paid to it.

There are other minor points dealt ably by the Royal Commission and we record our appreciation of the report and tender our thanks on behalf of the profession in India to the distinguished members of the Commission, for chalking out a programme of such importance for the development of Veterinary Service in India.

GONE TO ENGLAND

We are glad to inform the members of our profession that Mr. K. Kailasam Ayyar, G.B.V.C., Deputy Superintendent, C.V.D. Madras had left for England for Post Graduate Studies on 10th September, 1928.

It is hardly necessary for us to record that he is a gentleman of high repute with an enviable popularity amongst his subordinates. A man of high professional integrity who always cared for efficiency in practical work and not for red-tapism. His love of science is evident from the fact that he is taking this present course of studies at his own cost and at his age! He will be missed badly in the presidency of Madras by many of his friends and admirers. But we are glad to announce that he will be back amongst us within nine months more.

Notes

Our last sub-editorial on "An Article and After" seems to have disturbed the peace of some of our readers. We have been flooded with very many anxious enquiries as to the safety of the conduct of the Journal!

* * * *

We thank them for such a mark of love towards the Journal and we assure them that nothing untoward has happened or is likely to happen. If anything, our journal has increased in circulation a good deal.

* * * *

We are sure that the innate sense of freedom and justice of the European Officers will triumph in the end and they will see the fairness of criticisms appearing in our pages.

* * * *

Madras seems to lead the way in the matter of giving effect to the recommendations of the Linlithgow Commission. The Veterinary Adviser has already been styled as Director of Veterinary Services. Five more circles are to be newly opened from October 1928, each in charge of an officer of the Provincial gazetted rank. Our heartiest congratulations to the Veterinary Adviser and to the Government of Madras.

* * * *

A series of conferences seem to have been held between the Veterinary Adviser and the Government of Madras in connection with the development of the Civil Veterinary Department. May we hope that the pay and prospects of the subordinates received due consideration at their hands!

* * * *

We invite the attention of our readers to an excellent article (extracted in this issue) on Studies in Bovine Lymphangitis by Professor V. Krishnamurti Ayyar of the Madras

Veterinary College. That is a disease very prevalent in India and we hope the article will prove useful to many.

* * * *

We are glad to be in receipt of a copy of the Proceedings of the Fourth Annual General Meeting of the Bengal Veterinary Association. The association was practically not functioning for the last two or three years, for reasons which may well be allowed by all concerned to remain a buried past.

* * * *

Our pleasure is great indeed at its revival under the immediate presence and patronage of R. T. Davis Esq., M. R. C. V. S., I. V. S., Director C. V. D. Bengal and Veterinary Adviser to the Government of Bengal. Our congratulations to Bengal.

* * * *

Far off Assam is not behind other provinces in its professional activities. It makes our heart jump in glee to read of the proceedings of the Third Annual Conference of the Veterinary Graduates' Association, Assam, which we publish in this issue.

* * * *

We are sorry that we have not till now been provided with the news whether the next Annual Conference of the All-India Veterinary Association is to be held as usual in December 1928, and if so where. It will be nothing short of a misfortune if we should miss the conference this year.

* * * *

Central Provinces, Bihar or any one of the Indian States like Mysore and Hyderabad should invite the Conference and take immediate steps to make it a success. The other major provinces had their respective turns. We hope the members of the profession will be informed in time.

* * * *

We published in page 67 of the first issue of this volume that G. B. Purvis Esq., F.R.C.V.S., is the author of the method of demonstrating Microfilariae in blood. Mr. G. B. Purvis writes to us to correct it and states that the real author of this method is Dr. N. A. Dyce Sharp of the W. African Medical Service in the Transactions of the Royal Society of Tropical Medicine and Hygiene, Vol. XVII, No. 3, 21st June, 1923.

* * * *

We are glad to welcome once again to the Presidency of Madras Mr. T. J. Hurley, M.R.C.V.S., I.V.S., from his long study leave and it will be interesting to many of his friends and admirers to know that he has come back to India with added honours in the form of the valuable title of D.V.S.M.

* * * *

News of a very disquieting nature reaches us from far off Muktesar, Upper India. It is said Mr. J. T. Edwards, Director of the Imperial Institute of Veterinary Research has resigned for reasons which are highly surprising !

* * * *

We cannot vouchsafe as to the accuracy of the information. We await official confirmation before we comment anything on the matter.

* * * *

But our anxiety to retain the services of such an expert to India, prompts us to write these notes. We appeal to the Government of India not to accept his resignation and thus not to lose the very valuable services of one of the most eminent Veterinarians of the world. We heartily wish our information is false,

* * * *

Reports have reached us that junior men in the Madras Civil Veterinary Department are given acting chances in-charge of hospitals even in long vacancies extending over six months to one year, when there are seniors who have been touring for ten or twelve years working closely !

* * * *

True it is that none can question the actions of departmental officers, depending on the exigencies of service. But when such instances are becoming more frequent and cases of injustice more glaring, is it not time to cry halt!

* * * *

We are surprised to learn that such things are happening under the regime of that ideal officer, Mr. F. Ware. But we fear it is the circle officers who have to be found fault with. We appeal to them to imagine the feelings of a senior of ten or twelve years' service obliged to plod on as the Touring Veterinary Assistant Surgeon, while his junior of five or six years' service is permitted to enjoy the acting chance of a long vacancy in charge of a hospital. We hope the authorities concerned will set matters right.

* * * *

Another year has rolled on. And another batch of officers have come for Post-Graduate studies at the Madras Veterinary College. But our cry to abolish the examination at the end of the course still remains unheard. We repeat that the course itself is highly essential; but to worry aged men with the anxieties of an examination is not fair.

General Articles

THE CONTROL OF LIVER ROT OF SHEEP *

BY

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Sent by the author with compliments.

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During the past two years, much research concerning the control of liver rot of sheep has been in progress. These recent investigations have so considerably advanced our knowledge that it is opportune to discuss briefly the results obtained and their application. Effective control measures can now be recommended and the writer puts in a plea for a systematic attempt to abolish the disease as an epidemic.

Important Features of Liver Rot Bearing upon the Problem of Control.—Sheep pick up the encysted stage of the liver fluke in grazing. In the intestine, the young flukes emerge from these cysts, make their way to the liver and enter the bile ducts of that organ. There they mature and continue a parasitic existence, laying many thousands of eggs which, passing down the ducts, reach the outer world in the droppings of the sheep. Some time after reaching water, these eggs hatch and the free-swimming form seeks a certain fresh-water snail, *Limnaea truncatula* (also, possibly, *L. Pereger*), which it enters. Within the snail, development and multiplication take place until a final stage, in which the organism bores its way out, is reached. Swimming actively, this form seeks a blade of grass, or portion of another plant, on which it forms an adherent cyst. These cysts, which are about the size of a small pin's head, may form free on the surface of water. The ingestion of this encysted stage by

* In this paper, liver rot of sheep is limited in its application to cover only disease due to infestation with *Fasciola hepatica*. Infestation by *Dicrocoelium dendriticum* appears to occur only rarely within the British Isles, and the writer has had no opportunity of studying its control.

sheep (or other suitable host) completes the live cycle. The fresh-water snails mentioned are common inhabitants of wet places, the sides of ditches, pools, etc., particularly on clay soils.

The season of the year during which sheep may become infested is generally believed to be the late summer and autumn months, but it extends into the winter in wet open seasons. The period which elapses between the picking up of the encysted stage and the development of the fluke to egg-laying maturity does not appear to have been carefully investigated hitherto. As a result of certain preliminary observations, the writer believes that this phase of development occupies a period of about ten weeks. We may assume, then, for the purposes of control, that flukes picked up during the late summer will mature to egg-laying stage early in October, and that those picked up later will have matured by April 1. Future work may necessitate a modification of this view which is simply accepted as a working hypothesis.

It should be noted that cattle and rabbits may be infested with flukes and become, therefore, distributors of eggs. Considerable numbers of cattle harbour flukes without showing marked evidence of disease. During liver rot epidemics, many rabbits die in affected areas as a result of infestation, but the writer believes that, in the great majority of cases, their death occurs before the flukes have reached the egg-laying stage. It is very probable that cattle and rabbits play a much smaller part in the distribution of eggs than do sheep.

(1) General Principles Applicable to the Control of Liver Rot.—It is obvious that sheep and cattle should be kept away from land on which they may become infested. Very often this is impossible, and the fluke must be attacked at vulnerable points in the cycle of its life history.

(2) Since the fresh-water snails, mentioned above, must be available before the liver fluke can multiply and spread, steps may be taken to destroy them.

(3) Attempts may be made to destroy the fluke within the sheep and other hosts, thus preventing the distribution of eggs and the propagation of the parasite.

It will be appreciated that any or all of these principles should be applied wherever possible. The third necessitates the use of anthelmintic drugs and success will depend on the efficiency of the system of dosage adopted. It must be realized also that such dosage must be comprehensive and not limited to any group or species in a community of infested animals. Investigations have been concerned, chiefly, with the practical application of the second and third principles mentioned above.

APPLICATION OF THE GENERAL PRINCIPLES ENUNCIATED ABOVE

(1) Avoidance of Infestation.—Since the earliest days, it has been recognized that low-lying damp land, especially on clay soils, is "dangerous" as regards fluke infestation. Undoubtedly the loss caused by liver rot has been minimized by keeping sheep from such land. This precaution, which greatly reduces the value of so many grazings and renders others valueless for sheep, cannot, however, be widely observed. It may be possible, by means of fencing, to cut off small dangerous portions of fields which are otherwise sound. Fencing-out has been adopted with a certain degree of success, but, obviously, this is a method which can only be applied on a limited type of grazing.

(2) Destruction of the Snails.—(a) *The value of Certain Birds.*—Certain birds, ducks and lapwings in particular, make fresh-water snails part of their diet. Where practicable, flocks of ducks may be given free range over damp pasture and the lapwing should certainly be protected.

(b) *The Value of Drainage.*—Efficient drainage has been recognized as, perhaps, the best method of reducing the number of snails on any pasture, and it will be generally agreed that drainage is the greatest need of large areas of land in these islands. Certainly the prosecution of many drainage schemes is costly and each field presents its own particular difficulties of levels and outflow, but, quite apart from the opening up of new drains, proper attention to existing waterways can considerably increase the value of many pastures and, incidentally, reduce the number of snails on the adjoining land. On many occasions, the flooding of an area of land in the vic-

nity of a partially-blocked ditch or drain, or a ditch whose sides have been broken down, has been responsible for the infestation of many sheep. If ditches are cut with straight or steep edges, and thereafter kept clear and the edges attended to, a reduction of the number of snails within that area may readily be effected.

(c) *The Use of Copper Sulphate.*—In the search for a substance which would destroy the snail, without spoiling the pasture or rendering it dangerous to stock, lime, salt and other materials were given a trial. None of these proved of value, but the discovery that very dilute solutions of copper sulphate are particularly inimical to fresh-water snails opened up new possibilities. At the suggestion of Daubney, Walton made his first tests with copper sulphate, under field conditions, in 1921, continued his work in 1923 and, in conjunction with Jones, further extended it during 1925.

These researches have convincingly shown that the proper application of copper sulphate is a cheap and practical method of wiping out the snail population of the area covered. The sulphate has been employed in three different manners. Solutions may be sprayed over the area by means of a machine; either one of the large horse-drawn implements used to spray potato crops or to destroy charlock, or by one of the "knapsack" type employed by horticulturists. The strength of solution selected depends on the nature of the area to be sprayed. On fairly dry land, $\frac{1}{2}$ per cent. solution should be liberally applied that the whole area may be thoroughly wetted. On partially flooded land solutions of 1 per cent. or 2 per cent. should be used to allow for the further dilution which must occur before contact with the snail is effected. A smaller quantity per acre would suffice in this case. The amount of solution must also vary with the degree of protection afforded by herbage, being greater where the grass is long. Walton found amounts varying from 80 to 137 gallons per acre sufficient. Sprays may be used under a variety of conditions but the rather general absence, in affected districts, of suitable apparatus limits their use.

• As a dust, one part of finely-ground copper sulphate to four parts of china clay, an efficient dressing may be applied to small areas—the sides of ditches, etc.

The broadcast sowing of finely-ground copper sulphate mixed with dry sand appears to be an admirable mode of application. Walton and Jones found mixtures of four and of eight parts of sand to one of the sulphate efficient when sown at the rate of $1\frac{1}{4}$ and $2\frac{1}{4}$ cwt. per acre respectively. These broadcast mixtures appear to be applicable to all types of "danger" spots and areas.

Copper sulphate dressings may be applied at any season but, very probably, their use during the month of June will be attended with greatest advantage. After an application, a careful watch should be maintained to determine whether snails have re-entered the area by migration or by carriage in water. Norris has shown that sheep may be allowed to graze sprayed pasture after seven days. Following a dust or broadcast application, it appears advisable to keep stock from the treated land until rain has fallen.

Despite the fact that more than four years have elapsed since the value of copper sulphate was demonstrated, it cannot be said that this method is widely used to control the ravages of liver rot. It would appear that one reason for its partial failure to meet the case is that, at the season of the year when the use of copper sulphate is attended with most advantage, the stimulus of being face to face with the disease is absent. Few farmers can be made to consider and apply active control measures during the summer months. As the season during which they frequently experience loss approaches, their thoughts may more easily be directed to the control of the disease.

(3) Destruction of the Liver Fluke Within the Sheep and Other Mammal Hosts.—(a) *The Use of Carbon Tetrachloride in Sheep.*—Investigations directed towards the finding of a drug, which might be used in the destruction of the liver fluke infesting sheep, received relatively little attention, so far as these Islands are concerned, until the severe outbreak of 1920-21. Then a proprietary preparation of male fern named "Danistol" was introduced from abroad. Sold in carefully regulated doses ready for administration it gained favour as an efficient remedy.

Liquid extract of male fern B. P. had been little used within the British Isles until its value was investigated during 1924-25 by the writer and by Norris. These researches showed that the drug could be employed provided reasonable care was exercised. During its extensive use that season, it was evident that certain factors affecting its toxicity were not properly understood and required investigation. Further work indicated that one factor was the age of the extract. Freshly prepared material is much more dangerous than old.

Experiments conducted at this centre during 1925-26 showed that *pure* carbon tetrachloride was highly efficient and very safe. The efficiency of dosage with 1 c.c. was established, and sheep, in the advanced stages of liver rot, tolerated perfectly doses as large as 50 c.c. While this investigation was in progress, Norris, in Ireland, was working along similar lines. He did not have opportunity to pursue his research very far but obtained evidence of the efficiency and safety of the drug.

It must be noted that the efficiency of these drugs is limited, for it has been shown that they only destroy those flukes which are approaching maturity to the egg-laying stage, and those actually mature. Certain less mature forms escape. Thus, sheep which are infested with flukes in various stages of development cease to pass eggs following dosage but, at the earliest, four weeks after treatment, eggs reappear in their droppings.

We must compare the apparent value of these three preparations—"Danistol," extract of male fern, and carbon tetrachloride—particularly from the points of view of efficiency, safety and economy, and select the most suitable. All have demonstrated high value in destroying mature, and almost mature, flukes, and each has failed, in a degree at least approximately equal, to destroy less mature forms. "Danistol" is acknowledged to be "safe." Extract of male fern has a safety factor too small to permit that degree of error which is liable to creep in when large numbers are treated. The range of safety when carbon tetrachloride is employed is so wide that this drug may be used with confidence. The cost of "Danistol" places it at a serious disadvantage and discourages considerably its use to "treat," let alone to "control,"

liver rot of sheep. The cost of extract of male fern is much smaller, but considerably greater than that of carbon tetrachloride, which involved the expenditure of but one or two pence per head each treatment. It may be added that the employment of carbon tetrachloride necessitates dosage on one morning only, whereas each of the other drugs must be administered on two consecutive days.

It is evident that carbon tetrachloride is by far the most valuable drug. Eminently suitable for the dosage of large numbers of sheep at intervals, it provides a means to kill all the flukes infesting even large flocks before they reach maturity to the egg-laying stage, thus preventing the distribution of eggs and the spread of liver rot.

The administration recommended is a single dose of 1 c. c. of *pure* carbon tetrachloride in soft gelatine capsule. It is the writer's practice to prepare the sheep for dosage by removing them from pasture in the late afternoon of the previous day. This preliminary period of starvation may, however, be omitted, as it does not appear to affect the efficiency of the administration. In either case the sheep may be sent to pasture immediately after the capsule has been given. This mode of treatment has been found efficient for sheep up to 140 lb. weight, and it is probable that its range of efficiency is much greater. Since this dosage destroys only those flukes which are mature or approaching maturity, it is necessary to redose after a period. Then those flukes which previously escaped, and have in the interval reached a stage of development at which they may be assailed by the drug, will be destroyed. The evidence at present available indicates that this interval should be one of about four weeks. Dosage of a flock at monthly intervals during the season when flukes may mature would, therefore, prevent the deposit of egg on the pasture.

The extent to which this drug is employed in future years to prevent the outbreak of epidemics of liver rot must depend upon the realization by farmers in those districts which are menaced by the disease of the feasibility of materially reducing by one simple measure their current loss from the disease and at the same time lessening its future incidence.

It must be realized that each administration to an affected sheep of an efficient drug is, in itself, a general control measure apart altogether from the treatment aspect. Such administration decreases the number of eggs which are distributed, decreases the opportunity for snail infestation and, therefore, the chance of stock becoming infested with flukes. In addition to those members of a flock which show evidence of infestation, it must be remembered that many others, if not all, are likely to be harbouring flukes and distributing eggs. *These considerations make it obvious that mass treatment (dosage of whole flocks, not of individual sheep) should be adopted and that such treatment is a means of control. The tendency to dose only the obviously affected sheep of a flock should be combated by pointing out the great advantages of mass treatment. The low cost of carbon tetrachloride makes this mass mode of treatment very sound economically.*

The actual system of dosage adopted must depend upon several conditions relating to the incidence of the disease and the opportunities for the collection of sheep on each individual farm. On the great majority of those farms which regularly have small losses, and frequently large ones, it would be advisable and easily practicable to dose every sheep at monthly intervals each year, commencing at the beginning of October and ending early in April. Under such a system the farmer might be assured that his loss from liver rot (other than from "acute" cases, which must soon disappear where such a system is practised) would be cut out. Each year, fewer and fewer snails would have opportunity to become propagators of the disease. He might well look forward to the time when dosage at such regular intervals, at least following normal summers, would be unnecessary.

Following wet summer seasons, dosage at monthly intervals should always be carried out on farms which suffer any loss from liver rot. There may be seriously menaced farms on which difficulties of collection or other considerations make it reasonable to vary the system after normal seasons to dosage at intervals of two months. On less seriously affected farms, it might be reduced to dosage on two occasions, probably once early in December and again in March.

When the existence of liver rot is detected in a flock, every member should be dosed at once, and this treatment

repeated at monthly intervals until the whole of the original infestation has certainly been cleared. If, after diagnosis, opportunity for infestation still exists, the monthly administrations should be continued until April.

(b) *The Use of Drugs in Other Animals.*—The study of the value of drugs in the destruction of liver flukes infesting cattle has not reached the stage which will permit the recommendation of systems of dosage comparable with those recommended for sheep. Norris found certain doses of male fern of value, and "Danistol," given in the doses recommended by the manufacturers, also appears an efficient remedy. Carbon tetrachloride appears to be rather a dangerous drug for cattle and cannot, at present, be recommended.

The prevention of the scattering of eggs by infested rabbits must be attempted along different lines. We cannot induce them to come to a fold for periodic dosage! Ruthless destruction must be advised and should be practised.

Summary.—From the earliest times, disastrous epidemics of liver rot, such as those of 1879-80, 1920-21, and 1924-25, have caused widespread and serious loss to British flockmasters. In many districts, loss from this disease occurs even in normal seasons, and even though the *proportion* of sheep affected may not be large the *total annual loss to the nation* is serious.

Although there are still gaps in our knowledge, it is now possible to recommend satisfactory measures, not only for the treatment of affected sheep, but also for the prevention of infestation and for the control of the disease, which if generally adopted would remove the pest from the list of serious menaces. These recommendations are discussed in the foregoing pages and may be summarized as follows:—

- (1) Keep sheep from land which is, or is likely to be, infested with the snails which act as the intermediate host of the common liver fluke.
- (2) Drain wet land and open up ditches, keeping their sides as clean and vertical as possible.
- (3) Protect such birds as the lapwing.
- (4) Dress snail-infested land with copper sulphate.

(5) Administer carbon tetrachloride to sheep under a system which will prevent loss from the disease and also diminish or even prevent the distribution of eggs of the liver fluke.

(6) Keep down rabbits and have infested cattle treated.

Particular consideration has been given to two of these recommendations, the fourth and fifth stated above. Carbon tetrachloride must not be regarded simply as a drug of value in the treatment of sheep obviously affected with liver rot. It has a much higher value, and should be employed to reduce or eliminate general infestation, both current and future. It is now the duty of all interested to aid the application of the measures, recommended by those engaged in the study of the control of this disease, that the disastrous results which must, otherwise, follow in the wake of future wet summer and autumn seasons may be avoided.

Postscript.—Since the above was written, observations on the use of carbon tetrachloride in the "treatment" of some 20,000 sheep, located in many counties in these Islands, have been made and reported to the writer. *The dosage recommended (1 c.c. of carbon tetrachloride) has caused the death of sheep in certain flocks fed on artificial food or folded on special crops.* Excellent results have been obtained with sheep grazing natural pasture, and the administration of very large doses to such sheep has produced only transient effects. Until further investigation has explained this remarkable difference it is advisable to dose only a few representative members of the flock, particularly if not on free range, in the first place. Should these subjects show no illness, dosage of the whole flock may be undertaken with safety. If, however, the administration has caused serious illness in any of these sheep, a preparation of male fern should be employed.

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FURTHER STUDIES IN THE ETIOLOGY OF MILK FEVER

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To those who are unaccustomed to deal with the biochemical aspect of disease, there is a danger that a paper such as this may become somewhat involved. We shall therefore endeavour to aim at clarity of expression, even at the sacrifice of a considerable mass of detail.

Introductory

Milk fever was first recognised as a clinical entity towards the end of the eighteenth century, but, although the mystery of its causation has constantly intrigued the interest of investigators, and theory after theory has been promulgated to explain the nature of the disease, it is only in recent years that reasoned argument and experimental test have been applied to the problem.

In 1924 we resolved to approach the matter, and, as up to that time none of the experimental investigations had afforded any clue to the nature of the disease, we considered that a fruitful line of inquiry might be obtained by first submitting the whole problem to a process of reasoning. With this purpose in view we collected all the available evidence bearing upon the disease, in its occurrence and its clinical manifestations.

Having subjected our data to critical examination we endeavoured to interpret it in the light of physiological principles, and, as the result of our considerations, there emerged the probability that a parathyroid deficiency was primarily accountable for the genesis of the complex syndrome called milk fever.

Although our conclusions were unsupported by experimental evidence, we ventured to publish them in March 1925¹ in the form of a working hypothesis, as they seemed to throw open an entirely new avenue by which the solution to the problem could be approached; we also ventured the hope that this fresh conception would stimulate other workers to pursue their investigations along similar lines.

Our hope has been fulfilled; research is developing rapidly, and indeed, it is not unreasonable to suggest that the essential nature of the disease has now been elucidated.

Parathyroid Deficiency (Hypo-calcæmia) Theory

Our theory was, briefly, as follows:—The parathyroid glands play an important part in the regulation and maintenance of the level of calcium in the blood, and in the event of their defective functioning there results a fall in blood calcium and the occurrence of tetany. The parathyroid secretion is also credited with bringing about destruction of toxic metabolites, such as guanidine.

The relation which exists between the fall in calcium and the rise in guanidine is not understood, but it has been shown that tetany followed by coma can occur in certain diseases in which the blood calcium is reduced, and can also result from injections of guanidine.

We reasoned that the symptoms of milk fever represented a parathyroid insufficiency, and that a parturient cow about to fall a victim to milk fever was really in a condition of latent tetany.

During pregnancy the animal is able to meet the strain of increased metabolism imposed by the growing foetus, but upon the act of parturition there immediately occurs a suddenly increased demand for the destruction of toxic metabolites, and the defensive mechanism now becomes dangerously strained.

At this period, also, the blood calcium, already deficient in quantity, suffers further loss by reason of the heavy secretion of colostrum (in which calcium is abundant), and urgent calls are made upon the parathyroids for the replacement and stabilisation of calcium in the tissues.

Hence the parathyroids, unless they be highly active, are unable to cope with the demands made upon them; calcium falls, toxic guanidine compounds gather in the blood, and the condition we call milk fever is the result.

The dramatic cure which follows mammary inflation could, we reasoned, be explained by one or both of the following suggestions:—

(a) Mammary inflation gives rise to the production of afferent stimuli, which, as is well known, elicit excitation of the adrenal glands; the consequent excessive secretion of adrenaline stimulates the liver to increased glycogenolysis and thus the blood is flooded with glucose. This latter serves as a readily combustible fuel by which toxic metabolites are burnt up.

(b) Mammary inflation, by distending the udder, arrests all lactation and consequently prevents further exchange of calcium from the blood to the milk. In this way there occurs no further loss of calcium, and it now re-accumulates in the blood. We considered that similarly, calcium retention could also explain the efficacy of a restricted withdrawal of milk in the prevention of the disease.

Now, it follows that if adrenaline be produced in excess, then inflation should cause (1) a rise in blood pressure, and (2) an increase in the blood glucose.

Seitter,² using a Riva-Rocci apparatus, found that inflation of the udder of cows could raise the blood pressure within half an hour by an average of 55 per cent.

More recently Auger³ disputed these findings. He, using a method of greater precision (utilising an exposed carotid artery), concluded that inflation provoked a slight rise, if any, in the blood pressure. The precise action of inflation upon the blood pressure has still to be determined.

As will be discussed later, an increase in blood glucose usually follows inflation; but the rise, when it occurs, is only moderate in amount, and since the blood glucose in milk fever is already high, it is difficult to believe that such additional glucose can be of other than minor importance.

If our conception of the nature of the disease were correct then it followed that the blood calcium in milk fever should be below normal (hypo-calcaemia). Analyses of seven samples of blood from cases of milk fever showed an average of 4.8 mgrms. calcium per cent. serum; a marked reduction when compared with the normal, 9 mgrms. to 11 mgrms. per cent.

Later, in 1925, Little and Wright,⁴ having observed the similarity which existed between the symptoms of milk fever and those which occurred in an animal deprived of its parathyroids, made a valuable contribution in which they recorded the results obtained in blood calcium determinations on twelve cases of milk fever. They showed that a considerable diminution (in mild cases 20 to 30 per cent., and in severe cases up to 60 per cent.) accompanied the onset of the disease, and they also found that the greater calcium reductions accorded with the more severe cases.

These, and our own experiments, therefore furnished considerable support to our hypothesis.

Hypo-glycaemia Theory

At this stage another and important theory attracted attention. This new conception probably had its genesis as far back as 1923⁵ when a Canadian Veterinary Surgeon, whose name is not recorded, observed that the comatose phase of milk fever bore a striking resemblance to the coma associated with the depletion of blood glucose (hypo-glycaemia).

which follows massive injections of insulin. One case of milk fever was cited in which an intravenous injection of glucose brought about recovery.

Support to this theory was supplied by Widmark and Carlens in Sweden.⁶ These workers showed that inflation of the udder in normal animals caused a rise in the sugar content of the blood, which reached its maximum in 1 to 1½ hours after inflation and then very rapidly diminished.

Further support was given by Maguire,⁷ who recorded one case of milk fever in which an intravenous injection of glucose was followed by recovery.

The theory of hypo-glycaemia on *prima facie* examination appeared very attractive, and it seemed to us that the matter could easily be verified or refuted by determinations of the blood sugar content which obtained in the disease.

In seven cases of milk fever we found the figure for blood sugar to be high (.081 per cent.). This was in accordance with the published findings of other observers, notably Hayden and Sholl,⁸ Hayden and Fish,⁹ Little and Keith,¹⁰ Moussu,¹¹ all of whom have shown that a hyper-glycaemia and not a hypo-glycaemia was almost invariably present.

Widmark and Carlens (*ibid.*), although themselves exponents of the hypo-glycaemia theory, found that hypo-glycaemia existed in the mild cases they examined, but in their severe cases the blood sugar was considerably above normal.

Maguire had five cases examined, and found hypo-glycaemia occurred in all, but the figure which he took as his standard for normal was considerably above that of other observers.

In short, it may be said that although the blood-sugar figure in milk fever is occasionally low, in the great majority of cases it is increased in amount, and in a considerable number of instances it is remarkably high.

Now, it is possible that an excess of sugar in the blood may be associated with a lack of sugar utilisation by the tissues. This condition, of course, occurs in diabetes mellitus, in which, although there is an excess of blood sugar it cannot

be made use of because of the absence of a factor (insulin) which renders it available for metabolism; but it has never been suggested that milk fever is in any way comparable to diabetes.

Since it is a condition necessary to the proof of the hypo-glycæmia theory that the available sugar in the blood (glucose) must be low, the difficulty of the acceptance of the theory was emphasised by one of us,¹² and to this criticism Professor Auger of the Veterinary College of Lyons (*ibid.*) replied that our difficulty was capable of the following simple explanation.

As is well known, sugar exists in the blood as glucose, and in this form it is, normally, readily available to the tissues. During lactation the blood glucose is converted in the mammary gland into milk sugar (lactose). Lactating animals frequently re-absorb lactose from the milk into the blood, and the high blood sugar found in milk fever represents, according to Auger, a mixture of glucose and re-absorbed lactose.

Now, lactose cannot be assimilated by the tissues, therefore it was assumed by Auger that although in milk fever there is admittedly an increase in the *total* sugar content of the blood, the actual available sugar (glucose) is deficient in amount.

At that time (1926) there was no technique known whereby the two sugars could be differentiated in the blood and Auger's assumption was difficult to meet; but if, as we suspected, glucose was actually present in excess in the blood, then some of this sugar should be excreted by the kidneys and appear in the urine, in which it could be identified.

We accordingly examined 14 samples of urine from 14 cases of milk fever, and in 4 (about 28 per cent.) of these glucose was obtained by the fermentation test, thus indicating the presence of excessive amounts of glucose, as distinct from lactose, in the blood.

Although these observations negated the correctness of Auger's opinion, they need not be discussed at further length as the matter has been conclusively cleared up by Hayden and Fish.⁹ They, using the recently devised Folin-Svedberg technique¹³ for the differentiation of blood sugars,

showed definitely that in milk fever the great bulk of the blood sugar is glucose; indeed, the presence of lactose in the blood is of only occasional occurrence. Further, they showed that the increase in the sugar of the blood which follows mammary inflation is due very largely to lactose re-absorbed from the distended udder, and since lactose is useless to the tissues, its increase is without significance. We can readily understand that the administration of heavy injections of insulin to cows will produce a hypo-glycæmic coma resembling, clinically, the comatose phase of milk fever. The condition is rapidly and completely relieved by the intravenous injection of glucose; but it has yet to be shown that inflation of the udder will effect recovery in such cases.

For example, Moussu found¹¹ that in an artificially produced hypo-glycæmia in the goat, mammary inflation was quite ineffective in promoting cure, but the coma disappeared and recovery rapidly followed upon the subcutaneous injection of glucose.

There is a conflict of opinion as to the value of glucose injections as a curative treatment in milk fever. As has been indicated, a few cases have been recorded in which it was claimed that glucose alone had effected recovery. In other cases glucose produced a temporary improvement in the symptoms, but resort had later to be made to mammary inflation. In still other cases, glucose injections had no appreciable effect on the disease. A number of precise observations upon this point are required.

Based upon the results of our own experiments and upon consideration of all the available evidence, we have formed the firm opinion that milk fever is not a hypo-glycæmia.

An increased blood sugar is found in many intoxications, and it seems reasonable to believe that in milk fever it represents a natural response of the tissues in combating toxic metabolites. If this be so, then the injection of glucose in cases of milk fever in which the blood sugar is not already excessive in quantity, might conceivably be of benefit.

Fish has suggested that the favourable results which some have observed as following upon the intravenous injection

of glucose solutions may be due merely to the increased blood pressure resulting from the introduction of a large volume of fluid. These results would be further enhanced by the increased excretion by the kidneys and bowels which follow such injections.

Bearing upon this view, we may add that, on the supposition that there are toxic metabolites in the blood in milk fever, the injection of large quantities of liquid or, alternatively, of smaller volumes of hypertonic solutions, will result in increased volume of the plasma, and will thus produce a diminished concentration of the toxin.

These observations would partly explain (as we have pointed out in previous papers) the efficacy of blood-letting which used to be widely practised before treatment by mammary inflation was discovered. The plasma thus removed from the body carried with it its quota of toxin which was thus diminished in absolute amount.

Original Investigations

Still adhering to our belief that the essential nature of milk fever could be found in parathyroid failure, with resultant calcium deficiency and the consequent accumulation of toxic metabolites, we pursued our investigations, in the limited opportunities at our disposal, along these lines.

The results of our findings may be conveniently subdivided in the following manner:—

(1) *Determination of Blood Calcium Values in Parturient Cows.*—Calcium is recognised as presenting less variation in quantity than any other constituent of the blood; in point of fact, the serum calcium content in a given individual is singularly constant.

The calcium content of a normal milch cow is generally accepted as varying from about 9 mgrms. to 11 mgrms. per 100 c. c. serum. This covers the normal range obtained by Little and Wright, although these observers recorded four additional cases, all from one farm, which showed a normal calcium average of 7.6 mgrms. Exceptional factors were believed to operate in these cases, and apparently they cannot be strictly regarded as normal.

We considered it advisable to test the normal calcium values in cows during the usual milk-fever period (i.e., within

48 hours after calving), as it has been stated that a considerable fall in blood calcium occurs at parturition.

In 17 determinations on 10 parturient cows we obtained a range of from 8.64 mgrms. to 10.97 mgrms. with an average of 9.85 mgrms. calcium.

From these figures there appears to be no difference between the calcium values in parturient cows and those in advanced lactation.

(2) *Effect of Initial Lactation on Blood Calcium Values.*—

As has been noted, colostrum is rich in calcium, and its secretion represents a heavy drain upon the tissues. Little and Wright have estimated that the secretion of half a gallon of colostrum would be sufficient to deplete the blood of the whole of its calcium, if there were no reserve store in the body from which the blood might be replenished.

In order to determine the effect of the initial secretion of colostrum upon the blood calcium, the following observations on two cows were made.

TABLE I.—Case No. 13, "Maisie."

1st sample ...	1½ hours before calving ...	9.52 mgrms. calcium ..
CALVED		
2nd sample ...	7½ hours after calving ...	8.79 mgrms. calcium ...
3rd " ...	15½ " " ...	8.84 " " ...
4th " ...	66 " " ...	9.69 " " ...

Lactation commenced just after calving and was active when the second sample was taken. The figures indicate that the calcium returned to normal after the crisis accompanying the initiation of lactation was past.

TABLE II.—Case No. 15, "Hazel"

1st sample ...	21 hours before calving ...	10.97 mgrms. calcium ...
2nd " ...	13½ " " ...	9.77 " " ...
3rd " ...	4½ " " ...	10.09 " " ...
CALVED		
4th sample ...	10½ hours after calving ...	10.45 mgrms. calcium ...
5th " ...	21 " " ...	9.41 " " ...

In this case a moderate lactation commenced before calving, between the collection of the first and second samples, when the calcium fell approximately by 10 per cent. It gradually returned to normal but fell again when a profuse lactation set in between the collection of the fourth and fifth samples.

While it would not be justifiable to draw firm conclusions from two cases, we consider that these results are highly significant.

(3) *Determinations of Blood Calcium Values in Milk Fever.*—Forty samples of blood from cows attacked by milk fever have been examined. Each sample was collected before inflation of the mammæ with the exception of two, which were obtained just after the operation had been completed. All cases appeared to be typical of the disease and responded to the classic treatment of mammary distension.

The calcium content in these cases ranges from a minimum of 3.35 mgrms. per cent. to a maximum of 7.76 mgrms. The average of the values obtained in the cases works out at 5.18 mgrms.

The significance of these figures is realised when they are compared with the blood calcium content of normal parturient cows, the mean of 17 determinations being 9.85 mgrms. per cent.

The point is more clearly emphasised in the following summary.

TABLE III.

	Milk Fever (40 cases)	Parturient Normals (17 determinations)
Maximal figure ...	7.76	10.97
Minimal figure ...	3.35	8.64
Average figure ...	5.18	9.85

In no case has overlapping occurred between the lowest normals and the highest milk fever calcium values, but the following isolated case which, however, cannot be strictly classified either in the milk fever or normal series is worthy of detailed record.

This was a cow which had been attacked by milk fever at her two previous parturitions, and as there was the possibility that she would again be attacked, we took the opportunity of following the variations in her blood calcium as she approached her next calving. The figures are as follows:—

TABLE IV.—Case Y.

1st sample ...	9 days before calving ...	8.12 mgrms. calcium
2nd „ ...	5 „ „ ...	8.12 „ „
3rd „ ...	1 Day „ ...	8.12 „ „
4th „ ...	Day of calving ...	8.60 „ „
5th „ ...	1 day after calving ...	6.09 „ „
6th „ :	4 days „ ...	8.02 „ „

It is of interest that, although this cow was not actually attacked with milk fever on this occasion, her blood calcium was abnormally low towards the end of pregnancy and fell still further on the day after calving, and that on this day symptoms suggestive of the initial stage of milk fever appeared; these, however, were transient, and without treatment the animal regained normality in the course of the following day.

(4) *Effect of Mammary Inflation on Normal Lactating Ewes.*—In an endeavour to ascertain the effect of mammary inflation on the blood calcium in a normal lactating animal, the following experiments were made.

The test subjects were four black-faced ewes about six weeks lambed. The animals appeared normal, were in good milk yield, and had healthy lambs at foot.

A sample of blood was collected from each ewe. The udders of all four were then immediately inflated, and for observational purposes the animals were divided into two groups of two ewes each. From one group (A) the blood was drawn off at intervals of half an hour, until two hours after inflation had elapsed. In this manner, five specimens of blood were obtained from each of two ewes, one before inflation and four subsequent thereto.

From the remaining pair of ewes (Group B) the blood was sampled 3, 5, 11 and 22 hours after inflation, and from

each of these ewes five samples were thus obtained. These bloods were then analysed and it was found that in all the cases there was an increase of about 10 per cent. in the calcium content. In Group A the rise was observable in the specimens drawn half an hour after inflation, and it was also observed at the third and fifth hour in Group B.

(5) *The Effect of Mammary Inflation on the Blood Calcium in Milk Fever.*—In a few instances we have been fortunate in obtaining blood samples both before mammary inflation and at subsequent periods during and after recovery.

The results in five cases are as follows:—

Case No. 8.

1st sample (before inflation) ...	45 minutes after onset. Cow "down"	4.14 mgrms. calcium
2nd sample ...	5 hours later. Cow now on her feet	6.00 " "
3rd " ...	7 days later. Cow completely recovered	10.04 " "

Case No. 18.

1st sample (before inflation, ...)	Cow "down"	3.95 mgrms. calcium
2nd sample ...	9½ hours later. Cow now on her feet.	6.45 " "
3rd " ...	3 days later. Complete recovery.	11.79 " "
4th " ...	7 days after inflation. No recurrence.	9.72 " "

Case No. 32.

1st sample (before inflation.) ...	Cow tetanised but able to stand. Udder inflated while standing.	5.17 mgrms. calcium
2nd sample ...	10 hours later. Cow apparently normal.	8.07 " "
3rd " ...	82 hours after inflation. Complete recovery.	10.45 " "
4th " ...	131 hours after inflation. No recurrence.	11.59 " "
5th " ...	179 hours after inflation. No recurrence.	9.8 " "

Case No. 34.

1st sample (before inflation) ...	Cow comatose	5.17 mgrms. calcium
2nd sample ...	24 hours later. Complete recovery	10.97 " "

Case No. 39.

1st sample (before inflation) ...	Cow comatose	4.55 mgrms. calcium
2nd sample ...	25 hours later. Complete recovery	9.23 " "

This last case was attacked before calving. Premonitory symptoms (slight tetany of hind limbs and restlessness) appeared during the evening. The cow was found "down" next morning.

Discussion

We are of opinion that in milk fever the essential clinical manifestation is tetany, and we feel that this fact has not hitherto received proper recognition.

The tetany appears early in the course of the disease. It may be generalised and severe, and is then accompanied by convulsive seizures; or it may be of moderate degree and confined to localised groups of muscles, especially in the hind limbs, where it is frequently evidenced merely in extension of the hock joints with a concomitant stiffness and "paddling" gait.

The tetany is variable in its duration. When transient it may frequently pass unnoticed, or it may be masked by the lethargic or comatose phase which follows. In severe cases it may persist into the comatose phase, and it is then commonly observed that although the cow be in deep coma, the limbs are stiff and almost inflexible.

There is now a general tendency to accept the view that tetany is due to the non-availability of calcium to the tissues.

This condition may arise in two ways:—

- by the calcium being present in the blood in normal amount but in a form in which it cannot be utilised.
- by an actual deficiency in the amount of calcium.

Considering condition (a) above; calcium to be of any use must be ionised. Under physiological conditions the calcium exists in the blood as the tertiary phosphate. Any factor which tends to lessen the hydrogenion concentration of the blood will render the calcium less soluble and therefore less ionised. This is seen in conditions of alkalosis, where although the blood calcium is normal in amount, tetany is of common occurrence.

Condition (b), in which there is an actual diminution of the blood calcium, is believed to be due directly or indirectly to parathyroid deficiency. It is to this type that milk fever belongs.

It has recently been shown ¹⁴ that, in the case of the administration of a drug which was known to produce central necrosis of the liver, the tendency to intoxication as evidenced by tetany and coma is enormously increased if calcium be deficient, and that the administration of calcium salts rapidly evokes a temporary disappearance of the symptoms. Further, massive doses of the drug can be administered with no ill effect provided the concentration of blood calcium be adequate. The destruction of toxic metabolites is effected in the liver, and although the role of calcium in this process is not yet clear it appears to be of very real importance.

It seems reasonable to suppose that the above condition may be regarded as somewhat analogous to milk fever. The milch cow, unlike all other mammals, with the possible exceptions of the ewe and goat, has been bred to produce an enormous quantity of milk—indeed, her milk secretion may now be regarded as almost pathological. If, during the puerperium, the activity of her parathyroids does not keep pace with the activity of her mamma, then she cannot maintain her blood calcium at the requisite level and toxic metabolites will gather, since their destruction in the liver cannot be effected in the absence of calcium.

Mammary distension, by causing a sustained rise in the blood calcium, produces recovery.

Owing to the natural diffidence of stock-owners, we have not so far been enabled to test the curative effect in milk fever of intravenous injections of calcium salts.

When calcium is introduced into the blood stream it is quickly removed by the kidneys, and its effects are therefore transient. It is therefore probable that although calcium administration would prove of benefit it might not be found capable of replacing mammary inflation, since, as our findings show, the latter brings about a *sustained* rise in calcium, and this effect is prolonged over the first few days of lactation, that is over the period when the cow is most susceptible to milk fever. We hope soon to have an opportunity of making these experiments.

We feel, however, that the matter should not rest here. If the hypothesis enunciated in this paper be correct, then it ought to be possible to *prevent* the occurrence of the disease by suitable precautionary measures. This might take the form of ensuring calcium assimilation by means of a sufficiency of vitamin D in the animal's diet; or, alternatively, by administering to the animal a preparation which would supplement the action of the deficient parathyroids.

We have recently had such preparations placed at our disposal, and we hope in the near future to test their efficacy. It will be realised, however, that a large number of cases must be treated before conclusions can be drawn.

Summary.

(1) The blood calcium values for normal parturient cows do not appear to present any difference to those of cows in advanced lactation.

(2) The onset of milk secretion appears to be accompanied by a transient but appreciable fall in the blood calcium which returns to normal after the crisis of initiation of lactation has passed.

(3) Milk fever is usually associated with an increase in blood glucose (hyper-glycæmia), but this does not seem to be of any special significance.

(4) In milk fever there is, invariably, a pronounced fall in the blood calcium (hypo-calcæmia). The degree of severity of the symptoms is in inverse ratio to the calcium level in the blood.

(5) Inflation of the mammæ of normal lactating ewes causes a rise in the blood calcium (about 10 per cent.)

(6) Inflation of the mammæ of the cow in cases of milk fever results in a pronounced rise in the blood calcium. The rise is at first rapid, and the case usually shows definite signs of recovery when a level of about 6 mgrms. of calcium per cent has been reached.

(7) Two determinations suggest that the peak of the rise is not reached until the fourth or fifth day after inflation (when a hyper-calcaemia obtains), after which the calcium returns to normal.

(8) Evidence is produced which warrants the adoption of calcium therapy in the prevention and cure of milk fever.

We wish to record our thanks to the many veterinary practitioners throughout the country who have shown their interest in this investigation and have been good enough to send us samples of blood from milk-fever cases; and to W.P. Blount for assistance in carrying out analyses.

We wish also to express our thanks to Professor Poole of the Animal Diseases Research Association, and to Dr. John Simpson of Gracemount, Liberton, for placing animals at our disposal for the purposes of this research.

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SOME ANATOMICAL PECULIARITIES *

BY

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A few years ago I had the privilege of presenting a paper in this Conference about some notable anatomical peculiarities, and since then I have come across a few more, but of these, I believe there are two which may be recorded.

1. *A perforate soft palate in the horse.*—The animal was the usual dissection subject—old, emaciated, and small-sized. When the soft palate of this subject came under examination a neat little hole about $\frac{1}{2}$ " in diameter was observed in the middle of it, through which was projecting the tip of the epiglottis. At first I took it to be the aperture of communication between the mouth and pharynx, but on closer examination it was found to be higher up, and about the middle as stated before, whereas the isthmus lies between the palate and the root of the tongue, with the anterior pillars on either side, and is always found closed.

This second opening had a completely rounded circular edge and looked natural in all respects. As it was not the result of any pathological condition, it must have been congenital and as such, caused some amount of disturbance to the process of deglutition, as it certainly was an additional orifice of communication between the mouth and pharynx.

2. *The persistence of a well-developed and glandular thyroid isthmus in an adult horse.*—In this case also the subject was of the common dissecting-room type.

*Read at the Fifth All India Veterinary Conference, Bombay, December, 1927

It is a well-known fact that the two lateral lobes of the thyroid are connected by an isthmus passing almost directly across the trachea. In adult subjects this connecting band is extremely narrow and often fibrous. In the case in point, the isthmus was quite a large one, about half an inch wide, a quarter of an inch thick, and formed the connection about the sixth tracheal ring. Although no microscopical examination was made, there was no doubt of its glandular character, as it was of the same colour and consistence as the thyroid, and when cut into, presented a similar appearance to the cut surface of the thyroid.

Part of Sisson's remarks on the isthmus may here be quoted :—" A complete glandular isthmus is not rare, although it is usually very narrow, and may easily escape notice. In quite exceptional cases it may be 6—8 mm. in width."

Clinical Articles

AN INTERESTING CASE OF STREPTOTRICHOSIS IN A COW

BY

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On my return from Europe, I have found in my Bovine clinique, an interesting case of Streptotrichosis in a cow.

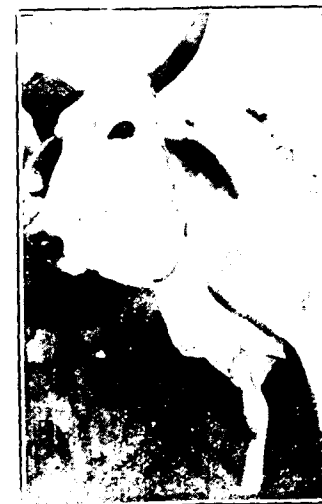
The subject was a poorly-nourished cross-bred Hissar cow suspected for Tuberculosis. It was tested for T. B. but gave a doubtful or no reaction. Clinically I diagnosed it to be a case of "Streptotrichosis". The cow was re-tested by me after 21 days from the first injection and was negative. The disease Streptotrichosis prevails in Calcutta and Dum Dum, and resembles "Epizootic Lymphangitis" of the horse clinically.



Open actinomycotic preaural
lymphatic gland.



A case of Streptotrichosis
or Actinomycosis



Dam Dum Sore on the hump and
Actinomycosis on wens of
the preapular gland.



Open actinomycotic preaural
gland.

History.—The first case on record occurred in November 1906 at Hastings, about 7 miles north of Calcutta. The subsequent cases were found from April to the end of December 1907. Eightyfive bullocks were affected. Out of these, some recovered; but others apparently made a recovery but had a recurrence after some months.

Segregation, observance of the routine of disinfection, surgical treatment i.e., lancing of a suppurated tumour, administration of Iodide of Potassium and application of Iodized-phenol, subcutaneous injections of Soamin and intravenous injections of Salvarsan in suitable doses proved of great value in my hands.

Etiology:—It is caused primarily by a "Streptothrix," allied, if not identical, to "Actinomyces Bovis" giving almost the same microscopic picture as the latter, and secondarily by many pyogenic microbes. It is stained well by Gram's stain (Jensen Gram); but could be coloured by any other aniline dye. "Crow" in my opinion is the common carrier of the disease from the sick to the healthy.

Signs of the Disease:—Subcutaneous nodule or nodules as near the seat of infection as possible, (neck, shoulder, ribs or flank); then hypertrophy of the Prescapular or Precrural gland or glands of one or both sides and lameness. The enlargements of the glands vary in size from peas to large potatoes and rarely as big as small cocoanuts. They suppurate, but have almost no tendency by themselves to burst, unless the process of suppuration has been hastened by Red Iodide of mercury ointment (1-12) applications.

On the onset of the disease like "Tuberculosis" (Surgical in man), there is no appreciable rise in temperature or alterations in the pulse rates and respirations.

But when the disease establishes itself, without the "Iodide treatment," referred to above, emaciation becomes very marked, the poor animal cannot rise and dies from the failure of the heart. One noticeable feature of the disease is, that the appetite does not fail throughout the course of the disease.

Bacteriology and Pathology:—Microscope shows granules as in "Actinomyces Bovis". Staining and cultural peculiarities are almost the same.

The surrounding thickened capsule of the affected gland is marked in some cases. There is a very great proliferation of fibrous tissue.

Caseation is not uncommon.

The pus is gritty sometime like the pus of actinomycosis. The neighbouring lymph glands are altered. No special change in the Viscera except slight noticeable change in the mediastinal and Bronchial glands, which may be neglected.

Therapeutics:—This has been mentioned above. Rest. Nutritious diets.

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Indian Civil Veterinary Department Memoirs No. 1. By J. D. E. Holmes, M.A. D.S.C., M.R.C.V.S. etc., Imperial Bacteriologist to the Government of India. Muktesar, 7th May, 1909.

This disease seems to be identical with Mr. V. Krishnamurthy Ayyar's (I.V.S.) Bovine Lymphangitis, extracted in this issue (E.D.)

TUBERCULOSIS IN AN ELEPHANT

BY

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Elephant Sultan belonged to the Coorg Forest Department. He was captured on 21-3-1903 by pit system. He was a Mukna, aged 32 years, 7 ft. 7 inches high at the time of destruction. He was a well made and strong elephant perhaps the best and the all round one of all the departmental elephants. He was usually employed to drag timber logs and capturing operations. I have been his doctor and surgeon for the last 16 years examining him at least once a month or two all these years. He always kept good condition and good temperament. He used to suffer from spasmodic colic

once a year or two. During the first attack in 1914 he was off his feed and water for 5 days. The subsequent attacks lasted only for a day or two. In 1918 he once slipped from a height of 50 feet, rolled down and fell at the base of the ghat. He remained in the recumbent position for over 24 hours. He got better in three days and went to work after a week. He developed an abscess at the withers in 1925. It was opened giving free drainage. The wound persisted to heal for about two years, though he was not harnessed and was attended to well. I went on leave and saw him again after two and a half months on 16-8-1927. He was harnessed and going for work. He appeared indisposed. I examined him. His eyes disclosed to me a sort of depression. His temperature was normal, 97.4°F. I had him walked fast for about 100 yards. His breathing was rather deeper than normal but not hurried. I rode him for about two miles. There was in him clear disinclination even for this ride and the breathing was marked, though the change could not be perceived by the keen Chief Forest Officer. I could not hear any abnormal sounds from the lungs. The elephant was in good condition. As I had the experience of a case of Tuberculosis in an elephant destroyed in 1926, I suspected Sultan for Tuberculosis. I could not get sputum then. He was put under a course of cod liver oil and segregated.

He was subjected to Tuberculine test on 2-9-27. There was no rise of temperature during the whole day. The next morning i.e., after 24 hours it rose to 99.4°F. and the animal showed febrile symptoms with profuse running from the eyes. At the 48th hour the temperature was 97.6°F.

The Director of the Imperial Institute of Veterinary Research thought the reaction to be doubtful positive and advised retesting after two months.

On 18-11-27 the elephant was subjected to the test again. There was no rise in the temperature at all this time. As the animal appeared dull in his ways and both the inspiration and expiration were deep if the animal was walked a few yards, I reported to the Director that it was probably due to the advanced stage of the disease that there was no reaction.

On 16-11-27, I sent sputum smears to the Principal, Madras Veterinary College and to the Director of the Imperial Institute. Both found acid fast bacilli indistinguishable from Tubercule bacilli and the Director, Imperial Institute of Veterinary Research advised destruction of the elephant as he thought it was highly suspicious.

Post-mortem notes on the carcass of elephant Sultan:— The elephant was shot dead at 8-30 A.M. on 8-2-28 and the post-mortem examination commenced immediately by Mr. C.B. Somanna, G.M.V.C., and myself and ended at 1 P.M. The animal fell down on the right side. There was not the least struggle at the time of death.

External appearances:— The animal was in very good condition. There was a little running from the eyes. All the natural orifices were normal. The skin was normal both to the touch and sight. The mucous membrane was rosy.

The skin was cut along the line of the back from the withers to the root of the tail and behind the shoulder and along the flank down to the median raphe. The skin was then flapped out. The subcutaneous tissue was normal and lined with fat. The abdominal and intercostal muscles were normal and covered with fat.

The ribs at the part were severed at their heads along the side of the spinal column and flapped out with the abdominal muscles. The peritonium was a sheet of fat resembling that of a fat sheep and the pleura was slightly thickened. The abdominal cavity contained a few pints of normal fluid.

Stomach and Intestines:— The intestines were pulled out along with the stomach, spleen and liver. The mesentery was full of fat. On cutting open the mesenteric glands, fine hard granules were seen (a few glands have been sent to the Principal, Madras Veterinary College for examination).

The external walls of the stomach and intestines presented a normal appearance. The stomach and intestines were slit open throughout. The contents were normal. The wall of the large intestines contained scattered and at places matted nodules containing thick caseous matter. These have been collected and sent to the Principal.

Liver and Pancreas:— These were normal in size and appearance (a portion has been sent). Bile was normal.

Spleen:— The superficial vessels were slightly engorged and the pulp congested. There were a few fine hard granular white nodules scattered about on the margin as big as mustard seeds (a piece with such granules has been sent).

Kidneys:— They were normal and coated with a thick layer of fat. The bladder was normal.

Testicles:— These were normal.

The diaphragm was normal.

Thoracic cavity:— The thoracic fluid was about a pint mixed with blood as a vessel had been cut during post-mortem examination.

The pleura was slightly thickened and more than normally adherent to the thoracic wall and lungs.

On pressing the lung between the fingers a number of very small hard nodules were felt scattered about and an inch away from the margin. No such nodules were felt at the base. The external appearance of the lungs was pale. On cutting the lungs into pieces many fine tubercular nodules were seen. In some places they were scattered and in other places they were matted (some pieces have been sent).

Heart:— The pericardium was lined with a thick coating of fat at the auricles. The size and appearance of the heart were normal. On cutting open, the auricles and ventricles were normal.

The carcass was set fire to immediately.

A CASE OF DYSTOKIA

BY

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On July 1, 1928, at about 11-30 A.M. a black she-buffalo, 8 years old, suffering from dystokia belonging to one Ram Khilwan son of Shanker, caste Kurmi of Baksai village,



Police Station Basti, was brought in a bullock-cart to this hospital. Half of the foetus was hanging outside. The hanging of the foetus was due to the fact that the villagers had mishandled it in their try to remove it and the uterus was ruptured and the foetus dead. I tried my best to remove it by traction in the standing posture but failed. Then I put

the patient on her back with her legs upwards, injected into the uterus warmed carbolised oil and with gentle traction the foetus was extracted.

It was a monstrous she-buffalo calf complete, its weight being more than a maund. It had 2 necks, 2 heads, 6 legs (2 in front and 4 behind with 2 buttocks and 2 tails etc.) and



had one chest in common. I preserved it in Formaline solution and packed up in a sealed bath-tub and under the orders of the local authorities I sent it to the Veterinary Adviser to Government, U.P. Lucknow.

Before sending it to Lucknow a photograph of it was taken in two positions.

The mother buffalo died in spite of all treatment.

At the end of a month there seemed to be little or no improvement. The case was allowed to go for three months following the operation with no change for the better. At this time Dr. H. A. Grant, a dentist of Fort Collins, Colo., was asked to look at the case. It was his opinion that another operation should be attempted, which he did before the meeting of the Colorado Veterinary Medical Association.

The field opposite the cavity was prepared. The animal was cast and given general anaesthesia. The first step was to thoroughly remove all decaying food that had packed the cavity. An incision two inches long was then made through the cheek into the mouth.

The mucous membrane of the gums had covered the alveolæ and lined the cavity for a depth of one and one-half inches. By introducing a sharp long-handled chisel through the fistulous tract the mucous membrane was loosened from the cavity so that the free edges might be turned into the mouth. These flaps were then united by means of horse hair sutures, using the incision through the cheek to facilitate the use of the needle. A blood clot filled the cavity and the skin of the fistulous opening to the exterior was sutured. The buccal incision was closed by means of mattress sutures. No further attention was given the case. At the end of two weeks, complete success of the operation was certain, and at this time (30 days following the operation), the wounds are almost invisible and the jaw is assuming its natural size.

This case is reported because it is believed to be a decided advance in veterinary dental surgery.—*H. E. Kingman*
Colorado Agricultural College, Fort Collins, Colo.

ANAPHYLAXIS IN CATTLE FOLLOWING INJECTIONS OF ANTIANTHRAX SERUM*

Melanidi and Stylianopoulo, Athens, Greece (*Rev. gen. de Med. vet.*, June, 1928), describe an interesting anaphylactic accident following injections of heterologous (horse) anti-anthrax serum in a herd of 25 cows. No reaction was observed after the first injection of from 25 to 30 cubic centime-

* The North American Veterinarian, August, 1928.

ters. Six months later, owing to the death of two of the cows from anthrax, a second dose was given to all of the survivors. Four of these showed anaphylactic shock within 20 minutes after the dose was administered. The affected cows became excited, anxious looking kicked violently into the air, and rubbed and bit themselves in the effort to ease the intense itching. There was intense cutaneous congestion and oedema, particularly of the eyes, anus, vulva, injected mucous membranes lacrimation and salivation dyspnea. and diarrhoea. The symptoms reach the peak of their severity in 15 minutes after their first appearance and subsided within an hour.

Thirteen months after the second injection, at the solicitation of the owner and purely for prophylactic purposes, the herd received a third treatment. This was 19 months after the first dosing. With the view of desensitizing the animals and avoiding anaphylactic shock, fractional doses were given. A two cubic centimeter dose was given 45 minutes before injecting the rest of the full dose. Notwithstanding this precaution, recommended by Besredka, the first ones of the cows treated were already showing anaphylactic shock before all of the herd had been injected. From 10 to 30 minutes after receiving the dose, every one of the cows began to exhibit the symptoms above mentioned except those which had been added to the herd since the time of the previous treatment. The conditions two of the cows was particularly alarming (decumbency, intense dyspnea, and intermittent respirations). In two hours, however, all of the cows were apparently normal. The authors recommended homologous sera.

TREATMENT OF WORMS IN HORSES

BY

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In the year 1876, I was living in a stock farm with my father, who was bothered considerably with worms in his horses; there being no Veterinary graduate at that time in our section of the country, I purchased a horse book titled "Navins Explanatory Stock Doctor", which had the follow-

ing prescription for worms, which he said would bring out any kind of worms:—

R Pulvis white Indian hemp root
 „ Pink root
 „ Bitter root
 „ Aloes *a a* oz. i.
 „ Balmony oz. ii.
 „ May apple root oz. i.

Mix. give one tablespoonful in a teacup of molasses, and one pint of water every 12 hours till it physics and repeat in 5 or 6 days.

After using this preparation during that season I found Dr. Navin did not exaggerate this a bit, some of the older Veterinarians may have this book; if so they will find this a very reliable worm remedy for horses. After going through college several years later and graduating, they did not seem to give us any reliable worm treatment for horses; consequently when I went out to practise I fell back on this worm remedy for horses, and if this will be of any value to my fellow practitioner of the present day, I will be much pleased that I mentioned it.

Notanda

(R.S.N.)

1. *Diseases of Veterinary importance, communicated by faeces*:—Fowls get tuberculosis from following pigs; chicks get bacillary diarrhoea and coccidiosis from droppings of diseased chicks; coccidiosis to puppies that licked up the droppings of diseased pigeons; cattle were sometimes badly affected with avian tuberculosis, probably due to the licking up fowl droppings from the manger.—(G. Mayall).

2. In persistent tympany in cattle, Soda Bicarb. 4 drams with 1 ounce of Pulv. Chiretta in warm water, 3 times daily produces the desired result.

3. *Normal Horse Serum*, is very useful in the treatment of anaemia (simple) as it is stated to encourage the

rapid production of hæmoglobin and corpuscles; also, as an agent to increase coagulability of the blood in case of surgical or other forms of hæmorrhage.

Also found useful as local application for ulcer and suppurating wounds.

Dose ranges from 2 to 5 c.c. for small animals and upto 100 c.c. for horses, mules and cattle.

4. *Sandal wood oil*:—(pure) is a valuable stimulating expectorant, disinfectant, diuretic, allays irritation of bladder and is excreted by lungs and kidneys. Taken with water, thrice a day after food. Dose for horses and cattle, 30 mm; dogs, 5 mm.

5. When herbivora live on their own tissues, as during starvation, they become carnivora and their urine alters in character corresponding to that of flesh feeders. This fact might be of considerable use in litigation cases where starvation is suspected.—(H. Kirk. F.R.C.V.S.).

6. Urine containing the Bacillus Coli has a fishy smell.—(H. Kirk).

7. *Treatment of burns*:—Spraying with a 2% solution of tannic acid on the surface of a burn, produces coagulation and rapid drying of the tissues and toxic products are insolubilized. The brown scab may better be left for its natural exfoliation.

8. *Antiseptic lotions for wounds*:—

R Ac. Picric, about 1 oz.
 Aqua, about 1 pint.

Put the picric acid into a quart bottle and fill up with aqua. Sig.—Do not shake the bottle. Pour out some of the clear solution into a clean jug and apply to wound once daily with syringe, as directed. Keep filling the bottle with water until all sediment has dissolved.

C Calx. Chlorinatae, Ac. Borici aa iv oz.
 Wrap each up separately.

Sig.—Add the contents of the two packets to a gallon of water in stone bottle. Allow to stand for 24 hours. Syringe the wound once

daily, as directed, with clear solution.—
(J. W. H. Holmes.)

9. *Mucin* in urine may be detected by the ring test, the urine is superimposed on a saturated solution of citric and a cloud is observed above the line of junction of the two liquids.—(Prof. A. R. Smythe).

10. *Symptomatic vagaries of Rinderpest in Malaya*:—

- | | | |
|----|---|---|
| A. | { | 1. <i>Catarrhal</i> —Eyes and nasal lesions only, slight diarrhoea previous to death. |
| | | 2. Do. Diarrhoea no blood, no eye or nasal or mouth lesions. |
| | | 3. Do. As above but with mouth lesions. |
| B. | { | 4. <i>Enteric</i> — Diarrhoea, blood, mouth but no eye or nasal lesions. |
| | | 5. <i>Typical</i> — A combination of the above in an aggravated form. |

(H. G. Simpson, F.R.C.V.S.).

Therapeutic Notes.

In malignant jaundice of dogs, caused by the *Piroplasma* (*Babesia*) *canis*, intramuscular injections of trypanblue give remarkably good results, according to the observation of Stirling (*Jour. Comp. Path & Ther.*), December, 1927, p. 275. The dose for dogs is 5 to 6 c. c. of a two per cent solution.

The North American Veterinarian, June, 1928.

When ovarian hæmorrhage is suspected after digital compression of the ovaries in bursting cysts or expressing corpora lutea the cow should be kept under close observation for 24 hours and if the respirations observed at the flank indicate that bleeding is occurring, all water is withheld and a quart of one per cent salt solution is administered every hour, per os. In the case of serious hæmorrhage two, 20-gram

(5 drams) of acetanilide are given in addition.—From Wegner, *Schweizer Archiv.*, October, 1927.

N. A. V. June, 1928.

Kelser (*Jour. Am. Vet. Med. Ass'n.* May, 1928) prompted by the satisfactory results obtained with intravenous injections in the treatment of epizootic lymphangitis with mercuric iodide in the Philippines, employed this chemical in a case of periodic ophthalmia and obtained "a complete recovery." The subject was a pony weighing 450 pounds and the dosage three 0.3 grams (4.5 grains) suspended in normal salt solution administered at 48 hour intervals. The duration of the observation was not given.

N. A. V. June, 1928.

Quinine and Urea in prolapse of the rectum.—Philip (*The Veterinary Record*, March 31, 1928) made the extremely valuable observation that quinine and urea hydrochloride owing to long duration of its anaesthetic action will prevent the straining which hinders successful retention in prolapse of the rectum. A colt so affected ceased straining after the rectum, prolapsed and for nine days, was treated with a solution of this drug and no further relapses occurred, notwithstanding that cocaine and epinephrine had failed in several attempts. The author credits W. E. Wilkinson a student of the Royal Veterinary College for information to the effect that the treatment had been successful in a similar case.

N. A. V., June, 1928.

The toxic action of cocaine is doubled by the action of chloroform. The two should not be employed at one operation.

N. A. V., July, 1928.

Epinephrine is an appropriate treatment for purpura hæmorrhagica of the horse. The dose is 5 c. c. of the 1:1000 solution. Caffeine and camphor are useful adjuncts to restore the cardiovascular dystonia so prevalent in grave attacks.

N. A. V., July, 1928

In the treatment of hæmorrhage, ascites, and dropsies, calcium chloride is the drug chiefly indicated. An ounce given intravenously in a quart of water may be given daily to a horse. Dogs take one to two drams according to body weight.

N. A. V., July, 1928.

Hypodermic injections of sodium cacodylate on alternate days is an effective treatment against boils (human) according to Gosch in the *Indian Medical Gazette*, March, 1928.

N. A. V., July, 1928.

Glucose is said to revive laboratory animals poisoned by inhalations of hydrocyanic acid, and striking results have been obtained in animals experimentally poisoned by ingestion.

N. A. V., August, 1928.

Intravenous injections of glucose given with subcutaneous injections of insulin constitutes a standard treatment for traumatic shock following grave accidents. Although less striking in effect for post-operative shock, the combination is, nevertheless, beneficial. From eight ounces to one pint of a five per cent solution of glucose is required for dogs, and one to two quarts for large animals, and this is given with a unit or more of insulin.

N. A. V. August, 1928.

While the milk of rabid cows contains the virus of rabies, the danger of contracting rabies by drinking milk is practically negligible, according to *The Journal of the American Medical Association*. The sole danger appears to lie in abrasions of the digestive tract through which the virus contained in the milk might enter.

N. A. V. August, 1928.

The use of the ophthalmic mallein test is disparaged by Captain Louis G. Weisman of the veterinary corps in a recent issue of *The Veterinary Corps Bulletin* and on various grounds

well known to experienced veterinarians. The ophthalmic test has but one redeeming feature. It is easy to apply. From the standpoint of reliability in yielding evidence to the diagnostician, it is inferior to the intradermal test, the captain states,

N. A. V. August, 1928.

Extracts

STUDIES IN BOVINE LYMPHANGITIS*

BY

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Bovine Lymphangitis, otherwise known as Infectious Lymphangitis, is one of the diseases commonly prevalent amongst cattle in India. The disease has been investigated in India by HOLMES (1908), RAYMOND (1909), and SHEATHER (1921).

HOLMES and RAYMOND investigated an outbreak of this disease which occurred in Calcutta among the Army Transport bullocks in the years 1906 and 1907, the former at the Imperial Bacteriological Laboratory, Muktesar, and the latter in Calcutta. The investigations were conducted independently of each other and the results arrived at by these workers are strikingly dissimilar.

HOLMES held the cause of the [affection] to be a streptothrix which he found not only in over three hundred smear preparations of pus from several cases but also in the sections of affected lymphatic glands. Histologically, he found in the lesions an extensive invasion of new connective tissue cells, epitheloid and a few giant cells.

On the other hand, RAYMOND held the cause of the disease to be a rod shaped organism with rounded extremities which he was able to isolate from less chronic cases. He has not, however, reported having found the organism in the smears of pus although he was able to isolate it in cultures from the pus and to reproduce, by inoculations of these cultures into animals, the same lesions as those observed by him in the naturally infected ones.

SHEATHER conducted his investigations at the Imperial Bacteriological Laboratory, [Muktesar, from material sent by the Superintendent, Civil Veterinary Department, Madras, in November 1918 and July 1919, from affected cattle and a report of his investigations was published in

* Reprinted from 'Memoirs of the Department of Agriculture in India, October 1927'.

the *Mem. Dept. Agri. India, Vet. Ser.*, Vol. III, No. 3, May 1921. SHEATHER has reviewed fully the results arrived at by the above workers as well as other previous literature bearing on the subject, namely, by NOCARD (1888) and VRYBURG (1907) and has finally come to the conclusion that the causative agent agrees in the majority of its characters with those observed by Vryburg and Raymond approximating most closely to the Preisz-Nocard bacillus but differing from it in being Gram-negative.

In view of the different opinions, held by HOLMES and RAYMOND regarding the cause of the disease and as SHEATHER'S report had not been published at the time, I set myself under instructions from Mr. AITCHISON, the then Principal of the Madras Veterinary College, to investigate an outbreak of this disease which occurred among cattle belonging to the Madras Corporation, in August 1920. The observations and experiments made by me in connection with the investigation of the outbreak and subsequently form the subject of this paper.

History

The disease was first noticed in Madras in the year 1909 among the bullocks employed for the conservancy work of the Madras Corporation and appears to have existed among them till about 1912. Subsequently, in August 1920, the disease was again observed in a bullock in one of the depots and the infection spread therefrom to three other depots.

Symptoms

During the period between August 1920 and November 1922, as many as 234 animals were affected in four of the depots A, B, C, D, of which 55 were sent over to the Madras Veterinary College hospital for treatment and the rest were treated by the Corporation Veterinary Officer at the depots. The symptoms shown by these animals were exactly similar to those described by HOLMES and RAYMOND in the animals that came under their observation and to those reported to have been exhibited by the animals from which materials were sent to SHEATHER for investigation.

The first observable symptom in this disease is the appearance of a nodular enlargement of one or more of the superficial lymphatic glands especially in the region of the flap of the flank or in front of the shoulder or very occasionally in other parts of the body. The affected animals in spite of such enlargements evince neither pain nor inconvenience and perform their usual work. In the course of two to three weeks, the nodules considerably increase in size and, in some animals, become tense and indurated.

In the cases which are allowed to run their course, the affected glands pit on pressure and indicate the existence of pus which has more or less disorganised them. No signs of acute inflammation in the regions of these glands nor of marked constitutional disturbance are noticed; but if the glands are considerably enlarged, slight lameness is discernible either in the fore leg or in the hind leg, according as the prescapular or the pre-rural gland is affected. In some instances, as a result of the blocking up

of the lymph vessels, small abscesses in the form of buds are noticed extending in a centrifugal direction.

Usually, the general condition of the animals is not much affected, though in some animals general emaciation and debility become very marked with the advancement of the disease and in others symptoms of respiratory affection are very prominent, indicating affection of the lungs. (pl. 1, Fig. 1) With the further advancement of the disease, paroxysms of cough and difficulty of breathing may become more insistent, and the animals eventually die of catarrhal pneumonia with pulmonary infarction and abscesses in the lungs.

Mode of Infection

In order to explain, what I believe to be the mode of infection in this disease, it is necessary to review the distribution of the various lymphatic glands in the body and the respective areas drained by them and to discuss briefly the opinions expressed by previous workers on this aspect of the question. The glands that are found to be involved in this disease are those that are concerned in draining the skin area of the body. Their study will therefore be dealt with in detail; for the purpose of this paper, I have adopted the following classification* of the area drained by these glands.

A

1. *Area of the skin of the face in part* is drained by the submaxillary (mandibular) lymph glands. In addition, these glands receive afferent vessels from the muzzle, lips, cheeks, hard palate, the anterior part of the turbinates and septum nasi, the gums (in part); the sublingual and parotid glands; the tip of the tongue; the muscles of the head except those of the eye, ear, tongue, and hyoid bone; the mandible, premaxilla and nasal bone.

The efferent vessels, two to four in number, go to the atlantal gland.

2. *Area of the skin of the head in great part* is drained by the parotid lymph gland. In addition, this gland receives afferent vessels from the muzzle, lips, the gums (in part); the anterior part of the turbinates and septum nasi; the parotid salivary gland; most of the muscles of the head including those of the eye and ear; the eyelids; lachrymal gland and external ear; the frontal, malar, nasal, and premaxillary bones and the mandible.

The efferent vessels of this gland also go to the atlantal gland.

N. B. The efferent vessels of the atlantal gland, three to six in number on each side concur in forming the tracheal lymph duct.

B

Area of the skin of the neck, shoulder, part of the ventral and lateral surfaces of the thorax, and the thoracic limb is drained by the prescapular (posterior superficial cervical) lymph gland. In addition, this gland receives afferent vessels from the muscles of the shoulder girdle and from

* Adopted from Sisson's *Anatomy of the Domestic Animals* (2nd Edition, 1914).

the external scapular muscles; from the tendons of the muscles of the forearm and digit and the fascia of the forearm; from the joints of the carpus and digit.

The efferent vessel of the right prescapular gland opens into the end of the right tracheal duct, while that of the left gland opens into the terminal part of the thoracic duct or the left tracheal duct.

C

Area of the skin of the posterior part of the thorax, the abdomen, pelvis, thigh and leg is drained by the precrural (prefemoral or subiliac) lymph gland. In addition, this gland receives afferent vessels from the tensor fasciæ latæ and the prepuce.

The efferent vessels and chiefly in the deep inguinal gland, but in some cases some go to the iliac glands.

N. B. Two small and inconstant nodes, one or two in number, the paralumbar lymph glands may be found under the skin of the upper part of the flank. Their afferent vessels come from the adjacent skin, and the efferents go in part to the prefemoral gland, in part to the deep inguinal gland.

D

Area of the skin of the medial and posterior surface of the thigh and medial surface of the leg is drained by the superficial inguinal lymph glands. In addition, these glands receive afferent vessels from the external genital organs (except the testicles) in the bull.

The efferent vessels go to the deep inguinal gland.

E

Area of the skin of the hip and tail is drained by the ischiatic lymph glands.

In addition, these glands receive afferent vessels from the rectum and anus, the vulva, the root of the penis, the prostate, the bulbo-urethral glands, the urethra and urethral muscle, the glutei, biceps femoris, semitendinosus, obturator internus, and gemellus and the lumbodorsal fascia; the hip joint; and the efferent vessels of the popliteal gland.

The efferent vessels go to the internal iliac lymph glands.

N. B. The efferents from the internal iliac glands go to the lumbar trunk and those from the deep inguinal glands go in part to the internal iliac glands and in part directly to the lumbar trunk.

From a study of the anatomical relations of the lymphatic glands noted above, it will be seen that there is absolutely no direct intercommunication whatever between the superficial lymphatic glands concerned in draining the several skin areas, A, B, C, D and E of the body. Each set of these glands empties itself either into the lymphatic duct directly, or communicates with other glands whose efferents empty themselves in turn into the duct.

From Plate II, it will further be seen that the precrural glands drain the largest skin area, the prescapular a fairly large area, while the submaxillary, parotid, superficial inguinal and ischiatic glands collectively drain only a very small area.

The mode of infection will now be dealt with.

SHEATHER has not dealt with this aspect of the problem in his paper.

In dealing with the symptoms, HOLMES writes as follows:—

“The first symptom which attracted attention was usually the appearance of a small nodule under the skin in the region of the neck, shoulder, ribs or flank. This was followed after a period varying from a few days to some weeks by an enlargement of the deep seated glands, almost invariably the prescapular or precrural.

This was accompanied by pain and inflammatory swelling in the affected part and generally marked lameness.

The affected subcutaneous lymphatic glands varied in size from a pea to a walnut. The precrural glands reached the size of a cricket ball, while the largest prescapular gland observed was more than six inches in diameter.

* * * *

In all except one, the disease followed a wound or sore in the region of the neck or hump. These sores are locally known as ‘Calcutta sores.’ They are indolent, spreading and very difficult of treatment. In one instance, the popliteal gland became affected after a wound between the digits of the hind foot.”

RAYMOND states as follows:—

“It (the disease) appeared to originate through the infection of a wound, at least, in the cases which came to this College, numbering 11 in all, a wound of some kind, generally a yoke gall, was present. This lesion was sometimes a simple abrasion, at others an important sore, which in some cases was complicated by a considerable tumefaction of the parts and lameness.”

Neither HOLMES nor RAYMOND has given a classified list of the glands affected in the animals which came under their observation, although it will be seen from their reports and the photographs appended to them that only the superficial glands concerned in draining the several skin areas as classified by me were found to have been involved.

The excerpts quoted above from the contributions of HOLMES and RAYMOND would appear to suggest:—

1. that the primary affection generally follows a yoke gall, or sore in the region of the neck or hump and
2. that from such seats of primary affection, the infection spreads and affects not only the prescapular glands but also other superficial glands of the body.

But the facts which have come under my notice suggest different conclusions. Of the animals that were treated at the College hospital and in the Corporation depots during the outbreak of 1920-22 only a few had any yoke gall, sore or apparent abrasion in the region of the neck or hump or anywhere else in the body. Even in these few animals, no enlargements of the lymphatic vein connecting an infected gland with a pre-existing yoke gall, sore or abrasion, as recorded by Raymond, to which the possibility of a primary infection could be traced were observed by me.

From the details of inoculation experiments recorded by SHEATHER, it would also appear that every subcutaneous inoculation of either pus emulsion from original cases or broth culture made from the pus, in hill bulls and plains calves in the region of the neck led to the affection of the prescapular gland only. No mention has been made of any other glands having been affected.

Further, if, as HOLMES and RAYMOND appear to have supposed that the infection had originated from a yoke gall or from an indolent tumified sore or abrasion pre-existing in the region of the neck, only the prescapular glands or perhaps the more deep seated glands of the region of the neck would have been affected but not the precrural or other superficial glands of the body. The infection could not have spread to these latter glands from the primary focus without other lymphatic glands *en route* having been involved, inasmuch as the organism has a predilection to the whole lymphatic system and not to particular classes of glands only. Neither in the animals observed by HOLMES and RAYMOND except four in which HOLMES found the bronchial glands enlarged, fibrous, and to be the seat of abscesses and one in which RAYMOND has reported that the inferior cervical gland showed suppuration and the sublumbar glands were beginning to suppurate, nor in those which came under my observation during the outbreak referred to and subsequently, was there any suppuration or affection of any any lymphatic glands other than those concerned in draining the skin areas. The presence of yoke galls and indolent sores on the neck and other wounds in the disease animals that came under the observation of HOLMES and RAYMOND might have been a coincidence. As the large majority of affected animals examined by me both in the outbreak referred to and subsequently had neither yoke galls nor perceptible wounds to which the primary infection could be traced, two issues present themselves for my consideration.

1. What is the possible mode of infection in this disease?
2. What is the cause of the predilection to such infection limiting itself only to the superficial glands draining the skin areas of the body, mostly to the precrural and to the prescapular and of the greater predilection to the precrural in comparison to the prescapular glands?

In the absence of definite proofs, I propose to map the field of enquiry and to indicate the answer to the first issue by the process of elimination. The only possible modes of infection in a disease are through ingestion, inhalation, or other methods simulating artificial inoculations of the causal agent.

The disease cannot be traced to infection through ingestion either through the medium of food or water or through grazing on an infected soil. If the portal of infection in this disease had been through any one or more of these routes, one should naturally expect lesions in the lymphatic glands of the alimentary tract, long before the superficial glands are affected. No such affection of any of the glands of the alimentary tract has been noticed by me in any of the animals that have died of the disease or has been reported upon by previous workers.

Infection through the second of the routes, i.e. inhalation may also be ruled out of consideration. If this were the portal of infection, the bronchial and mediastinal glands would have been affected long before the superficial glands are involved. But these glands have not shown signs of suppuration or anything unusual even in those animals that showed affection of the lungs and died. The *Post-mortem* examination held on them revealed advanced lesions of catarrhal pneumonia, abscesses and infarction in the lungs. HOLMES has stated that even in the majority of animals in which the lungs were filled with abscesses similar to those found in the superficial lymphatic glands, the bronchial glands were not found affected except in the four cases referred to already.

The only possible conclusion, therefore, is that infection in this disease arises through some method or other which simulates artificial inoculation of the causal organism. Such methods of infection usually occur either through any abrasion or wound existing in a healthy animal coming directly or indirectly, in contact, either with the soil or any other material previously infected with the natural excretions, wounds or abrasions, containing the causal organism, or, through transmission of the causal organism from an infected to a healthy animal by means of insects.

In favour of the first of the above alternatives, it might be argued with great plausibility, that when animals lie down, the lower parts of their abdomen flaps of the flank, dewlaps, generally come in contact with the ground and that animals with abrasions on these parts can easily be infected by previously infected soil, etc. Such infection is likely to involve the various superficial glands.

Full consideration has been given by me to the possibility of infection in this manner, but from careful observations made by me during the study of this disease, and for the reasons mentioned below, I consider that the chance of natural infection arising in the above manner, in the normal sequences of events is almost negligible.

1. I have found, in my experience, that the causal organism of the disease is very delicate and the chance of its remaining in the soil and causing infection is very small. Vryburg has also recorded that outside the body, the bacillus rapidly loses its virulence.

2. The sheds in which the animals were kept during the outbreak were always cleaned thoroughly every day and every animal which showed signs of affection of any of the lymphatic glands, in the body was isolated long before the gland developed itself into abscesses. There was,

therefore, not the least, likelihood of the floor becoming infected with the discharge thereby becoming a source of infection.

3. Though animals have been found liable to infection throughout the year, facts point to the fact that the disease exhibits a seasonal variation and that the largest number of cases occur in the wake of the breeding season of suctorial insects.

I am therefore led to the conclusion that the infection takes place through the medium of suctorial insects. RAYMOND in his report says that out of the eleven cases sent to his College for treatment, nine cases occurred respectively on the 4th and 9th April, 24th May, 8th, 20th and 27th June, and 1st, 2nd and 3rd July 1907. HOLMES has reported that the first case occurred in November 1906, no further cases were observed till April 1907 and between that time and the end of December 1907, 85 bullocks were affected. These reports also bear out my observations regarding the seasonal prevalence of the disease. In my examination of the various insects that are likely to be the agents of transmission, I am led to suspect that cattle lice are the more probable agents of dissemination of this disease. Confirmatory experiments are, however, necessary before one definitely incriminates these insects as the actual carriers.

The second of the issues, namely, the reason for the greater predilection shown by the precrural glands to infection than by the prescapular or by other superficial glands, offers next for consideration.

Prior to the enquiry of the Indian Plague Commission into the prevalence and incidence of Plague in India, it was thought that the reason for the presence of inguinal buboes in the majority of cases in India was that the Indians usually went barefooted and became infected by the plague bacilli getting rubbed into abrasions on their feet. The Plague Commission, however, pointed out that the reason why the groin glands are so frequently affected was simply because they drain the largest skin area and showed that the areas drained by the glands of the neck, axilla, and groin were respectively in the proportion of 1:1.8:5, while the number of cervical, axillary and inguinal buboes were in the proportion of 1:1.3:5.8. Further it is also stated that in communities wearing shoes, the percentage of groin buboes was no less than in those that went barefooted.

Unfortunately, none of the text books on Veterinary Anatomy give any ratio of the extents of the skin areas drained by the several superficial lymphatic glands in cattle. I have worked out as approximately as possible the extent of the areas drained by these glands and their ratio as will be seen from Table 1, approximates very closely in every animal irrespective of its size, breed or age. It may be taken on an average that the areas drained by the precrural, by the prescapular and by other glands taken together are in the ratio of 4.9:2.2:1 and the data collected during the outbreak investigated by me show that the average ratios of the precrural, prescapular and other glandular abscesses are in the proportion of 4.4:1.6:1. These figures stand to each other in the same relationship as those arrived at by the Plague Commission and suggest the inference.

TABLE I.

Showing the approximate extents of the areas of skin drained by the various superficial lymph glands in cattle.

Serial No.	Description of cattle.	Weight in lb.	Area drained by the precrural gland in square inches.		Area drained by prescapular gland in square inches.		AREA DRAINED BY OTHER LYMPHATIC GLAND IN SQUARE INCHES				Ratio of columns 4, 5 and 6
			4	5	4	5	Submaxillary and parotid	Superficial in guinea	Ischitic of a, b and c	Total of a, b and c	
1							a	b	c	6	
1	White bullock (Ranipet)	456	1,792	832	1,95	48	195	48	192	435	4.1:1.9:1.0
2	Red bullock (Ranipet)	368	1,512	645	180	52	180	52	180	412	3.7:1.6:1.0
3	White bullock (Ongole)	974	2,922	1,472	306	57	306	57	214	577	5.1:2.6:1.0
4	Ditto	823	2,888	1,443	288	60	288	60	185	533	5.4:2.7:1.0
5	Grey bullock (Ranipet)	480	2,146	954	180	64	180	64	160	404	5.3:2.4:1.0
6	White bullock (Alambady)	584	2,276	922	225	64	225	64	200	489	4.7:1.9:1.0
7	White bullock (Kangayam)	569	2,477	1,068	240	64	240	64	170	474	5.2:2.3:1.0
8	Heifer (2½ years)	286	1,372	621	154	39	154	39	153	346	4.0:1.8:1.0
9	Red bullock (Ranipet)	248	1,280	559	132	30	132	30	116	278	4.6:2.0:1.0
10	Calf (8 months)	95	720	300	80	20	80	20	48	148	4.9:2.0:1.0
11	Buffalo (Delhi)	1,161	2,654	948	225	64	225	64	150	439	6.0:2.2:1.0
12	Calf (6 months)	57	493	234	36	16	36	16	37	89	5.5:2.5:1.0
13	Red bullock (Ranipet)	325	1,404	713	121	28	121	28	112	261	5.4:2.7:1.0
14	Bullock (Ongole)	800	2,658	1,250	272	66	272	66	170	508	5.2:2.5:1.0
15	White cow (Ranipet)	291	1,427	693	162	39	162	39	144	345	4.1:2.0:1.0
	AVERAGE	...	...	...	...	...	...	...	...	...	4.9:2.2:1.0

* Weight has been calculated according to the formula $\frac{\text{length} \times (\text{girth})^2}{300}$

that the various superficial glandular abscesses on the body are in correlation with the infection of the areas of the skin drained by the respective lymphatic glands.

Inasmuch as the regions inhabited by the lice, which, I think, are the agents of transmission of the disease, are those that are drained chiefly by the precrural and prescapular glands in the order named, it is but natural that these glands are chiefly affected in this disease and that greater predilection to infection is shown by the precrural glands than by the prescapular glands.

Etiology

The causal agent of the disease has been dealt with at length by SHEATHER who, in reviewing the reports of the various workers, has come to the conclusion that the disease is caused by a rod shaped organism. He has described its morphological and cultural characters and also recorded the results of his inoculations in experimental animals with the pus from original lesions as well as with the culture of organism isolated from the pus.

In my experimental inoculations, I have also obtained identically the same results as those got by SHEATHER and I therefore do not propose to record the results of my observations concerning this part of the work at length in this paper except confirming that intraperitoneal inoculations in male guinea-pigs either with pus from natural or experimental lesions, or with culture of the organism generally produce suppurative orchitis and encapsulated abscesses in the omentum (Pl. I, Fig. 2), while subcutaneous inoculations in cattle with the same material lead to the involvement of the lymphatic gland nearest to the seat of injection.

Morphology of the Organism

(1) *In Lesions*:—SHEATHER records that it is extremely difficult to detect microscopically the bacilli in lesions. In my experience, detection of the causal organism in lesions entirely depends on the state of the glands from which the smears are made. In those lesions in which suppurating foci have not completely invaded the gland, I have experienced no difficulty in detecting the organism. In smears made from the lesions, taken at a later period, when disorganisation has taken place but not advanced to the state of a caseo-purulent condition, the organism can still be detected after a careful search. Only in lesions where the glandular structure has been completely disorganised into a caseo-purulent condition, it is found impossible to detect the organism in the pus. The stain that I usually employ for staining the organism in smears of pus is Leishman's stain, and my reason for using this stain is that it not only brings out clearly the morphological characters of the organism but also gives me a good guide by the presence or absence of the staining affinity of the pus cells whether or not it is worth while to continue the search for the organism.

In preparations of smears made from the pus and stained by Leishman's stain, the causal organism is found either singly as a small oval rod

or more usually arranged in the form of clumps among pus cells and sometimes scattered in their vicinity. The bacilli show very characteristic bipolar staining with a clear intermediate unstained area and resemble in every respect those of the *Pasturella* group. (Plate III).

(2) *In cultures*:—SHEATHER mentions that growth from the sediment of a 24-hour broth culture is mostly in the form of long filaments which are intricately twisted and coiled together, the filaments not being all alike in appearance and adds that even after 24-hour incubation involution forms appear, some of the filaments having rounded swollen ends and some of the bacilli being large and spindle shaped. Preparations made by me from broth culture of the organism presented, however, quite a different picture and revealed chains of the bacilli with distinct bipolar staining, resembling those one gets in broth culture of *Bacillus pestis* (Plate IV, fig I.).

In preparations made from the surface growth on agar, the bacilli appear as typically small, slender rods, some showing distinct bipolar staining, while others not (Plate IV, fig. 2). Variations in size of these rods exist here and there, and one can see distinctly elongated rods with thickened ends in preparations from cultures incubated for three days.

Very characteristic morphological appearances are exhibited by the organism when cultivated on 3% salt agar. Different remarkable involution forms—coccoid, oval, pyriform and sausage-shaped—are usually found after incubation from 24 hours to 3 days (Plate V and Plate VII, Fig. I).

The bacillus as recorded by SHEATHER can be stained by any of the simple aniline dyes, but is not "fast" either by the method of Gram, Gram-Weigert or Claudius.

Cultural Characters

I have experienced no difficulty in obtaining primary cultures on agar. On this medium, growth is visible in forty-eight hours and appears as smooth transparent dew drop like colonies which show a great tendency to remain separate, without becoming confluent. In further subcultures, a continuous growth appears along the track of the needle. When the growth is removed for microscopical examination, it is found to be dry and granular, exhibits a tendency to slip away from the needle. It is even difficult to crush it on the slide. I have noticed that this is a constant peculiarity. No luxuriant growth takes place even after incubating the cultures on this medium for a week.

On serum agar, growth is more luxuriant than on ordinary agar, but the cultural characters are the same.

On salt agar, the growth is very faint and scanty and my object in using this medium is with a view to study the characteristic involution forms which form a distinct feature of identification.

In broth the organism grows easily. The growth in this medium is characteristic. The broth remains quite clear and numerous minute powdery deposits are observed to make their appearance from the second

day and increase in their number. These deposits are granular in character and appear as if they are adhering to the sides of the flask and with the slightest vibration, they have a tendency to fall down to the bottom of the flask. However, in broth, sown from a previous culture of broth, a more or less marked turbidity of the medium appears with a thin surface scum.

No growth is observed on potato.

Milk is not coagulated.

Pathology

The appearances which the affected gland presents in this disease depend on the state when it is examined. In the early stages, one finds the gland considerably enlarged, tense and indurated. Sections cut from it at this stage, when examined microscopically, reveal a great increase in the bands of its reticulum and a gradual conversion of the glandular tissue into a mass of fibrous tissue, the lymphoid cells becoming more and more scanty as the fibrous tissue is more fully formed until one eventually finds in places only masses of fibrous tissue, without even a trace of its original substance (Plate VI, figs. 1 and 2). At this stage, suppurating foci which commence to appear in small areas within the gland begin to extend into the newly formed masses of fibrous tissue, and abscesses of varying sizes are soon formed and distributed over large areas. These areas when examined microscopically reveal pus cells with granular material encapsuled by a fibrous wall (Plate VI, Fig. 1). Endarteritis is very marked and forms one of the special features of the lesions. If the gland is left at this stage without any surgical interference, disorganisation of the entire tissue into a mass of purulent material soon takes place (Plate VII, Fig. 2). Such an abscess when opened is found to contain pus, whitish in colour, of viscid consistency and granular in character.

In some cases, while the disorganisation of the glandular tissue is going on, masses of the causal organism with broken up tissue fragments gain access to the blood stream and set up puriform emboli in the blood-vessels which become finally arrested in the lungs and give rise to catarrhal pneumonia, infarction and pulmonary abscesses which supervene and determine the life of the animal generally long before either the bronchial or the mediastinal glands get affected. Post-mortem examinations held on such animals reveal the lungs to be the only organs showing typical appearance. They present numerous nodules ranging from the size of a big pea to that of a large lime scattered throughout. These nodules are not of a uniform colour. Some are dirty white, while others pure white. When cut into, they are found to contain pus of the same character and consistency as that in the affected glands (Pl. VIII, fig. 1). In some cases, shrinking cavities filled with caseopurulent material simulating those which are found in tubercular lesions are present (Pl. VIII, fig. 2). Sections of the affected portions of the lungs, when examined microscopically, reveal a condition of catarrhal pneumonia. The bronchial tubes are found filled with catarrhal exudate (Pl. VIII, fig. 3). Their walls show considerable thickening. The epithelium is found proliferating. The alveoli are

found in different stages of infiltration, and in some their walls cannot be made out at all, while in others they are just faintly visible. Some of the alveoli are found to be filled with catarrhal cells, while in others croupous exudate forms a prominent feature. Areas of necrotic foci are found in plenty. Leucocytic infiltration surrounding these areas is prominent. In some, the formation of new connective tissue is marked. Infarction due to embolism of the pulmonary artery forms also a predominant feature in the lesions.

Treatment

Ordinarily, surgical opening of the abscesses, irrigation of the abscess cavities with saline douches and the dressing of them with antiseptic gauzes act as effectively as any other treatment.

However, in such of the cases, in the outbreak referred to, as were not amenable to the above line of treatment, a vaccine was prepared and used.

The organism was grown in broth for six weeks, to which was added a 72-hours' broth culture of the same organism, in the proportion of 1: 4. The mixture was exposed to 58°C for half an hour and carbolic acid was subsequently added in the proportion of .5 per cent. The dose of the vaccine used varied from 10 to 40 c. c. injected subcutaneously. The number of injections and the intervals between each injection depended on each case treated.

In those cases which were considered from the nature of the lesions exhibited by the animals to be likely to give trouble, vaccine was used from the very commencement of the local treatment; while in others, only when it was found that the local treatment was ineffective, vaccine treatment was commenced. In addition to the treatment of animals at the hospital, vaccine was also issued to the chief Superintendent in charge of the Corporation depots to be tried on selected cases not responding to local treatment. The report furnished by him to the Principal of the Madras Veterinary College in the form of two statements is subjoined (Tables II and III).

A concise description of each of the cases treated at the College hospital with the vaccine is given below.

NO. 1. CASE NO. 28 OF 1921.

Red and black bullock B-16 admitted on 20-v-21 with abscesses on the left flank and scrotum. Vaccine treatment was commenced from 21-v-21. Four injections of the vaccine were given:—

10 c.c.	.	.	.	.	on 21-v-21
20 "	.	.	.	.	" 23-v-21
30 "	.	.	.	.	" 25-v-21
30 "	.	.	.	.	" 29-v-21

The abscesses were opened on 29-v-21 and the animal was cured and fit for discharge on 27-vi-21.

TABLE II.
Showing list of animals subjected to multiple abscess vaccine treatment in D. Depot—Harris Road.

Serial No.	Bullock No.	Date of operation	No. of abscesses	DATE OF INOCULATION.			Results	REMARKS
				1st	2nd	3rd		
1	D. 40 . {	5th January 1922 . 15th March 1922 .	{ 2	28-4-22 .	2-5-22 .	7-5-22 .	Discharged on 27th May 1922.	
2	D. 4 . {	1st February 1922 . 28th April 1922 .	{ 3	Do. .	Do. .	Do. .	Ditto.	
3	D. 127 . {	1st February 1922 . 28th April 1922 .	{ 10	Do. .	Do. .	Do. .	Discharged on 7th June 1922.	
4	D. 36 . {	14th February 1922 . 15th March 1922 .	{ 1	Do. .	Do. .	Do. .	Discharged on 27th May 1922.	
5	D. 3 . {	10th February 1922 . 15th March 1922 .	{ 50	Do. .	Do. .	Do. .	Died on 10th May 1922.	
6	D. 69 .	31st March 1922 .	2	Do. .	Do. .	Do. .	Condemned and sold .	Developed lameness in both fore.
7	D. 99 . {	Ditto. 2nd May 1922 .	{ 7	Do .	Do. .	Do. .	Discharged on 15th June 1922.	
8	D. 89 .	28th April 1922 .	2	Do. .	Do. .	Do. .	Discharged on 27th May 1922.	
9	D. 104 {	Ditto. 23rd May 1922 .	{ 2	Do. .	Do. .	Do. .		Still under treatment.
10	D. 138 .	28th April 1922 .	8	Do. .	Do. .	Do. .	Died on 18th June 1922.	

TABLE III.
Showing the bullocks injected with multiple abscess vaccine and the results.

Serial No.	Bullocks No.	No. of abscesses	No. of injections	Dates of injections	Date of operation	Result	REMARKS
1	A. 37 .	7	4	{ 26th March 1922 30th March 1922 5th April 1922 9th April 1922	{ 7th March 1922	Discharged on 8th April 1922.	
2	A. 128 .	26	3	{ 26th March 1922 30th March 1922 4th April 1922	{ 1st February 1922.	Died on 9th April 1922.	8 more abscesses formed after injection.
3	A. 65 .	5	4	{ 26th March 1922 30th March 1922 15th April 1922 9th April 1922	{ 7th March 1922.	...	Developed one on off flank—losing condition and coughing.
4	A. 87 .	17	4	{ 26th March 1922 30th March 1922 4th April 1922 9th April 1922	{ Ditto.	Discharged on 14th April 1922.	
5	A. 17 .	12	1	26th March 1922	1st March 1922.	Died on 28th March 1922.	
6	A. 27 .	8	4	{ Ditto. 30th March 1922 4th April 1922 9th April 1922	{ 15th February 1922	Died on 13th April 1922.	
7	A. 80 .	9	4	Ditto.	1st February 1922.	...	Abscess formed in front of the one already operated.

TABLE III.
Showing the bullock injected with multiple abscess vaccine and the results—(Contd.)

Serial No.	Bullocks No.	No. of abscesses	No. of injections	Dates of injections	Date of operation	Result	REMARKS.
8	A. 8	2	4	9th April 1922	1st October 1921	...	One developed in front of the one already operated. Abscess increasing in size and furrowing—no tendency to heal.
9	B. 42	12	4	26th March 1922 30th March 1922 2nd April 1922 7th April 1922 Ditto	29th January 1922	Died on 30th April 1922	Two more developed—Coughing and heavy breathing.
10	B. 169	4	4	26th March 1922 30th March 1922 5th April 1922 19th April 1922	19th February 1922	Discharged on 21st April 1922	
11	A. 96	10	4	30th March 1922 4th April 1922 7th April 1922 9th April 1922	22nd January 1922	Died on 22nd April 1922	
12	A. 10	3	4	30th March 1922 4th April 1922 7th April 1922 9th April 1922	21st November 1921	Died on 10th May 1922	Big abscess formed underneath the ones operated with fibrous growth. Operated again on 27th April 1922. Developed heavy and laboured breathing and cough on 8th May 1922.
13	A. 5	2	3	30th March 1922 4th April 1922 9th April 1922	7th March 1922	Discharged on 14th April 1922	But pus formed in the healed one; one new one formed at the angle of off-jaw and below ear on the same side.
14	A. 47	7	3	Ditto	19th February 1922	Discharged on 10th April 1922	

Abstract:—6 died, 3 yet under treatment, 4 discharged, 1 developed after discharge.

NO. 2. CASE NO. 29 OF 1921.

Grey bullock B-32 admitted on 20-v-21, with abscesses on the face; the gland affected was the left parotid lymph gland with small abscesses near and around the primary one. Vaccine treatment was commenced from 27-v-21, and three injections were given:—

10 c.c.	.	.	.	.	on 27-v-21
10 "	.	.	.	.	" 29-v-21
20 "	.	.	.	.	" 3-vi-21

The abscesses healed by 24-vii-21, though the animal was detained for another complaint till 9-ix-21.

NO. 3. CASE NO. 30 OF 1921.

White bullock B-155 admitted on 20-v-21 with the left precrural gland hard and indurated; vaccine treatment was commenced from 21-v-21 and four injections were given:—

10 c.c.	.	.	.	.	on 21-v-21
20 "	.	.	.	.	" 23-v-21
30 "	.	.	.	.	" 25-v-21
30 "	.	.	.	.	" 29-v-21

The abscesses were opened on 30-v-21 and the animal was cured and fit for discharge on 18-vi-21.

NO. 4. CASE NO. 31 OF 1921.

White bullock B-44 admitted on 21-v-21 with a number of abscesses; both the precrural and prescapular glands were affected; the animal was poor in condition with overgrown hoofs. Four injections of the vaccine were given:—

10 c.c.	.	.	.	.	on 27-v-21
20 "	.	.	.	.	" 29-v-21
20 "	.	.	.	.	" 3-vi-21
30 "	.	.	.	.	" 8-vi-21

As the animal did not improve in condition and showed affection of the lungs, it was recommended to be destroyed.

NO. 5. CASE NO. 39 OF 1921.

Grey bullock C-36 admitted on 4-vi-21 with abscesses at the parotid region. The left parotid gland was found hard and indurated with a number of small abscesses in and around it. As the animal did not get any relief with the local treatment, vaccine treatment was commenced from 16-xi-21. Three injections were given:—

30 c.c.	.	.	.	.	on 16-xi-21
30 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The abscesses healed by 13-ii-22. As there was still left a hard tumour with a fibrous thickening, it was decided to remove it, which was one on 15-ii-22, and the animal was cured and discharged on 30-v-22.

NO. 6. CASE NO. 48 OF 1921.

Light red bullock B-125 admitted on 18-vi-21 with abscesses on the left flank. As the local treatment afforded no relief to the animal inasmuch as more than 10 abscesses formed within a course of about five months, and as the condition of the animal began to be affected very much, vaccine treatment was commenced from 16-xi-21. Three injections were given :—

30 c.c.	.	.	.	.	on 16-xi-21
30 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal was cured and discharged on 6th June 1922.

NO. 7. CASE NO. 56 OF 1921.

Grey bullock C-107 admitted on 28-vi-21. At the time of its admission a few small abscesses in the form of buds were found on the region of the left side of the neck. The abscesses were opened and the local treatment was adopted until 6-v-21. As more abscesses extending along the region of the neck began to develop, and the animal was also losing condition, vaccine treatment was resorted to from 16-viii-21. The animal received eleven injections of the vaccine as detailed below :—

10 c.c.	.	.	.	.	on 16-viii-21
10 "	.	.	.	.	" 19-viii-21
10 "	.	.	.	.	" 21-viii-21
30 "	.	.	.	.	" 23-ix-21
20 "	.	.	.	.	" 26-ix-21
20 "	.	.	.	.	" 27-ix-21
30 "	.	.	.	.	" 23-x-21
30 "	.	.	.	.	" 10-xi-21
30 "	.	.	.	.	" 16-xi-21
30 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal with the commencement of the vaccine treatment began to improve in condition and was fit for discharge in its best of health on 3rd January, 1922. During its stay in the hospital as many as 33 abscesses developed.

NO. 8. CASE NO. 67 OF 1921.

White bullock C-98 admitted on 21-vii-21 with an abscess involving the right precrural gland. This animal was given every method of local treatment till 16-xi-21, when as more abscesses began to develop and the animal began to lose condition, vaccine treatment was commenced and three injections were given :—

30 c.c.	.	.	.	.	on 16-xi-21
30 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal was cured and discharged on 20th April, 1922.

NO. 9. CASE NO. 97 OF 1921.

White bullock B-47 admitted on 21-ix-21. Soon after its admission, the animal showed symptoms of affection of the lungs and received symptomatic treatment. Vaccine treatment was commenced from 5-xi-21 and two injections were given :—

30 c.c.	.	.	.	.	on 5-xi-21
30 "	.	.	.	.	" 16-xi-21

The treatment gave the animal no relief and the animal died on 11-xii-21.

NO. 10. CASE NO. 98 OF 1921.

Black bullock B-109 admitted on 21-ix-21. The gland affected was the left precrural gland, which was hard and indurated. Three injections of the vaccine were given :—

10 c.c.	.	.	.	.	on 23-ix-21
20 "	.	.	.	.	" 26-ix-21
20 "	.	.	.	.	" 29-ix-21

The animal was cured and discharged on 17-x-21.

NO. 11. CASE NO. 116 OF 1921.

White bullock B-40 admitted on 26-x-21 with a big abscess involving the right prescapular gland and small abscesses around it. The usual local treatment was given until 5-xi-21, but as the animal, was found to develop more abscesses and its condition began to be affected, vaccine treatment was commenced from 5-xi-21. Three injections were given :—

30 c.c.	.	.	.	.	on 5-xi-21
30 "	.	.	.	.	" 16-xi-21
30 "	.	.	.	.	" 19-xi-21

The animal was cured and discharged on 9th February, 1922.

NO. 12. CASE NO. 118 OF 1921.

White bullock D-9 admitted on 1-xi-21 with a precrural abscess on the left flank. This animal was given the usual treatment till 16-xi-21. As more abscesses began to develop along the sternum and the chest, vaccine treatment was commenced from 16-xi-21. Three injections were given :—

30 c.c.	.	.	.	.	on 16-xi-21
30 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal was cured and discharged on 6th January, 1922.

NO. 13. CASE NO. 133 OF 1921.

White bullock C-1 admitted on 18-xi-21. This animal had seven abscesses and both the precrural glands were affected. Vaccine treatment was commenced from 25-xi-21. Three injections were given :—

20 c.c.	.	.	.	.	on 25-xi-21
20 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal was cured and discharged on 5-iii-22.

NO. 14. CASE NO 138 OF 1921.

Red and white bullock D-8 admitted on 23-xi-21 with an indurated abscess involving the right precrural gland and three other smaller abscesses around it. Vaccine treatment was commenced from 25-xi-21. Three injections were given:—

20 c.c.	.	.	.	.	on 25-xi-21
20 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal showed no relief and died on 7th February, 1922.

NO. 15. CASE NO. 139 OF 1921.

Red bullock D-37 admitted on 23-xi-21 with multiple abscesses. Vaccine treatment was commenced from 25-xi-21. Three injections were given:—

20 c.c.	.	.	.	.	on 25-xi-21
20 "	.	.	.	.	" 30-xi-21
30 "	.	.	.	.	" 8-xii-21

The animal was cured and discharged on 6th January, 1922.

NO. 16. CASE NO. 193 OF 1922.

White bullock C-148 admitted on 2-iii-22 with abscesses involving the right thigh and both the precrural glands. The usual treatment was given till July, but as the animal was losing condition and more abscesses began to form, it was transferred to me for treatment with the vaccine. The animal received four injections commencing from 16-viii-22.

20 c.c.	.	.	.	.	on 16-viii-22
20 "	.	.	.	.	" 22-viii-22
40 "	.	.	.	.	" 31-viii-22
40 "	.	.	.	.	" 5-ix-22

The animal was cured and discharged on 10-ix-22.

NO. 17. CASE NO. 194 OF 1922.

White bullock A-84 admitted on 3-iii-22 with a precrural abscess. The usual treatment was given until 18-vi-22 when tertiary abscesses began to form all over the body. Concurrent with these abscesses, the animal began to show lung affection and at this stage on 22-viii-22, vaccine treatment was commenced and four injections of the vaccine were given:—

20 c.c.	.	.	.	.	on 22-viii-22
40 "	.	.	.	.	" 31-viii-22
40 "	.	.	.	.	" 5-ix-22
20 "	.	.	.	.	" 11-ix-22

The treatment afforded no relief and the animal died on 27-ix-22.



1. Bovine Lymphangitis. A bullock in an advanced state of the disease.



2. A. A guinea-pig showing orchitis as a result of intraperitoneal injection with broth culture of the organism of bovine lymphangitis.

B. A male guinea-pig (normal).

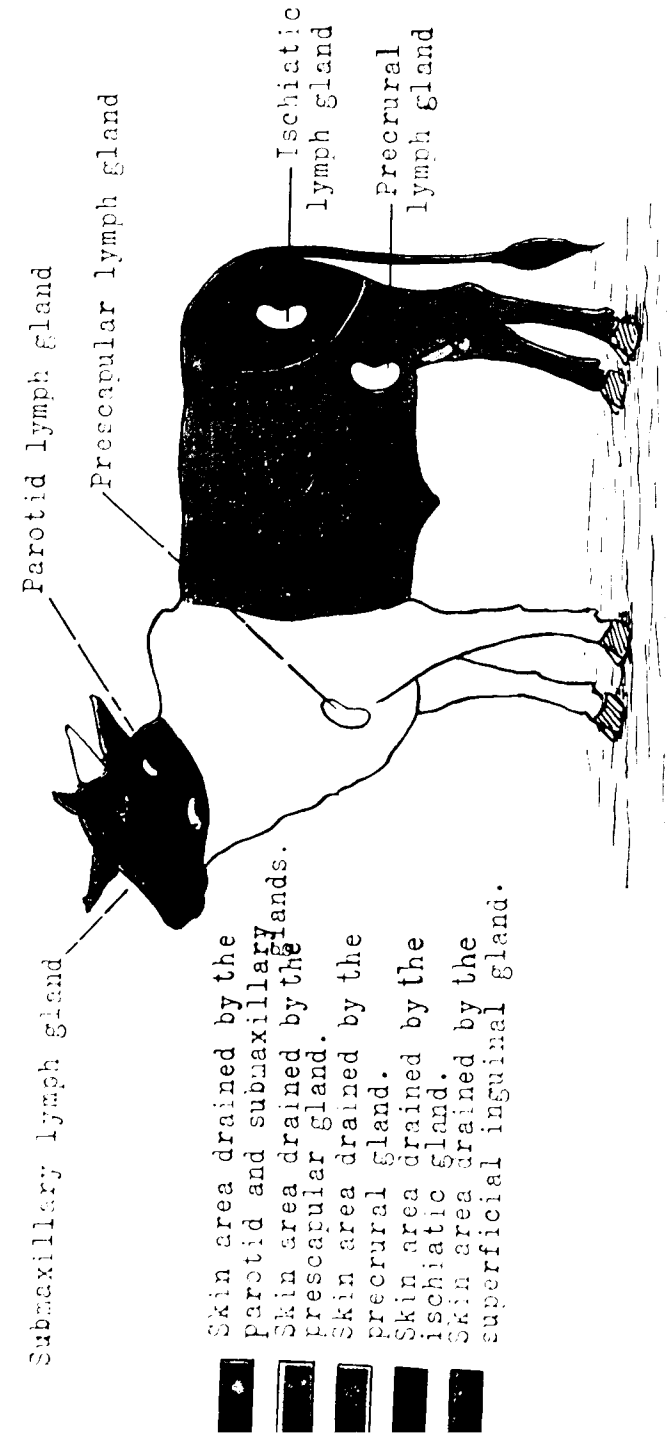


Diagram showing the approximate extents of skin areas drained by the different lymph glands in the bull.

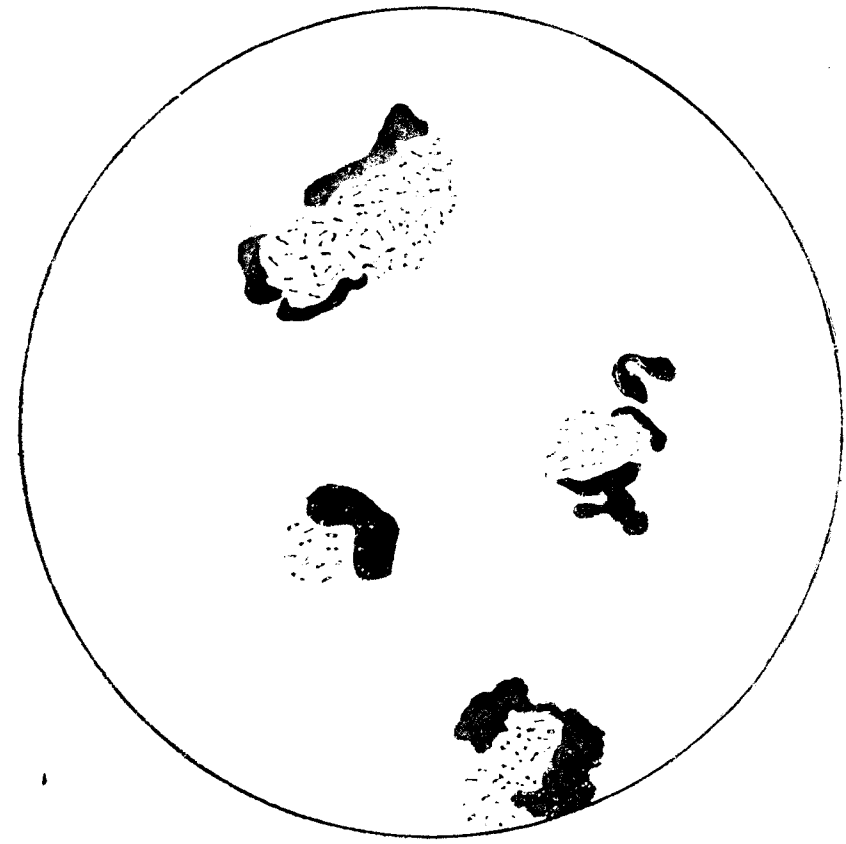


PLATE IV.

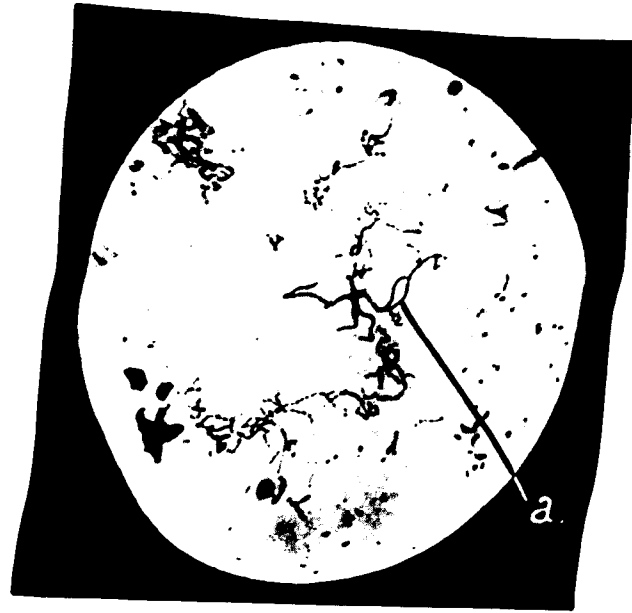
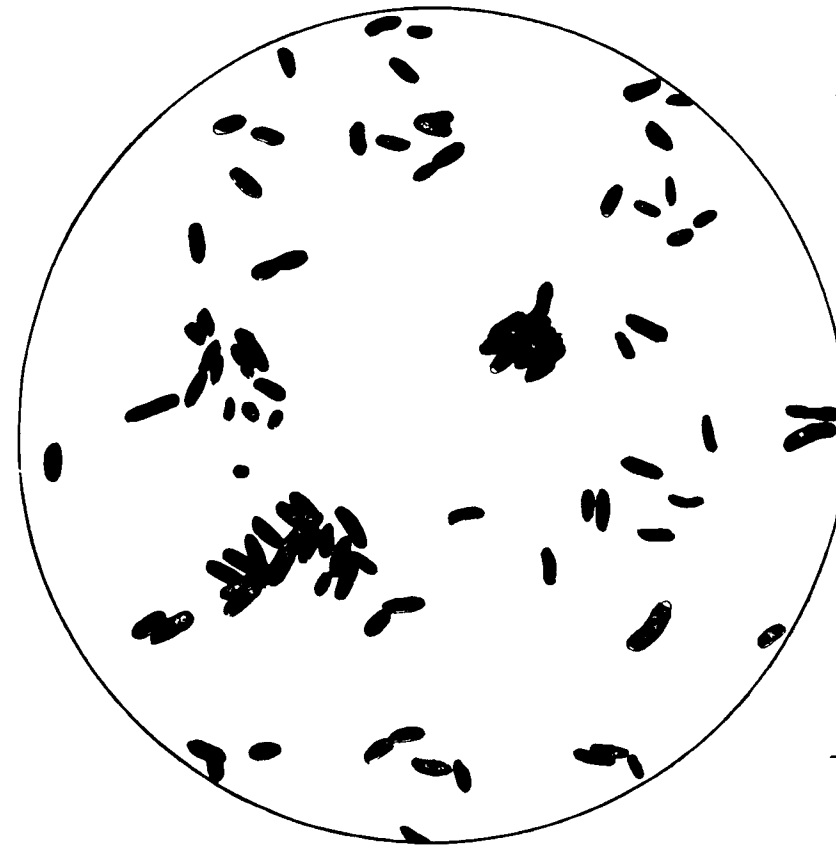


Fig. 1. a. Organism of bovine lymphangitis from a 48 hours' broth culture, showing chain forms.



Fig. 2. Organism of bovine lymphangitis from a 48 hours' agar culture.

PLATE V



0.15. Mm.

Mm 0.1

Organism of bovine lymphangitis from a 48 hours' salt agar, culture, showing involution forms.
Drawn to scale with camera lucida 1-12th objective and No. 4 eye-piece. Stained with carbol-fuchsin.

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CONVULSIONS IN DOGS

BY

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**Fort San Houston, Texas Veterinary Corps, U. S. Army.*

It is not my intention to enter upon a lengthy scientific discussion of convulsions in dogs. First of all, to-day, I am among canine specialists and veterinarians who have had an extensive small animal practice and many have had a vast experience with convulsions in dogs. As an Army veterinarian, naturally you are all aware of the fact that we do not have an extensive small animal practice. I am referring to the subject of this condition more from the standpoint of a breeder than that of a practitioner and therefore my experience will differ accordingly from that of the practitioner.

During the past six years, I have maintained a large kennel of German Shepherds, commonly known as German Police dogs. My kennel was conducted on a large scale and I maintained the kennel proper at a short distance from my residence. A good many brood matrons were placed out on shares, or, as we say, "farmed out." In this manner the puppies were raised under varying conditions. The one great obstacle with which I had to contend was the frequency of convulsions which occurred among the dogs owned by me. My experience with this condition was a very interesting one, as well as a costly one. In many instances I had disposed of puppies for a handsome price and then had them returned to me within a few days suffering from convulsions. Many large kennels dread this condition. Many kennels boast of never having

* Journal of the American Veterinary Medical Association, July, 1927, New Series Vol. 24, No. 4.

had the unfortunate condition in their animals, but a large majority have experienced a heavy percentage.

During the year 1922, considerable discussion appeared in the various veterinary journals, concerning the appearance of a new disease called "frights disease." This malady was characterized mainly by convulsions. As many different articles as were written on the subject contained as many different opinions as to its cause, symptoms, etc. Many practitioners doubted the existence of such a disease. There was considerable discussion as to its nature and many claimed it to be of an infectious nature. I have had the condition described to me by many experienced practitioners and many claim that as high as 80 per cent of dogs in a community are affected, dogs of all ages and breeds, mongrels as well as pure-bred, dogs that are free from intestinal parasites and intestinal disturbances, dogs that are fed on a strictly meat diet as well as those on a mixed or a whole-cereal diet, and animals that have had and fully recovered from distemper, as well as those that have never suffered from distemper.

FRIGHTS DISEASE NOT KNOWN IN GERMANY

From the description of this new disease that was given me by many practitioners, I realize I have not encountered "frights disease," but I do not wish to say that I do not believe such a disease exists. I do know from actual experience that this disease was unheard of in Germany during 1922, as I was in that country at that time, and recollect one animal that an Army officer shipped back to the States that became affected with "frights disease," according to a well-known practitioner, about two weeks after its arrival or just after its release from quarantine. I do not wish to refer to "frights disease" any further, because I evidently have not seen a case of this kind, and I do not believe the cases of convulsions I have experienced were those caused by one specific disease, because I proved to my own satisfaction the cause of the different types of convulsions appearing in my own kennels, in dogs owned by me or dogs disposed of by me to individual owners, who would return the dogs purchased, for treatment. I devoted a great deal of time studying the cases in my kennels and if I had not maintained a kennel I would not have had the opportunity of studying the conditions from the standpoint of a breeder.

There is no doubt that convulsions in dogs are more common in the United States now than they were ten or fifteen years ago. Dogs of the United States are changing. New breeds are being developed. There is too strong a practice in inbreeding among many breeders, in attempts to produce a variation in the breed or the type, attempts at improving individuals, producing toy types of various breeds, etc. All these factors enter into the consideration of common ailments, which may have a bearing on convulsions due to weakening of vital organs. Changing conformation of animals, by such inbreeding and crossbreeding, surely has as its sequel a retrogressive change in vital organs. Another factor entering into causes of various diseases which may in turn produce convulsions, is the feeding of an inferior or deficient product. How many

firms were manufacturing dog foods fifteen years ago? Compare that number with the number of dog-food concerns to-day. The majority of these concerns are located in one large city of this country, a city known for the manufacture of various breakfast foods under different names.

Some of the firms which manufacture dog foods advertise some of the well-known breakfast foods as ingredients in their products. Take into consideration the cost of some of these dog foods. Some are so astonishingly low that you wonder what on earth can be in them. Foods are being put out at prices that are even below the cost of a poor-grade grain which is used in their making. Such ingredients cannot be of a wholesome quality and are either sweepings from various breakfastfood concerns, sweepings of mills, or are mouldy, rejected ingredients. Many practitioners will relate cases of convulsions which were produced soon after placing animals on some of these commercial foods. I have experienced cases which I know positively were caused by such food. We cannot condemn all firms manufacturing a mixed cereal dog food, because some produce a very reliable food, prepared under strict supervision and of wholesome ingredients.

DOG BEING CHANGED

We are constantly changing the dog from a carnivorous to an omnivorous animals. His natural instincts cause him to seek foods containing the necessary vitamins contained in meat. He will, therefore, eat objects if placed on a cereal diet that he would not eat if upon a meat diet and in this way swallows many foreign objects and indigestible material. Many practitioners will state the mongrel rarely suffers from intestinal disorders or common ailments. The reason probably is the food, care and handling the mongrel receives.

Convulsions, we know, may result from numerous causes and are only symptoms of existing diseases. The common causes of convulsions in kennels and among a great many individual dogs are in all probability common disorders mentioned herein. Dogs of all ages are susceptible, but naturally puppies from three and one-half months to nine months of age suffer most and during their dentition period they continually chew and gnaw upon various objects. The presence of vectorial insects in kennels also has a great bearing. Dogs over fifteen months old are not so susceptible as the younger dogs.

Generally speaking I would divide the common causes of convulsions most frequently met with into three classes: first, dietary deficiency; second, gastro-enteritis; and third, auto-intoxication. I believe that each form of convulsions resulting from these causes presents a quite clear clinical picture. The symptoms and prognosis depend upon the causative factor.

Dietary deficiency cases will generally have a history that the animals were fed on cornbread, cracklings, cornmeal, rice, commercial dog biscuit or other cereal food. Little or no meat has been fed and very seldom any bones to chew upon. The convulsions from this condition

come on real suddenly and are more of a clonic nature. Prior to the convulsions, the animal has exhibited no signs of any disease or disturbance other than a slight diarrhoea. There is a sudden loud barking, which is very rapid and sharp, the animal starts running, runs into objects and shows great anxiety or fright. The eyes appear to be normal and it is only through his great excitement that he runs into objects. He runs under a box or into a corner of his kennel, continues his sharp barking for some time, assumes a crouching position, head down as if he were frightened, and rests either upon the hind legs or sternum.

CHANGE OF DIET INDICATED

The convulsion lasts from three to five minutes and suddenly disappears. The animal will shake himself, arise and be normal again. There is no noticeable muscular weakness following this and no evidence of pain. Temperature is normal and within half an hour after the attack the pulse is normal. In several instances where there are several puppies in the kennel, all having been upon the same food, most of them will be affected. When first affected, the pup starts into convulsions. This excitement causes others to become affected and in many cases the entire kennel will be affected following the first case. This form is rarely fatal and soon disappears upon change from a cereal to a whole-meat diet. Other than a good eliminative treatment, nothing else than change of diet is required. The cases may last from one to three days after change of diet, but if maintained upon a meat diet they soon recover.

Convulsions resulting from gastro-enteritis constitute another common form. The history of the cases, the habits and the feeding of the animals are of importance here. Some owners will inform you that they have given some patent vermifuge, or other patent medicines which some one has recommended for conditioning their dogs. In other cases, the owners will state that their animals have been constipated or have been noticed to swallow foreign bodies such as cinders, coal, pieces of leather, feathers, hoof trimmings, gravel, etc., and have noticed these foreign obstacles appear in the feces. The animals may have suffered from diarrhoea or from constipation for some time prior to the appearance of the convulsions.

The dog seems to be in great pain, the barking is very sharp, more like the bark of an injured animal. The animal runs, shows great anxiety, and is often noticed to bite at his side while in a spell. The convulsion lasts from three to five minutes and the animal frequently will groan for some time following. When attempts at defecation are made, where there are foreign objects in the intestines, it often starts again. There is clamping of the jaws and salivation. The saliva, however, does not seem to be thick. There is no loss of consciousness. The intervals between attacks vary from one to twenty-four hours and many disappear and return again at the end of four or five days. The appetite is disturbed and the animal soon loses flesh.

CONVULSIONS DUE TO AUTO-INTOXICATION

The third and most severe form of convulsions includes those resulting from auto-intoxication, which may be due to several causes. Animals

which are heavily infested with intestinal parasites, tapeworms, and ascarids, which in great numbers apparently produce a toxemia resulting from metabolic disintegration products of the parasites, dogs fed upon a mouldy or decomposed food and those which have had an attack of distemper or those which are in the first stages of distemper, frequently exhibit this form. In determining the cause, the fact that the animal has or has not had distemper is an important factor. The presence of segments of tapeworms or a microscopical examination of the feces for these and other parasites, will facilitate a diagnosis if the condition is caused by parasites.

Animals seem to be dull or sluggish two or three days before an attack. Some dogs are very restless and take an ordinary running spell without any further signs of disturbance until the convulsion proper comes on. This type is the most severe. The animal shows great anxiety. A great stiffness is noted in the beginning, pupils are dilated, head extended and rigid, profuse salivation, saliva very thick, legs stiffened, severe clamping of jaws. The animal reels, does not make attempts at running except in the first two or three attacks, and the gait is very unsteady. After a severe spell the animal will fall over backward, breathing rapidly. When the animal is down it assumes a recumbent position. There is a rapid flexion and extension of the legs while in this position, an involuntary passing of urine and feces, the latter being very soft and watery. The animal soon passes into a coma; eyes are sunken. Soon there is a relaxation, the animal then rises, but is in a very weakened condition for some time after. These convulsions last from five to fifteen minutes. In the severe cases they become more frequent, as the disease progresses and severe cases do not last over four or five days. Animals frequently die during convulsions. The mortality seems high in these cases.

Cases of this kind cause one quite some grief. I have, in many instances, succeeded in clearing the intestinal tract of parasites and have succeeded in getting a vast quantity of tapeworms and the animal would show no sign of improvement.

In some cases I hesitated to give arecolin, owing to the weakened condition, but later found there was no use hesitating as time could not be lost and chances were, as we say, too slim to waste time. I had quite some successes from the administration of calcidin (Abbott) in these cases, giving a five-grain tablet per ten pounds of live weight, three times daily, for four or five days. This was given following the administration of the one arecolin treatment.

TRANSMISSION OF SURRA AMONG ANIMALS OF THE EQUINE SPECIES.*

BY
KELSEY (R.A.)

Previous work on the transmission of surra by Arthropods is reviewed; with the possible exception of Cross's experiments with the tick, *Ornithodoros crossi*, Brumpt (R.A.E., B, xi, 116), no definite evidence has

* The Review of Applied Entomology, Series B: Medical and Veterinary, May, 1923.

been produced of the cyclical development of *Trypanosoma evansi* in an invertebrate host.

An account is given of an outbreak of surra among horses and mules in a military post near Manila in August 1926. This began among animals in the isolation ward and corral of a veterinary hospital, and with the exception of cases that occurred in units to which infected animals were returned before the discovery of the disease, was confined to them. The isolation ward and corral were close to a river along which *Tabanus striatus*, F., bred and at the edge of an area of bamboo where this fly was abundant, while water-buffaloes and oxen, a large percentage of which are carriers of surra in the Philippines, frequented the river and an adjoining road, and a pound for water-buffaloes had been constructed not more than 150 yards away from the corral. The horses and mules in the corral were attacked by large numbers of *T. striatus*, which began to appear commonly in the latter part of July and was very abundant by the middle of August, and it was noticed that when one of these flies began to feed, the animal attacked almost invariably became restless and succeeded in making it fly off to another animal; flies thus disturbed in their feeding were seen to bite two or three horses in the space of a minute or two.

During the course of the outbreak eleven examples of *T. striatus* were caught in the vicinity of the isolation corral and immediately given the opportunity to feed on a healthy white rat; five of the flies bit the rat, which developed surra 11 days later. The stomach contents of some of the other six, which were fully engorged when caught, were examined, and numerous trypanosomes morphologically indistinguishable from *Trypanosoma evansi* were found in one. Subsequently eight flies were caught and fed alternately on a guineapig infected with surra and on three healthy white rats, the feeds on each animal being interrupted; two of the rats developed surra after 11 and 12 days respectively. On the following day and up to the eighth day, when the last died, five of the flies were allowed to bite a healthy white rat, without again taking an infective meal; the rat remained healthy for several months and was finally inoculated with blood containing *T. evansi*, when it developed surra and died.

The conclusion drawn from these experiments that infection is spread by *T. Striatus* in a purely mechanical manner is confirmed by observations in connection with the outbreak. After the bamboo jungles in the vicinity of the isolation corral had been cleared, the flies invaded other parts of the post and were frequently seen attacking the horses and mules, but as there were no cases of surra among them and water-buffaloes had been excluded from the military reservation, the bites were harmless. Had cyclic development of the trypanosome within the fly occurred, the outbreak would not have been terminated so promptly by the removal of infected animals, as there were nearly 900 susceptible animals on the post, and *T. striatus* occurred in fairly large numbers for some months after the outbreak.

Attempts to transmit surra from infected to healthy white rats by means of the bites of *Stomoxys calcitrans*, L., and *Lyperosia exigua*, de

Meij., both with interrupted feeds and after intervals of 1-27 and 1-9 days, respectively, were unsuccessful. In a series of experiments with laboratory-bred *Aedes argenteus*, Poir, (*aegypti*, L.) two rats became infected as a result of interrupted feeds on infected rats, but only negative results were obtained when the mosquitos were allowed to feed on a healthy rat over a period of 32 days after feeding for 6 days on an infected one. Although it is probable that mosquitos occasionally transmit surra in nature, it is unlikely that they do so commonly, as they normally complete their feed on an animal without the latter becoming aware of their presence. Negative results were obtained in experiments with *Boophilus annulatus australis*, Fuller, and *Dermacentor reticulatus*, F., in which the ticks were fed for a short time on dogs infected with surra and then transferred to healthy dogs, on which they were allowed to remain. Negative results were also obtained from the injection into rats of emulsions of eggs laid by ticks that had had an infective feed and of larvae that had hatched from such eggs.

The method employed to determine whether cattle and water-buffaloes were carriers of *Trypanosoma evansi* is described. Of 141 water-buffaloes and 54 cattle, 73 and 12, respectively, proved to be carriers. No carriers were found among equines, in which the disease runs a progressive course terminating in death in a few weeks, and the author considers this a proof that the horse is not a natural host of *T. evansi*. He concludes that the common vector of surra among equines in the Philippines is *Tabanus striatus*, and that the transmission is purely mechanical, but he suggests that transmission to a natural host, possibly water-buffalo, ox or some wild animal, may be effected by an invertebrate in which cyclical development of the trypanosome takes place.

THE DESTRUCTION OF TICKS BY HAND-DRESSING

That cows and breeding cattle in general suffer acutely as the result of Tick activity is the common experience of livestock owners in all Tick-infested areas.

The parts of the animal most readily open to attack and therefore subject to more severe infestation—are the udders, teats, interior of ears, round the eyes, back of shoulders, under the tail, the scrotum and escutcheon.

In tick-infested districts where no dipping or hand-dressing operation has been carried on, one rarely finds a cow with a sound udder and teats. Much of the injury to these parts is regarded by farmers as due to "garget" (congestion of the udder), but experience proves that unsound udders and blind teats are often the result of festering caused by Ticks, and especially the Bont Tick.

When, however, the soft skin parts of cattle are smeared with some suitable preparation, such as Cooper's Cattle Tick Grease, tick damage is prevented, for it kills the parasite.

A further effect of the application of a suitable Grease is to afford protection against the attacks of Ticks over a considerable period.

Origin of Cattle Tick Grease.

At the beginning of the Cooper Tick Eradication work at Gonubie Park, C.P., South Africa, on a farm grossly infested with ticks, it was found that the 14 day interval between the dippings was too long to enable cattle to be kept free from ticks. Hence it became necessary to adopt additional measures for coping with the Ticks.

Experiments directed to this end, resulted in the discovery of a preparation that, when smeared over the skin of the animal on the parts most open to attack, not only killed all the Ticks on those parts, but prevented others from attaching themselves for some considerable time afterwards.

All the breeding cattle were treated with this preparation, which is now known as Cooper's Cattle Tick Grease, mid-way between the 14 day dippings, so that each animal was dipped and hand dressed alternately at weekly intervals.

The results were most satisfactory, and fully justified the extra trouble and expense of applying the Tick Grease. On examining the herd it was seen that although every one of the old cows (those which calved before the treatment commenced) had at least one blind teat, the young cattle had sound udders and all four teats were in good condition.

Tick-Borne Diseases.

In heavily infested districts, where dipping has been carried on for a short time only, and where cattle are exposed to the danger of an outbreak of tick-borne disease, such as Redwater or East Coast Fever, it is important to reduce the number of ticks on a farm as quick as possible. We, therefore, recommend the application of Cooper's Cattle Tick Grease in the mid-interval between the dippings; or if that is not convenient, when the animals are in the draining race after dipping. As even a single tick may convey disease to an animal, and so to the whole herd, thoroughness of treatment is of vital importance.

Dipping Essential.

The use of the Cattle Tick Grease is not intended as a substitute for dipping. Smearing is for local application. It would be too laborious to attempt to apply it over the whole surface of the animal.

It is, however, an excellent preparation for mitigating gross infestation at such times as dipping or spraying may not be practicable, or when the dipping tank or spraying apparatus is, for some reason, temporarily not available for use.

Tick Grease for Horses.

"I have used Cattle Tick Grease for several years as a preventive against horse-sickness, and consider it a certain preventive if the horses are well smeared with it every seven days or so; at any rate I have lost no horses since using it, whilst my neighbours have lost heavily."—Mr. W. P. Campbell, of Grasmere, Transvaal.

"I found Cattle Tick Grease an excellent preparation. Have used it in the ears and under the tails of both cattle and horses, where the small red tick is usually found in great numbers, and is difficult to kill with dipping. Two applications in a week completely cleans the animal. It is harmless to the skin, resists the rain, and I can strongly recommend it."—Mr. G. R. Matthews, of Alice, C.P., S. Africa.

Directions For Use.

Smear the cattle Tick Grease with the hand on the udder, the escutcheon, between the legs, and into all recesses and folds of the skin.

Apply it also in the ears, on the dewlap, and at back of the shoulders and under the tail. In Oxen, dress also the sheath and scrotum.

In applying the grease to the ears, the operator should first remove all the small Ticks from the lower part of the inside of the ears with a smooth stick, and then smear the Grease as far possible over the part with a small swab.

The tail should be treated by first trimming off the hair of the brush, and then applying the grease.

The Cattle Tick Grease may be most conveniently applied to the Cattle whilst they are tethered in the Yard or Kraal, or whilst they are passing slowly through a narrow race, two operators being employed, one on each side of the race.

COOPER'S CATTLE TICK GREASE is non-poisonous, and will not cause the least injury to the animal or operator.

Association News.

MINUTES OF THE PROCEEDING OF THE THIRD ANNUAL CONFERENCE OF THE VETERINARY GRADUATES' ASSOCIATION, ASSAM, HELD AT SILCHAR, ON THE 26TH. DECEMBER 1927, UNDER THE PRESIDENCY OF RAI SHAHEB BHARAT CHANDRA CHOWDHURY BIDYABARIDHI, B.A., A.E.S., ASSAM.

The Conference commenced with a welcome song, sung by Miss. Jyoti Probha Dutta-daughter of Babu Hem Chandra Dutta, B.A. B.L., High Court Vakil in a spacious hall of Silchar Normal School and in the presence of 500 visitors-officials and non-officials representing almost all sections of the public.

Babu Srish Chandra Ghose, Chairman, Reception Committee read out his address at length explaining the utility of the Veterinary Department, cattle, its economic value and

influence on the nation which was very much appreciated by all present. (Appendix A.)

J. Hezlett Esqr. C.I.E., I.C.S., Commissioner, Surma Valley and Hill Division, Assam, graced the occasion by his kind presence. He opened the conference with a far reaching and instructive speech particularly touching the importance of the work done by the officers of the Civil Veterinary Department, offering some practical suggestion which touched the feelings of the delegates and was highly appreciated by the gentlemen present. (Appendix B.)

Rai Shaheb Bharat Chandra Chowdhury, Bidyabaridhi, B.A., A.E.S., was proposed to the Chair, which was carried unanimously.

The President delivered his address which was very interesting and instructive and was highly appreciated by the public and received with applause. (Appendix C.)

Babu Hem Chandra Sen, General Secretary, Veterinary Graduates' Association, Assam, read out the following report and Balance Sheet for the year ending the 31st October 1927:—
Gentlemen,

I have much pleasure in submitting before you to-day my first annual report for the year ending the 31st October, '27. In your last conference you were pleased to make me the General Secretary of your Association and I too in accordance with your bidding had to accept the same though with a considerable amount of diffidence. Hesitation there was a lot, on my part before I accepted the offer because there was a presentiment that the year would not be a mean critical one for the executive of the Association.

At the outset I am glad to mention that the Association has been steady in its progress throughout the year as it has been found increasing in prosperity, usefulness and membership, the activities however could not be pushed on to the desired extent for a number of reasons. Among others an ostensible one is the want of confidence and enthusiasm on the part of a few members. Next in order is the smallness of the Association fund. In order to place the Association on a firm footing the necessity of starting reserve fund cannot be over-rated. With this end in view I strove hard throughout the year to collect as much money as possible. I am afraid, my actions towards controlling the finance of the Association might be looked upon as too miserly.

Mr. Ghose, my predecessor as General Secretary urged upon the members the need of due payment of subscriptions. The same was recapitulated by Mr. Harris our venerable Superintendent as President of the Second Conference, and

often repeated also by me. Members will please bear in mind that nothing can be done, great or small, without money. The Association might appear now to a casual observer as a small one, but who knows that it will not grow to a colossal structure, in course of time. We must have patience. We should try to learn and obey the principle, and should also know how to lay one brick upon another as a mason does in building up an edifice. Ours is an honourable profession, as I said once in a conference, and in order to make it more honourable we are morally bound. I hope those gentlemen who have not yet joined hands with us will have no more hesitation. *Vis Unita Fortior.*

Gentlemen, please excuse me for this digression.

To resume the thread, at the beginning of the year under review there were 44 members on the roll. Three more members joined the Association during the course of the year thus raising the number to 47, but there was a casualty by one owing to the temporary resignation of Mr. G. P. Sen. So at the close of the year there were 46 members.

During the year under report the work of the Association was conducted by an Executive Committee of eleven members with Mr. S. C. Mukherjee as its President, Mr. A. U. Sircar as Vice-President, humble myself as General Secretary, and Mr. J. P. Das as Assistant Secretary and Treasurer. Two meetings of the Executive Committee were held, one on the 13th April and the other on the 4th December last. The following resolutions were considered by the Executive Committee. In the first meeting :—

1. A resolution to send a deputation consisting of three members with Mr. S. Ghose as spokesman, to wait upon the Hon'ble Minister for Education.

2. A resolution to inquire by telegrams if the members would agree to act as deputationists.

In the second meeting :—

1. A resolution to increase the number of deputationists from three to seven.

2. A resolution sanctioning single inter class fares both ways for the deputationists.

3. A resolution expressing inability to contribute to meet expenses of the Third Annual Conference at Silchar in view of the smallness of the Association fund.

4. A resolution sanctioning the amount of Rs. 20/- for the purchase of a Typewriter.

5. A resolution accepting the temporary resignation of Mr. G. P. Sen, and sanctioning the appointment of Mr. D. F. Ahmed in his place as a member of the Executive Committee.

6. A resolution sanctioning the sum of Rs. 89/- spent in printing the proceedings of the Second Annual Conference.

7. A resolution sanctioning the amount of Rs. 8-4-0 spent in purchasing a steel trunk for keeping records of the Association.

8. A resolution appointing Mr. F. C. Bhuyan as Auditor.

All the resolutions were adopted unanimously.

During the year under review total receipt amounted to Rs. 377-12-0, and the expenditure to Rs. 126-6-9. Thus the opening balance at the beginning of the current year was Rs. 251-5-3. Since the close of the year under report a sum of Rs. 27/- has been received from the members, paid towards subscriptions, bringing the total amount at the disposal of the Association to Rs. 278-5-3. From this amount during the current year Rs. 138-13-0 have been spent to meet the expenses of printing of the Proceedings of the Second Annual Conference, postage, stationery and other miscellaneous things leaving a net balance of Rs. 139-8-3 at the disposal of the Association to-day. Out of this amount Rs. 47-3-3 is in the hand of the General Secretary and the balance of Rs. 92-5-0 are in deposit in the Postal Savings Bank at Gauhati. Account has been audited by the Auditor appointed by the Executive Committee.

Permission for the opening of a Postal Savings Bank Account in the name of the Association was sought of the Post Master General early in January 1927, but the reply was received in November 27. So the Savings Bank Account could not be opened earlier.

In connection with the payment of annual subscription of Rs. 6 at a time, the attention of the General Body is being drawn. Some members say that it becomes difficult for them to pay Rs. 6 in one instalment. So whether half yearly payment @ Rs. 3 can be introduced is a matter for the General Body to decide. In fact some members are paying already their subscriptions in part-payment system.

Another matter for the General Body's consideration is whether contribution should be made, if so to what extent, from the Association fund to meet expenses of the Annual Conferences.

It was resolved in the last Conference (Resolution No. 15) to send Mr. Ghose to Bombay to attend the All India Veterinary Graduates' Conference as a representative of the Assam Veterinary Graduates' Association during the last Easter Holidays. As the All India Conference did not meet that season, it was not necessary for Mr. Ghose to go over there.

Mr. W. Harris, M.R.C.V.S., J.V.S. very kindly presided over our Second Annual Conference held on the 26th December 26. The following interesting papers were read on that occasion :—

1. The administration of dilute hydrochloric acid and its efficacy in perforate palate in cattle. By Mr. P. C. Dutta.

2. The value of camphor in Hæmorrhagic Septicæmia and Anthrax. By Mr. N. N. Dutta.

3. Clinical cases. Distokia. By Mr. L. R. Das.

4. Clinical case. A notable cure of a calf with extensive sloughing of the skin in the abdomen. By Mr. L. R. Das.

5. Clinical case. A case of Ascitis in dog. By Mr. F. C. Bhuyan.

6. Clinical case. A case of traumatic meningitis in a bullock By Mr. L. M. Das Gupta.

7. Kumri as a sequel of Filaria Oculi. By Mr. D. F. Ahmed.

8. A case of Sclerestomum Tetracanthus with complications of hepatitis. By Mr. D. F. Ahmed.

9. Intra-ocular Filariasis in Equines and some observations. By Mr. H. C. Sen.

The papers were appreciated by the members and there were discussions in which members and President took part.

During the last Conference Mr. F. C. Bhuyan announced a prize of Rs. 10 to be awarded for the best article on "Cattle problem in Assam and its remedy." This was hailed by all members present. No article has been received up till now. Now it is a matter for the donor of the prize to declare whether the period of submission of the papers should be extended further.

My thanks are due to Mr. J. P. Das, Asstt. Secretary who took pains in assisting me in my work, and my grateful thanks are due also to the members generally for their co-operation.

Cash account of the Veterinary Graduates' Association, Assam, for the year ending the 31st October, 1927.

RECEIPT.			EXPENDITURE.		
	RS.	AS. P.		RS.	AS. P.
Balance on hand on the 1st November 1926	...	114 12 0	Postage and Telegrams	...	21 10 6
Admission fee	...	85 0 0	Printing	...	70 0 0
Subscription	...	178 0 0	Stationery	...	1 6 3
Other Sources	...		Miscellaneous and other expenses	...	33 6 0
					126 6 9
			Closing balance	...	251 5 3
		377 12 0			377 12 0

H. C. SEN,

26—12—27

General Secretary,

Veterinary Graduates' Association, Assam.

The following resolutions were passed unanimously :—

1. This conference is of opinion that the Government Veterinary Officers in the province should be supplied with vaccines free of charge for anti-rabic treatment of animals and requests that the Superintendent, Civil Veterinary Department, Assam be pleased to take steps for the same.

Proposed by Mr. S. Ghose and seconded by Mr. N. N. Bose.

2. This conference feels the necessity of chemical examination of materials collected by officers of the Civil Veterinary Department, Assam, from suspected cases of poisoning and recommends that the Government be pleased to take steps for free examination of the same by recognised and competent authority.

Proposed by Mr. S. Ghose and seconded by Mr. S. C. Chanda.

6. This conference tenders respectful protest to His Excellency the Governor of Assam, the Hon'ble the Minister for Education, and the Superintendent, Civil Veterinary Department Assam, against the recent revision that has been given effect to from the 1st October, 1926, in the pay of the Veterinary Inspectors and Veterinary Assistants, Assam, in view of the fact that the revision is not commensurate with the present day economic condition of the country and moreover it

has been drawn up without regard to the provision and intention of the letter of the then Government of Assam to the Government of India, regarding the pay and prospects of the Veterinary Inspectors and Veterinary Assistants in this province.

This conference therefore confidently trusts that the scale of pay will be raised according to the term of the resolution No. 5 dated 26th December 1925, and resolution No. 3 dated 27th December, 1926, and that the full length of service will be taken into consideration in determining the initial pay of each individual officer of the Department.

Proposed by Mr. A. M. Das and seconded by Mr. P. C. Dutta.

In seconding the resolution Mr. P. C. Dutta made the following speech :—

GENTLEMEN,

It is with a feeling of great disappointment and sorrow that I stand before you to-day to raise my voice of protest against the recent revision in the pay and prospect of the subordinates of the Civil Veterinary Department, Assam, lately sanctioned by the Government to be given effect from 1st October 1926, and when I say that the revision is inadequate and unsatisfactory and disappointing, I hope and believe, I voice the sentiments of my fellow associates. But the relief that has been extended to us we cannot forget and we gratefully acknowledge it. We cannot at the same breath help but protest against it because the long desired and overdue—I say overdue since all other Departments under Government have already been privileged with revisions in their pay and prospects—re-organisation in the pay and prospects of the subordinates of the Civil Veterinary Department, Assam, after repeated memorials from the subordinates of the Department and representation by the Veterinary Graduates' Association has at last been sanctioned. It is most unfortunate that it has fallen far below our anticipation and cannot remove our grievances in the least. The revision makes no appreciable difference in the scale of our pay as I will show you later on and leaves where we are. This Association should therefore urge the Government for immediate revision again in the pay and prospects exactly equal to that of the Assistant Surgeons and Sub-Assistant Surgeons for the Veterinary Inspectors and Assistants respectively, if not more, as our Department is always compared to that of the Civil Medical one though it is recognized both by the Government and the people that our work is more hard and arduous and is beset with serious risks to life and

disadvantages in every way. This is our minimum demand and anything less than this will not satisfy us—a fact to which His Excellency the Governor's personal attention is respectfully drawn.

Before I proceed further with an analysis and justification for the reason of protest it would not be out of place to tell you in plain words the need and importance of the Civil Veterinary Department, Assam and its comparative advantages and disadvantages both as regards pay and prospects with the Civil Medical and Agricultural Departments with which it is generally compared. Gentlemen, in an Agricultural Province like Assam, Veterinary service is of no mean importance. Here cultivation is carried on with the help of cattle—the only capital and resource of the cultivating classes. The country is poor, the cultivating classes are illiterate and therefore cannot and have not as yet taken up the modern scientific implements for carrying on the work of cultivation and there is no hope of its being taken up in future. Moreover it appears to me and I believe that whatever scientific improvements there may be, Agriculture will ever remain the main industry of the country and will mainly be carried on with the help of the cattle population. But year after year thousands of cattle are being swept away by the various contagious diseases leaving the people destitute of their only resource and capital. The standard of agricultural efficiency has therefore fallen down and is falling down still making the country poorer in its economic wealth. The preservation and maintenance of cattle therefore become of the greatest importance in Assam and for this the service and the need of the Veterinary Department cannot be overestimated. Veterinary thus serves the country in one of its vital and most essential needs. Moreover there are diseases which are communicable from animals to human beings. As members of the Veterinary Department it is our look-out to check and prevent any out-breaks of cattle diseases so that the people of the locality may not be effected. The Veterinary Department therefore indirectly safeguards the health and life of human beings. The cattle population lies scattered throughout the country in far off villages and out-lying places wherein the execution of our duties we are to undergo greatest hardships and serious disadvantages which can be better imagined than described. Our difficulties have been made greater by maintenance of inadequate staff—putting nearly 109000 animals in charge of each Assistant with an extensive jurisdiction so much so, though it is the rule that we should tour ten days in summer and fifteen days in Winter we are practically to remain out on tour to meet the ever-increasing demands of our service from the public. The travelling allowance being

fixed therefore becomes quite insufficient for our touring purpose which is generally expensive. To remove all these difficulties our irregular life and absence from headquarters render us quite incapable of looking after our family and give no opportunity for the education of our children. In proportion to the heavy duties we undergo we cannot have sufficient food and comfort for want of reasonable pay and travelling allowance. This ultimately tells heavily upon our health and life. The greatest miseries and hardships we suffer at present and the tragedy of the whole affair is that our future too is also gloomy. A dark cloud also moves about our eyes when we look into future of our children not being duly cared for and properly educated. Such is our lot. But what do we find in the case of the subordinate officers of the Civil Medical and Agricultural Departments! Our case is always looked at as similar with theirs both by the people and Government. But gulf of difference stands between these two cases. When the Veterinary Department was first organised in India, the pay originally fixed was intended for those who qualified themselves by a completion of two years' course in a Veterinary School and even then the scale of pay of the Veterinary Assistants was a little higher than that of the Sub-Assistant Surgeons. The standard has since then been raised and the officers who are now employed are graduates of Government recognized Veterinary Colleges with a higher and longer course of training and better academical qualification and they are to undergo Sero-Therapy and Post graduate training in addition. That the training a Veterinary Assistant undergoes is in no way inferior to that of an Agricultural Inspector. The work which an Agricultural Inspector has to do with a great deal of ease and advantage in fixed selected demonstration centres can hardly be compared to the hard and arduous task that a Veterinary Assistant has to perform irrespective of localities and other uncongenial circumstances. In view of the fact that the land we live in, is an agricultural one where agriculture being the mainstay of a vast population, chiefly depends on a plenty live-stock which is committed to the proper care and supervision of the Veterinary Department the contribution made by the latter can hardly be minimised—rather theirs is a more responsible and important charge and it can safely be said that Agriculture and Veterinary are inter-twined, the latter occupying a higher place of importance. Further the duties of an Agricultural Inspector are mostly of an advisory nature as opposed to practical executive work which the Officers of the Veterinary Department have to do with their own hands. In spite of these differences the officers of the Veterinary Department are relegated to a comparatively degraded position. Besides the question of

pay the Agricultural Inspectors are helped in their work by demonstrators whereas the Veterinary Assistants are denied any helping hands, having to do every thing single-handed. The differences in the pay and prospects of those departments above referred to, are being actually felt because of the fact that the Veterinary Assistant to reach the present starting pay of the Sub-Assistant Surgeon has to wait for six years and the present initial pay of the Agricultural Inspectors is equal to the pay in the selection grade of the Veterinary Assistant. Such gulf of differences is unthinkable. The status of the Veterinary Assistant should be equal, if not higher, so that of the Agricultural Inspectors or Sub-Assistant Surgeons and that the Veterinary Inspectors by reason of the nature of responsibility of their work should be placed in the same footing as the Agricultural Superintendents or Assistant Surgeons.

GETLEMEN,

I beg to draw your kind attention to the fact that in the recent revision in consequence of the length of service not having been taken into account in fixing the initial pay, the senior officers of Department have fallen in service by several years and they have had to sustain a loss of several hundreds of rupees varying according to the length of service and many would not be able to reach the maximum scale of pay at the time of retirement. Let me give you a concrete instance how the present policy of fixing the initial pay of an officer who joined the Department on the 1st November 1907 and completed his twentieth year's service on 31st October 1927 effects him financially. According to old scale—I mean to say—the scale of pay Rs. 50-10-5-100 he will get Rs. 90 on 1st November 1927 whereas in the present sanctioned scale he will get Rs. 87 plus personal pay Rs. 3 on 1st November 1927 and he will get Rs. 91 on 1st November 1928, under Article 22 (b) (ii) of Fundamental Rules. Had length of service been taken into account he would have got Rs. 55 plus Rs. 80 i.e. 135 (maximum of the present scale) in all. Thus he has been made loser of Rs. 45 per month for next ten years i.e. a total loss of Rs. 5400 in all.

Another thing is that a new man who will be appointed as a Veterinary Assistant on 1st November 1927 will get Rs. 135 on the completion of his 20th year's service but a man who entered the service 20 years before when the Department was in its infancy is to get Rs. 90 i.e. Rs. 45 less than that of a man who newly enters in the service. Such is also the case of all Senior Assistants in the Department.

Now gentlemen, I like to put before you a budget estimate of one who newly entered into the service of this Department and is living with a servant only. I shall try to prove that the revision which is extended to us is quite inadequate to meet the high cost of living which is prevailing throughout the country. I shall only show you the daily necessities of life which are needed to the officers of this Department and I hope and believe that I shall be able to convince you of the reasonableness of our demand. I do not like to tax your patience with the details of every item. I shall put the items as briefly as I can. Now let me turn to the items of daily necessities of life in seriatim:—

(1) Food expense of a single gentleman with a servant at the rate of Rs. 15 each	...	Rs. 30	per month.
(2) House rent	...	" 10	"
(3) Pay of a servant	...	" 10	"
(4) Washerman	...	" 2	"
(5) Barber	...	" 0-8-0	"
(6) Miscellaneous expenses (Medical aid and cycle repairs etc.)	...	" 5	"
(7) Initial price of cooking utensils Rs. 30 changeable every 5 years i.e.	...	" 0-8-0	"
(8) Initial price of beddings, cots etc. Rs. 60 changeable every 5 years i.e.	...	" 1	"
(9) 2 Half pants, 2 coats, 6 shirts, 1 hat, 6 pairs of socks, 2 pair of shoes, 2 pairs of slippers Rs. 72 changeable every 3 years i.e. I have intentionally avoided full pants, collars, to minimise expenditure.	...	" 2	"
(10) Warm suits and 1 warm wrapper Rs 60 changeable every 5 years i.e.	...	" 1	"
(11) 4 Dhoties, 2 Ganzies, 2 Towels, 1 Umbrella, Rs. 18 every year	...	" 1-8	"
Total...		Rs. 63-8-0	per month.

From the above it will appear that the total expenditure of a gentleman with a servant comes to Rs. 63-8 a month i.e. a deficit of Rs. 8-8 per mensem. I hope and believe you will agree with me that it is not the intention of any body

that the man who adopts Veterinary profession should remain unmarried throughout his life and as Indians we are, we cannot overlook the joint family system also and if we are to remain in the joint family system we must look to the comforts of family members too. It is only natural that the members of a family and dependents multiply with the advancement of age and service and the expenditure unaccompanied by any increase in the earnings has its worst effects. If a thorough enquiry is made by any body it will be found out that almost 95% subordinates of this Department are encumbered in debts. Such a state of affairs would not help in the contended subordination of the Veterinarians and would certainly retard the advancement and progress of Veterinary science.

With these words I beg to second the resolution with an appeal to our benign Government, the Councillors and the public to see that the grievances of the Veterinarians are removed as early as possible. The cost towards the improvements of pay and prospects of this Department would not be much as the number of subordinates in comparison with the other Departments of Government service is very limited.

4. This conference approves, the action taken by Babu Srish Chandra Ghose, Spokesman of the deputation that has to wait upon the Hon'ble the Minister for Education, Assam, in deferring the deputation till the return of Mr. W. Harris, the permanent Superintendent of the Civil Veterinary Department Assam, and resolves that Babu Srish Chandra Ghose be requested to wait upon Mr. W. Harris, immediately after his return from leave and before the deputation waits upon the Hon'ble the Minister in February next and that the actual travelling expenses be met from the Association fund.

Proposed by Mr. B. C. Chatterji and seconded by Mr. H. C. Sen.

5. This conference affirms the appointment of Messrs. S. Ghose, B. C. Chatterji, B. Quader and Abdul Rakib Chowdhury as members of deputation that has to wait upon the Hon'ble the Minister for Education in February next.

Proposed by Mr. A. M. Das and seconded by H. K. Nag Chowdhury.

6. This conference draws immediate attention of the Government to the resolution No. 4, dated the 26th December 1925 and resolutions Nos. 5, 7, 8, 9, 11 and 12, dated the 27th December, 1926, of the First and Second sessions of the conference of the Veterinary Graduates' Association, Assam, respectively.

Proposed by Mr. B. C. Chatterji and seconded by Mr. B. Quader.

7. This conference requests the Superintendent, Civil Veterinary Department, Assam, to furnish the Association with a complete quarterly list of Veterinary Officers in Assam with their names, designations and addresses each quarter and requests that all new postings, appointments, transfers etc. be communicated to the General Secretary of the Association.

Proposed by B. C. Chatterji and seconded by H. K. Nag Chowdhuri.

8. Resolved that the following gentlemen be appointed Office-bearers of the Association for the year ending 31st October, 1928:—

President	...	Mr. S. Ghose.
Vice-President	...	" B. C. Chatterji.
General Secretary	...	" P. C. Dutta.
Asstt. Secretary & Treasurer	...	" N. N. Dutta.

Members of Executive Committee:—

Messrs. H. C. Sen, N. N. Sen, B. Quader, A. R. Choudhuri, S. N. Dass, A. M. Dass, G. C. Dev.

Proposed by H. K. Nag Choudhuri and seconded by M. K. Dass Purkayastha.

9. This conference feels deep sympathy with Mr. R. M. Boruah Veterinary Assistant who has contracted BOVINE TUBERCULOSIS in the discharge of his professional duties, and requests the General Secretary to refer the matter to the Government for pecuniary help for the treatment and to meet other incidental expenses.

Proposed by H. K. Nag Choudhuri and seconded by A. R. Choudhuri.

N. B:—This resolution was amended by the members of the Executive Committee.

10. Resolved that copies of the resolutions be sent to the Government Press and to the Superintendent, Civil Veterinary Department, Assam.

Proposed by Mr. S. N. Dass and seconded by Mr. B. Quader.

11. Resolved that the proceedings of the conference be printed and expenses met from the Association Fund.

Proposed by Mr. N. N. Dutta and seconded by Mr. H. C. Sen.

12. This conference proposes that the Superintendent, Civil Veterinary Department, Assam, may be requested to move the Government to furnish quarters for the Reserve Veterinary Assistants at their head quarters free of rent or on payment of reasonable rent.

Proposed by Mr. N. N. Dutta and seconded by Mr. N. N. Sen.

13. This conference recommends that the General Secretary's report and the account of the last year as submitted by the Assistant Secretary and Treasurer be adopted.

Proposed by Mr. S. Ghose and seconded by Mr. N. N. Bose.

The following professional papers were read:—

1. Treatment of Bursatee with Arsenic
BY Babu P. C. Dutta, G. B. V. C.
2. Camphor treatment in Anthrax
BY Babu M. K. Dass Purkayastha, G. B. V. C.
3. Treatment of Aconite poisoning with an Indigenous drug
BY Babu M. K. Dass Purkayastha, G. B. V. C.
4. Muscular Rheumatism based on clinical observation
BY Babu H. K. Nag Chowdhury, G. B. V. C.
5. Diagnosis of Pancrinitis of Post-mortem
BY Babu N. C. Chakravarty, G. B. V. C.
6. Distemper in Dog. BY Babu N. N. Dutta, G. B. V. C.
7. Clinical observation on some cases
BY Maulvi S. R. Laskar, G. B. V. C.
8. Cattle poisoning. BY S. C. Chanda, G. B. V. C.
9. Dropping from retention of the second cleaning
BY Babu N. C. Chakravarty G. B. V. C.
10. Osteoporosis. BY Sjt. J. P. Dass, G. B. V. C.
11. "Kohonia". BY Babu H. C. Sen, G. B. V. C.
12. Hæmophlygia in horses a sequel of Filaria
BY Maulvi D. F. Ahmed, G. B. V. C.
13. Rupture of the Oesophagus in a Buffalo-calf
BY Babu B. C. Chatterjee, G. B. V. C.
14. Rupture of the Abdomen of a Cow.
BY Babu B. C. Chatterjee, G. B. V. C.

Next conference was invited at Maulvibazar by Maulvi Abdul Rakib Chowdhury, G. B. V. C. and was seconded by Babu Satyendra Nath Dass, G. B. V. C. and accepted by all present.

The proceedings concluded with closing remarks from the Chair. A vote of thanks to the President was proposed by Babu Srish Chandra Ghose, seconded by Babu Bhudhar Chandra Chatterjee and carried with acclamation. Conference ended with thanks to the Chairman and members of the Reception Committee for their cordial welcome and to the authority of Normal School for lending the Hall for holding conference.

APPENDIX A.

SPEECH MADE BY BABU SRISH CHANDRA
GHOSE, G.B.V.C.,
CHAIRMAN, RECEPTION COMMITTEE, THIRD SESSION
OF ANNUAL CONFERENCE, VETERINARY
GRADUATES' ASSOCIATION, ASSAM.

BROTHER DELEGATES AND GENTLEMEN.

I, on behalf of the members of the Reception Committee, consider it a proud privilege to accord you a hearty welcome to the labours of the Third Session of the Annual Conference of the Veterinary Graduates' Association, Assam. I however stand before you with apology having accepted the responsibility of receiving you knowing fully well that I am not worthy of the great privilege and honour—a responsibility which I would have never accepted had I not confidence in your sympathy, support and co-operation. Gentlemen, our sincere and earnest desire to meet and serve you prompted us to call the third session of the conference in this premier town of Surma Valley and invite you here. I believe and hope that we can count upon your kindness and sympathy to forget the troubles and forgive our failings.

The Valley is as rich in natural resources as in grandeur. The vast plains with lofty mountains and ranges of hills around are watered by the sacred currents of the Barak and the Surma. My friends from the other valley must have enjoyed the journey over the hill section of the A. B. Ry. which has crossed the hills separating the two valleys. Human skill of construction coupled with natural sceneries attracts and keeps absorbed many a traveller travelling over this section of the Railway, and those who are from this valley had the pleasant sight of vast and golden paddy fields extending from either side of the Railway line to the foot of the hills interspersed here and there with villages.

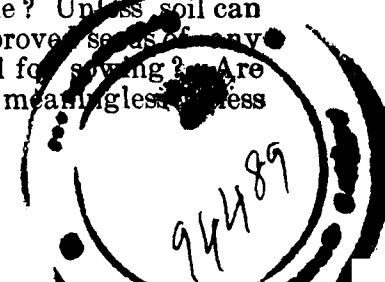
The valley is sacred to the Hindus having "*Unakuti Tirtha*" where *Rishi Dadhichi* sat in meditation, "*Sidheswar*"

where was the hermitage of *Kapil Muni* and the temple of "*Bhubaneswar*" where thousands of Hindu pilgrims go every year to say their prayers on the "*Siva Chaturdashi*" day. I am sure my Mohamedan friends who had not been to Sylhet would like to extend their journey there and pay homage to the *Darga* of *Shahojilal* which is held in veneration by the Hindus and Mohamedans alike.

The district where we have assembled here to-day is full of history. Mention made of *Vim* and *Hirimbo* in the *Mahabharata* is said to have connection with it. Neither time nor the occasion would permit a discussion on it. Suffice it to say that after the death of *Raja Govindo Narayan* Cachar came under British Rule in the year 1832. It was then with a population of 50 thousand and the land under cultivation did not exceed 62 thousand bighas. How fast the district has since then advanced and become prosperous needs hardly a description. With commercial and industrial development population has now increased beyond 5 lakhs and the agriculture has been so steadily and rapidly developing that land under cultivation now measures over 7 lakhs of bighas.

Friends,

I am afraid, I am trying your patience by making reference to physical and historical aspect of the place where we have met in to-day. Now turning to the business of the day the very first thing I desire to bring to your particular notice is cattle, its economic value and its influence on the nation. To make a country prosperous whose 80 p. c. population are agriculturists, agricultural development is of paramount importance. This has also been acknowledged by His Majesty the King Emperor as indicated by the appointment of the Royal Commission on Agriculture in India. How agriculture has been adding to the resources of the country can be judged by the fact that in a single year (1925-26) export trade of only five agricultural produce—rice, jute, oil-seeds, cotton and tea valued at 206 crores and 90 lakhs of rupees. India's position in agriculture can be realised from the fact that comparing acreage under rice, wheat and cotton—three main agricultural produce, she stands foremost in rice and second only to the United States of America in wheat and cotton in the whole world. Bengal's jute which added to the wealth of the country by 97 crores of rupees in a single year has earned a world wide reputation. But gentlemen, is agriculture possible in India, particularly in Assam, without good and healthy cattle? Unless soil can be tilled what manure can do? Are improved seeds of any value unless soil can be properly prepared for sowing? Are not improved agricultural implements meaningless? *Ass*



we can find cattle strong and sufficient enough to work them with? What benefit is likely to be had from Expert Agricultural Officers unless their advice can be translated into action? Gentlemen, these are the points which deserve very serious consideration. Without first making proper and adequate arrangement to safeguard the health of cattle against the scourge of diseases any attempt to improve the breed or agriculture in the province, may in India, would be like putting the cart before the horse.

Milk question has become the problem of problems. Milk scarcity has been adversely affecting the health of the people, specially the infants. You all know that milk is an ideal diet as protein in milk is said to nourish the brain best. This is not only true for our present day world but the value of milk was brought home to us even in the earliest days of civilisation as borne out by mention of milk and its preparations in Vedas composed some three thousand years before the birth of the Christ. That the scarcity of this article of diet is greatly responsible for infant mortality needs hardly any comment. To say in the words of Col. Hutchinson, a Public Health Commissioner with the Government of India. "India will never be able to compete in industry and other matters on equal terms with other nations while she is so seriously handicapped by the unhealthy factors killing her infant population." The supply of milk being far below the demand, people have to resort to adulterated milk with dire consequences. For economic reason it is neither possible nor profitable for us to replace fresh milk with "Cows Head" from Holland or "Horlick's, Allenbury's, and Nestles" from the continent. The only way out of it is to have every home self-contained in milk as it was once before.

Gentlemen, milk has a commercial value and can greatly add to the resources of a country. Denmark with a population of 30 lakhs or only a little over than that of the two districts of Sylhet and Cachar, has nearly 40 lakhs of cattle and 1,300 factories for products of milk with a capital of 35½ crores of rupees. Holland is another small country with a population of—60 lakhs or nearly twice as much as that of Dacca district, exports condensed milk, butter and cheese valued at rupees five crores annually.

In India cattle is not only necessary for milk and tilling the soil but their dung and urine are manures of high order and of every day use. Cow-dung-cake solves the question of fuel in many an Indian home at no cost. Cattle enrich commerce, industry, and agriculture not only during their life-time, but they are also of immense trade value after death. They are the mother of all wealth so to say. There

is an Assamese saying which means, one who has no cattle is the poorest of all. This is true to the letter. Gentlemen, the importance of a department which has been entrusted with the responsibility of healing the sufferings of so valuable an asset and protect them against the scourge of diseases cannot be minimised. Officers of the department as custodians of the health of the cattle, which form the chief wealth of India, not only do a humanitarian duty but also contribute to build India into a nation of prosperity.

After we see the light of the world cow's milk is our ideal nourishment. This is why cows are called "*Gomata*." In olden days Indians irrespective of position and rank deemed it sacred to tend and take care of cattle by themselves and no body else other than the daughter of the household were entrusted with the milking of cows. This is why the daughters are called "*Duhita*." Even during Manu's time "cattle constituted the chief source of wealth of Indo-Aryans and offenders were fined certain head of cattle determined according to the gravity of the offence." We the Hindus regard the cows as sacred and call them "*Gomata*." We feel agrieved against those who slaughter them for meat. But by sheer apathy and utter neglect are we not killing them inch by inch? Gentlemen, I believe you will agree with me that unless immediate steps are taken to ameliorate and protect the stock our children in time to come might require to be explained what milk was and how it looked like. Like to a blind man the explanation will perhaps have to come through a crane.

Now gentlemen, the question before us is how to overcome the difficulty. Degeneration of cattle may be attributed to (1) Injudicious breeding, (2) Milk-starvation of calves, (3) Improper feeding, (4) Unequal distribution of cattle, (5) Owner's neglect, (6) Influence of diseases, (7) Climatic influence, and (8) Poverty or indifference of individual owners.

Points which deserve immediate consideration and action are (1) Cattle breeding, (2) Cattle rearing, (3) Protection against and effective treatment of diseases and (4) Propaganda work.

Cattle breeding is a vexed question in this province and a very careful consideration is necessary before embarking on any scheme. Broadly speaking our object should be:—

(1) To secure a combination of dual purpose i.e. females should be good milkers and males should possess draught powers.

(2) To select bulls which should stand local conditions and should not be too different in size from the cows. Improvement of indigenous breed would therefore seem desirable. Hissar breed of Punjab which has earned an all India reputation has been raised by a thorough application of this principle.

(3) To avoid bulls with hill, manipuri and foreign blood which are highly susceptible to Rinderpest—a disease to which the province appears to be peculiarly liable and which is responsible for a heavy toll every year.

(4) To emasculate weedy bulls and check indiscriminate breeding.

(5) To encourage sale and use of pedigreed stock

(6) Lastly to undertake the operation on extensive scale as half-measures are always unsuccessful, they prove a false economy in the long run and do but touch the fringe of the question.

Feeding and keeping of the cattle have to be considered on its own merit. Popular theory and demand are, there should be sufficient grazing-reserve. There can be no two opinions about it. There is however another aspect of the question, if extensive grazing reserve will not add to the indifference of individual cattle-owners. One of the causes of the general apathy of the owners in this direction is attributable to better grazing found in the wastes in this province. Assam which is much smaller in area than Bengal has culturable waste land about thrice as big as that of Bengal. So in considering the question of grazing reserve for rural areas we shall have to look to the both sides of the shield and devise means how best the indifference of owners can be overcome. Cattle in this province are in great majority left to themselves to pick up their own food if they can, as if it does not least concern the owners. In Bengal with the increasing demand of land for agricultural purpose there is a proportionate decrease in grazing land and people there now appear to realise better that they have to make different arrangement to feed their cattle. Time will alone show if with the increase in population and expansion of agriculture a similar condition would not arise here also. Attempts may be made to make cattle owners grow fodder by such inducement as concession in land revenue for the area exclusively utilised for the purpose.

For preventive measures against a defective treatment of cattle disease a thorough reorganisation of the Veterinary Department is urgently required. To what extent reorganisation of the department in Assam is necessary can be judged

when I say that a Veterinary Assistant has now been placed in charge of an area of about 1500 square miles with a lakh and a quarter of cattle and an Inspector has got an area and a charge 16 times bigger. Can treatment over so huge a number of cattle or itineracy and supervision over such an unwieldy area be possible by a single officer with any degree of efficiency? To add to the difficulty epidemic of cattle disease has become almost a normal condition in Assam. So in reorganising the department we must have a comprehensive scheme. "No progress can be made in developing the cattle industry unless the breeder is reasonably assured that his efforts will not be nullified eventually by incursions of diseases." There can be no question that "serious contagious diseases act as deterrent to the development of cattle breeding as an industry. Outstanding examples are Rinderpest, Hæmorrhagic Septicæmia, Anthrax, Endo and Ecto parasitic diseases etc." The remark made by Sir P. Fagan, Financial Commissioner, in reviewing the work of the co-operative societies in the Punjab for 1919-20, deserve more than a passing notice. He remarked "over 16 lakhs, nearly one quarter of the whole sum lent, were advanced for the replacement of cattle. This clearly demonstrates enormous burden borne by the cultivating classes on account of high cattle mortality and leaves no room for doubt that much greater veterinary assistance is necessary than is available now". These are the words of a very high and responsible officer of matured experience and refer to a province which has been enjoying the reputation for being the premier province in India as regards veterinary organisation. It would be a thousand and one pities if the question of fund should stand on the way of advancement of this much needed department in this province where total annual loss from cattle mortality would amount over ten lakhs of rupees as opposed to a lakh and a quarter or so, spent for the maintenance of an ill paid and understaffed department. Pay and prospects as offered by the dept do not attract suitable candidates. In consequence there is always a great dearth of candidate in this branch of service though there is always an overcrowding in every other service. Recent revision of pay did not go far enough to remove the complaint and the length of service having not been taken into consideration in fixing the initial pay it has hard hit the senior members, who are the worst sufferers in the department though the department of the day is the fruit of their labour. The demand of the Association to place the Veterinary Assistants and Inspectors on an equal footing with the Sub-Assistant Surgeons and Assistant Surgeons respectively in the matter of pay and status is only a modest demand.

However my experience of nearly 20 years in the department in the province prompts me to suggest that to make the reorganisation really effective :—

(1) There should be at least two Veterinary Assistants in each thana.

(2) Each district and subdivisional headquarter should have a full equipped veterinary hospital with facilities for microscopical work and a sufficient stock of preventive sera.

(3) A sufficient reserve of officers under each Inspector for special epidemic duty and leave vacancy is necessary.

(4) To ensure proper supervision and control epidemics not more than eight Veterinary Assistants should be under each Inspector.

(5) For general supervision three officers in the rank of "Assam Veterinary Service"—one for Upper and one for Lower Assam another for Surma Valley, are the minimum requirement.

(6) The Head of the Department should have a technically qualified Personal Assistant who should rank equal with Deputy Superintendent.

(7) A special branch for research work and a fully equipped Provincial Veterinary Laboratory are necessary.

(8) Dual control by the Local Boards and Government should cease and the veterinary institutions should be provincialised.

(9) Pay and prospects of the department should be made attractive.

Propaganda work may be conducted by demonstration with (1) Lantern lectures, (2) Distribution of leaflets, (3) Inclusion of subjects containing instruction about general welfare of cattle in the curriculum of schools, (4) Exhibiting and demonstrating specimens and models in exhibition, (5) By cattle-show, and (6) By opening model dairy and breeding farms.

Objection may be raised that the question of cattle breeding and rearing should be beyond the scope of the consideration of this conference as it is no longer a concern of the veterinary department. With apology I should like to differ from those who may share such a view. If the veterinary department is made responsible for the health and life of cattle it should have a liberty in regulating matters connected with breeding and rearing of cattle. Responsibility without liberty of action is fundamentally unsound. Scientific cattle

breeding and rearing involve questions in which sound veterinary knowledge is essentially necessary. Veterinary department played no mean part in organising scientific cattle breeding operation in India. The initiative came through it so to say. If any suggestion comes questioning this, gentlemen, I should like to remind you that the veterinary department in India was originally started in the Army with the primary object of controlling and regulating breeding of animals required for military purposes and the excellent record of work left behind several veterinary officers and the work that is still being done in the Hissar Government Breeding Farm under the efficient control of the Civil Veterinary Officers should be an answer to the question. It may not be known to many of you that Col. Morgan, late an Inspector General of the Civil Veterinary Department with the Government of India, formulated a scheme, for cattle breeding and rearing. Assam Government considered the scheme, nay a note was prepared and an estimate was drawn. The idea however did not materialise as the then Chief Commissioner of Assam was reluctant to allow any such experiment in absence of veterinary department in the province indicating that Government was not prepared to let any such scheme into operation without first having expert control of veterinary department. Personally I have not the least objection to work in collaboration with any person or any department provided the independence of work and dignity of the profession have not to be surrendered or subordinated.

Gentlemen, I have already taken much of your time. One word more and I have done. We have got a noble duty before us. We must strain our every nerve to regenerate and protect our chief national wealth—the cattle. I appeal to our self-governing institution—Local Boards and Municipalities and to our wealthy country men to whole-heartedly co-operate with us to attain this common good and unloose the string of their purse if they really mean to save the cattle race from extinction. The country cannot be indifferent to this wealth any longer. We must move from the land of dreams to the realm of living reality.

My brothers in profession, by joining the Veterinary department we have embraced a noble duty—a duty which is sacred and second to none in importance in an agricultural country like that of ours, a duty which not only heals the sufferings of the dumb and helps to build up the country into a nation of prosperity but also does invaluable service to the mankind by effectively checking the spread of intercommunicable diseases. As members of this nation-building department it should be our aim to discharge responsibility

committed to our care honestly and to the best of our ability. Failing this our action will be sinful.

Before I resume my seat I shall be failing in my duty if I do not express my deep sense of gratitude to Mr. J. Hezlett, C.I.E., I.C.S., our revered Commissioner for his kindly consenting to open the conference in spite of his multifarious duties, and to Mr. W. Harris, M.R.C.V.S., I.V.S., Superintendent, Civil Veterinary Department, Assam, for his kind patronage to the Association. Thanks of the Reception Committee are also due to the gentlemen for their kind encouragement extended to the members of the Association by their kind presence here in such a large number.

With these words, gentlemen, I accord you again a hearty welcome and wish the conference all success.

APPENDIX B.

SPEECH MADE BY J. HEZLETT, Esq., C.I.E., I.C.S.,
COMMISSIONER, SURMA VALLEY AND HILL
DIVISION, ASSAM, IN OPENING THE
THIRD CONFERENCE OF THE
VETERINARY GRADUATES'
ASSOCIATION, ASSAM,
HELD AT SILCHAR
ON THE 26th December, 1927.

I should like to thank the Chairman of the Reception Committee for the honour he has done me by asking me to open the conference. As an officer who was for sometime in charge of the Veterinary Department I take a certain amount of interest in its work. The Chairman of the Reception Committee has explained to you in detail in his interesting speech the very great importance of the work done by the officers of the department. As we all know success in agriculture depends to a great extent on the strength of the cattle which are available for ploughing and doing all the other multifarious work connected with agriculture. It is a great drawback that the owners of cattle depend so much on public grazing grounds and do not realise the necessity of growing fodder crops. It is for this reason that cattle in Assam are so weedy. I agree with the Chairman of the Reception Committee that there is more grazing land available in Assam than in any other province, but it is at the same time a fact that we find the best specimens of cattle in provinces where there are no public grazing grounds. In my opinion too many cattle are kept by individual owners and so it is impossible for the owners to look after them properly. The cattle are

not good enough and they are not productive enough. If we are to obtain good results we should feed the cattle better and look after them better. It is no good keeping too many weedy bulls and cows. A cow yielding ten seers of milk is a much better economic proposition than 20 cows each giving half a seer of milk or so. In order to get good results it is desirable that the agriculturists should keep fewer cattle of a better type and look after them properly. Thereby they will be saved considerable expense and their purposes will be better served. As pointed out by the Chairman of the Reception Committee a great deal depends on persuading the people to grow fodder crops. I am inclined to agree with him that grazing grounds in this province are not an unmixed blessing. Because of the fact that the cattle in this province have a certain amount of grazing, ordinary owners take no interest whatever in their maintenance. In other provinces of India where the breed of cattle is good it is a fact, I think, that there are no public grazing grounds at all. In fact there is no grazing for cattle in the whole country, still we find that the cattle of those places are far better. The reason is that the owners grow fodder crops and take more care of their cattle. At present the Agricultural Commission is sitting and I hope when their report is out we shall have much useful information as to what should be done to improve agriculture and the breed of cattle in this country—two problems which are intimately connected.

As regards the officers of the Veterinary Department, as I have just said, I was for sometime the Director of Agriculture. At that time the Veterinary Department was under me. I thus claim to know something about the officers of the department. I have a very high opinion of their work and their capabilities. They are a very hard worked body of men and they are doing immense good to the country for which they have hitherto not received the amount of consideration to which they are entitled. I understand that an increase in their pay has recently taken place but I still think there is room for further improvement in this matter. We want more men in the department and we can only get them if the prospects of the department are to a certain extent improved. These are matters which I am sure will come before you and be considered by the Government departments concerned in due course.

In conclusion, gentlemen, I desire to thank you again for the honour you have done me by asking me to open the conference and I wish you all success. I hope that the Association will do much good both to the officers of the department and to the country by their deliberations in this conference. I have now much pleasure in declaring the conference open.

APPENDIX C.

PRESIDENTIAL ADDRESS

BY

RAI SAHEB BHARAT CHANDRA CHAUDHURY.

The 26th December, 1927.

Chairman of the Reception Committee, Members of the Veterinary Graduates' Association, Assam.

LADIES AND GENTLEMEN,

I offer, and I hope you will join me in offering my homage of gratitude and praise to that glorious but inscrutable Power who guides all destinies and disposes of all events and invoke His blessings on our work for the success of our understanding.

I must first express my grateful thanks to the members of this Association for the signal honour they have done me by electing me the President of this meeting. Though I feel diffident of my ability to guide their deliberations and have accepted their kind offer in the hope that they can do without my assistance, I am very much grateful for the opportunity given me of bringing prominently to their notice what a layman like me may think of their noble profession and of the way in which it should work and improve.

The Association is both a professional body and a Service Union. It seeks to improve the profession by experimental treatment and research work on the one hand and defend its rights and interests as a Service Union on the other. It reflects great credit upon the Association to find from the reports of the last two years that a large number of discourses on professional subjects were read in the annual meetings and some of them threw new light on existing problems. It seems that the spirit of research is already abroad and it deserves well of the public and the Government to encourage and foster it in all possible ways and by all means. Both the science and the art of medicine as well as of surgery for man and cattle are capable of infinite improvement and the field of research lies abroad and vast, alluring men of abilities to its investigation. Indications are not wanting that we have capable men in the profession but organisation and money are required if their talents are to bear fruit in the direction of making new discoveries.

The somewhat hostile attitude of the general public towards the Veterinary Department which manifested itself at its inauguration has changed and the masses are more and

more getting to appreciate its benefits. The change for the better may be expected to become complete in the course of a few years through the assiduous efforts of the members of this Association. Then will come the time when Government may be asked to organise and finance a research branch in the Veterinary Department. In the meantime the capable Veterinary graduates will not desist from the noble work of investigation but will carry it on in the course of their professional routine as they appear from records to have done in the past.

I venture to suggest a line of work in this connection. There is ample evidence in Sanskrit Literature that a system of Cattle treatment was developed in India. I will not encumber this short address with quotations and references but shall only invite your attention to the well-known Mahabharata in which, we know, Nakula and Sahadev, the two youngest Pandavas, are described as being experts in the treatment of horses and cows respectively. I do not know if there is extant any Sanskrit treatise on cattle treatment but I remember to have seen, in the house of a Pandit in the pergana Dulali in North Sylhet, some Sanskrit couplets written on a palm leaf giving prescriptions for the treatment of some cow disease. I believe that such stray extracts lying uncared for may be found in the manuscript libraries of erudite families of Pandits particularly in the districts of Sylhet and Kamrup. There are many people among our cultivators who know something of the diseases of cattle and practise the Veterinary art mainly with vegetable drugs. In many cases the medicines they use are found to be efficacious. It is open to the members of this Association to collate the prescriptions of the village doctors of cattle, to test their efficacy and to investigate into their properties, to utilise their knowledge of chemistry for making powerful preparations of such indigenous crude drugs as are found to contain curative properties and to make a scientific use of their research in this direction in a variety of other ways.

Cattle surgery was not unknown to India but when to operate on a cow even for its own benefit came to be regarded as a sin, the practice of this art was delegated to a particular caste. It survives to this day in a degraded form particularly in some outlying parts of the Sunamganj Sub-division. I dare say that there are among the members of this Association such curious ardent souls who will feel interested in the crude surgery of the ignorant with a view to finding out if there is any method in it and also if there are any date from which it can be tried to a scientific origin.

In any case familiarity with the indigenous method of cattle treatment will enable our Veterinary graduates to win popularity by pouring new wine in old bottles, that is by administering their medicines in the right Indian manner. The introduction of anything new is always viewed with suspicion in all ages and all countries. But generality of people are concerned with the form not with the spirit, so that they have little objection to accepting a new thing if it is offered in the old familiar form. An investigation into the indigenous ways of cattle treatment should not therefore be altogether discarded as unscientific and useless. It may have a scientific origin although it has now degenerated, being placed in ignorant hands.

Gentlemen of the Association, you are certainly conscious of the nobility of your profession and of its importance in our national welfare. It is noble to relieve the sufferings of dumb creatures that are so useful to us and whose services we cannot do without. But the value of your good art transcends all praise in an agricultural country like ours. Agriculture is the mainstay of the people of this country and it depends greatly on an adequate supply of healthy, stout and vigorous cattle. The appointment of the Agricultural Commission is a clear indication of the Government adopting the view that the economic salvation of India lies in the improvement of its agriculture. Manufacture and trade depends on the products of agriculture and the prices of things rise or fall according as the earth yields a plentiful or scanty out-turn. Production companies are coming into existence showing that this view point is gaining ground in the thoughts of our own people. The value and importance of your profession is bound to be recognised as soon as agriculture receives practical impetus from the action of Government taken on the report of the Agricultural Commission as well as from the efforts of our thoughtful people.

You are demanding equal status with the officers of the Medical profession. I fully appreciate the intrinsic justice of your claim which is based on the equality of the nature of training and work done. It is to be hoped that the inequality in the service status and prospects will soon be removed as an act of justice to your profession which is more hazardous than the practice of medicine with man and also less remunerative from private practice. But apart from this the improvement of the status and prospects of the rank and file of your service is a claim which judged on its own merits stands fully justified and cannot be deferred for a long time. I am sure that with the improvement and spread of the art of

production from the land a time will come when the importance of your good work will be adequately realised and you will be given a position higher than or at least not below that of the medical service.

The inadequacy of the numerical strength of your department is a patent fact to which nobody can shut his eyes. There are villages I think which have never received a professional visit from a Veterinary doctor. The sphere which a single Veterinary assistant is required to serve may be wide enough for 50 or more of them. The Government may be aware of this but its present resources together with those of Local Boards are not commensurate with what is required. In the course of time the actual requirements will be met by private Veterinary practitioners whom, I think, the exigencies of this age implore to bring into existence. But the existing strength of the service is admittedly insufficient for its purpose and in public interest it should be increased without delay.

GENTLEMEN,

I shall not try your patience much longer. I wish to conclude by inviting your attention to another matter which appears to me to be very important. In my opinion the problems of fodder supply, cattle sanitation and cattle breeding should incidentally engage your attention. Your curative art may allay sufferings and life but it cannot improve the constitution, breed and health of our cattle unless the above problems can be practically solved. All these subjects and more may be treated of under 'Cattle Hygiene' on which a book may be prepared and published through your efforts. To enlist and sustain the co-operation of the owner of cattle in the villages, pamphlets on important and interesting subjects may be issued at times for distribution. We need not be discouraged by slow progress provided we strive in the right direction for universal good. The law of Karma is as sure in its operation as any other law of Nature and the blessings of the Disposer of all events are always showered on honest efforts.

I am grateful to the audience for kindly giving me a patient hearing. I thank the gentlemen of the Veterinary Graduates' Association again for the honour they have done me. May their endeavours be crowned with complete success.

Communications**A CALL FOR CO-OPERATION**

BY

M. V. PILLAI, G.B.V.C.,

Penang.

I wish to draw the attention of my Indian professional brothers to certain important points connected with the welfare of the profession in general. I feel that our profession, though noble and dignified, is still inadequately recognized and is therefore falling in the estimation of the public. The fault of such a state of affairs lies on us as well as on the authorities who hold the reins of our profession.

First of all let us imagine of what use are the Veterinarians. The answer is plain and plumb. They are the protectors of cattle which are considered to be the national wealth of India; they are the promoters of national health and vigour which depend entirely on scientific inspection of milk and meat; and they are the preventers of diseases of animals communicable to human beings. In spite of all these manifold advantages we are not duly respected and we still continue to suffer in comparison with other professions. We have our own difficulties. We are overworked and underpaid. Nobody cares to give us due regard even if we pretend that we are Graduates of Veterinary Colleges. We find it impossible to turn our energies towards the cultivation of our profession on account of our poverty and starvation. Why is this? Because we are not given the right sort of training and education in the Veterinary colleges, so much so, we are kicked out on all sides. Our present study is not recognized by the Royal College of Veterinary Surgeons in Great Britain. We cannot hope to get a concession or even admission in the above colleges. They consider that our standard of training, in a country like *India* where we meet all sorts of diseases among animals, is low and not quite up to the mark. The authorities of the R.C.V.S. are perfectly right. No specialists are appointed to teach special subjects in our colleges. In many of the Veterinary Colleges subjects like chemistry, botany &c., are not handled by men of real merit and experience. Animal husbandry should form one of the most important subjects in the Veterinary College curriculum. Meat and milk inspection should be dealt with more practically in the final year class. The system of removing experienced Lecturers to the posts of Deputy Superintendents

and appointing Veterinary Inspectors as Lecturers of the Veterinary Colleges should be dropped. The House Surgeons of Veterinary Colleges should take more interest and pain in teaching students during hospital hours. The standard and quality of a Veterinary College depend more upon the ability of its teaching staff, its entrance requirement and facilities for clinical work. Higher course of training extending up to four years and affiliation of the colleges to different universities are also very important to remove the present discontentment and to elevate the profession to a higher degree. All these can be done very easily if the Principals of the different Veterinary Colleges take an active interest for the welfare of the profession. Thanks to that great Officer Col. Walker who has done so much in bringing the Punjab Veterinary College to the fore-front. We will be only lucky if we have more Walkers, Raymonds and Guns.

Now coming to our professional brothers, we have our own faults in store also. Co-operation is entirely absent among us. Sympathy is still wanting in us. One glaring example with which I want to support these statements is regarding the subscribers of our only organ of our association edited by our ever enthusiastic and patriotic friend Mr. P. S. Rao. This organ was started four years ago with a splendid motive. It is well known to all that an organ of this type is an efficient weapon to fight for our rights. How many of us are supporting this weapon with true interest and love? How many of us are helping it by way of professional contributions? In a country like India where there are abundant facilities to study and improve different diseases, a quarterly organ, unsupported and unpatronized by many, is too meagre. We must have an organ more powerful and more popular, published monthly. This requires the co-operation and union of all Veterinarians in India. We are fortunate enough in these days to have many Indians having the Diploma of M. R. C. V. S. in different Provinces. We want such men to join with us side by side and take an active lead in all matters connected with the uplift of our profession. They must prove themselves more patriotic and more loving towards their Indian Graduates. United effort can never be futile.

Another useful suggestion I wish to put forward for our welfare is to introduce among us a sort of "protection fund system." Few among us realise the fact that it is in us to better our lot. Here also requires sympathy, co-operation and faith among the various members. Such organisations, I believe, exist in all other departments. Sub-Assistant Surgeons have their own. In Malaya there are many organisations

tions of this sort doing useful work. If it is started among us and if it can be worked well, we will be doing so much good to provide financial assistance to the relatives of a member in case of death or to the member himself. It is earnestly requested that all members will open their eyes atleast now and join the movement in large numbers for establishing such an organisation. I should be happy to see the question taken up by those who feel interested and are competent.

To

THE EDITOR,

The Indian Veterinary Journal, Madras.

DEAR EDITOR,

Kindly allow me some space in your esteemed Journal for the following few lines :—

DIRECT RECRUITMENT IN THE MADRAS C.V.D.

Rumour is strong that one or two more Indian M.R.C.V.S. officers are to be recruited to the Provincial Service of the Madras Civil Veterinary Department in the near future. If that be so, I need hardly state that it is not doing justice to the hardworked subordinates of the non-gazetted rank. These plums of office in an otherwise ill-paid service are few and far between and come once in a way and if these are to be given away to others and not to the deserving members of the non-gazetted rank, will it be any wonder that the service as such will be discontented, morale lowered and out-turn of work lessened. There is no incentive to work in this department. By such a procedure the Government are imposing a double infliction viz. one man loses a gazetted rank and another man a place in the Selection Grade.

Will the Director of Veterinary Services and the Government pay their due consideration and stand by the interests of the subordinate men, which are also the interests of the profession in India?

16-9-1928.

FAIR-PLAY.

Review

Incompatibility in Prescriptions, by S. K. Mukherji, M.B., Published by Rai Sahib B. N. Mukharji and Son, 44, Badur Bagan Street, Calcutta. pp. 135 Price Rs. 1—8—0.

We are in receipt of a copy of the book 'Incompatibility in Prescriptions', by Santosh Kumar Mukherji, M.B., Editor Indian 'Medical Record.'

The Subject of incompatibility is as dry as dust and nowhere has much stress been laid on the study of it. As a result of which students, and young practitioners do find themselves in a bad predicament when asked to prescribe independently through fear of combining drugs which are incompatible.

This book on incompatibles by Mr. Mukherji has indeed solved the problem and a study of it will never be in vain. Mr. Mukherji has dealt with the subject so well that it is never a hard and dry reading. The chapter on general principles alone gives one a good idea of the incompatibles.

Practically all the drugs that are commonly used in daily practice have been dealt with in detail. His exercises and answers will indeed be welcomed by every student of practical materia medica.

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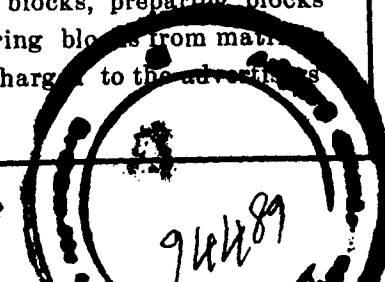
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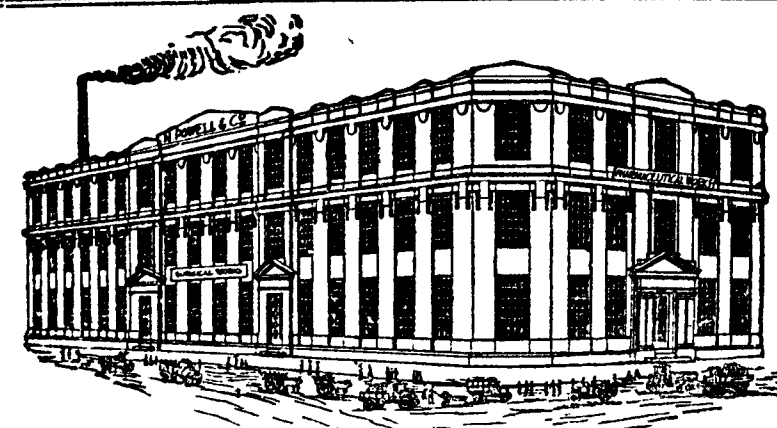
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