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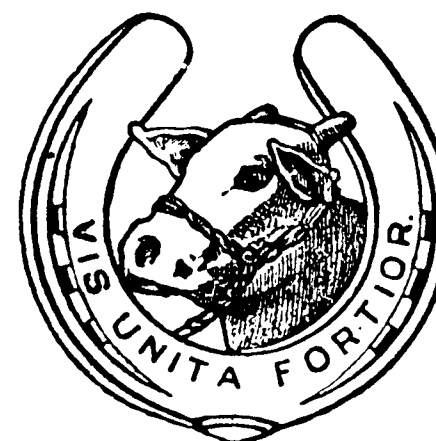
Vol. XXXIV, No. 4

JULY, 1957

THE INDIAN VETERINARY JOURNAL

(The Journal of the All-India Veterinary Association)

*A Bi-Monthly Record of
Veterinary Science*



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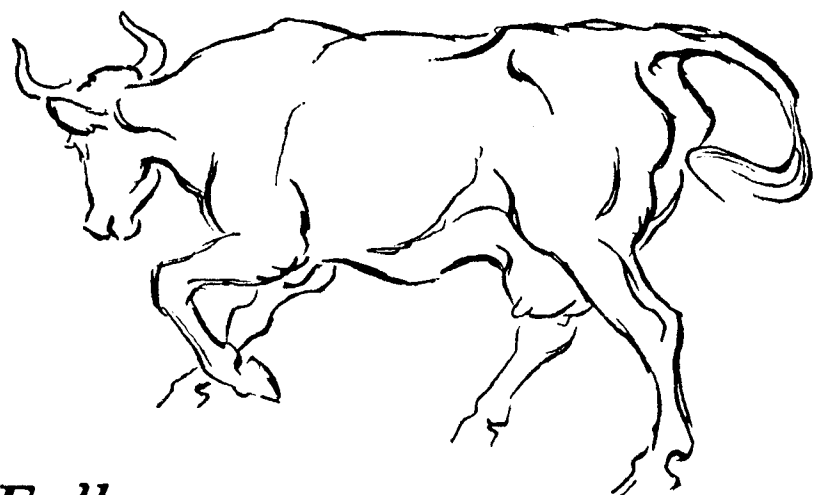
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EDITOR

Rao Sahib T. VINAYAKA MUDALIAR, G.M.V.C.,

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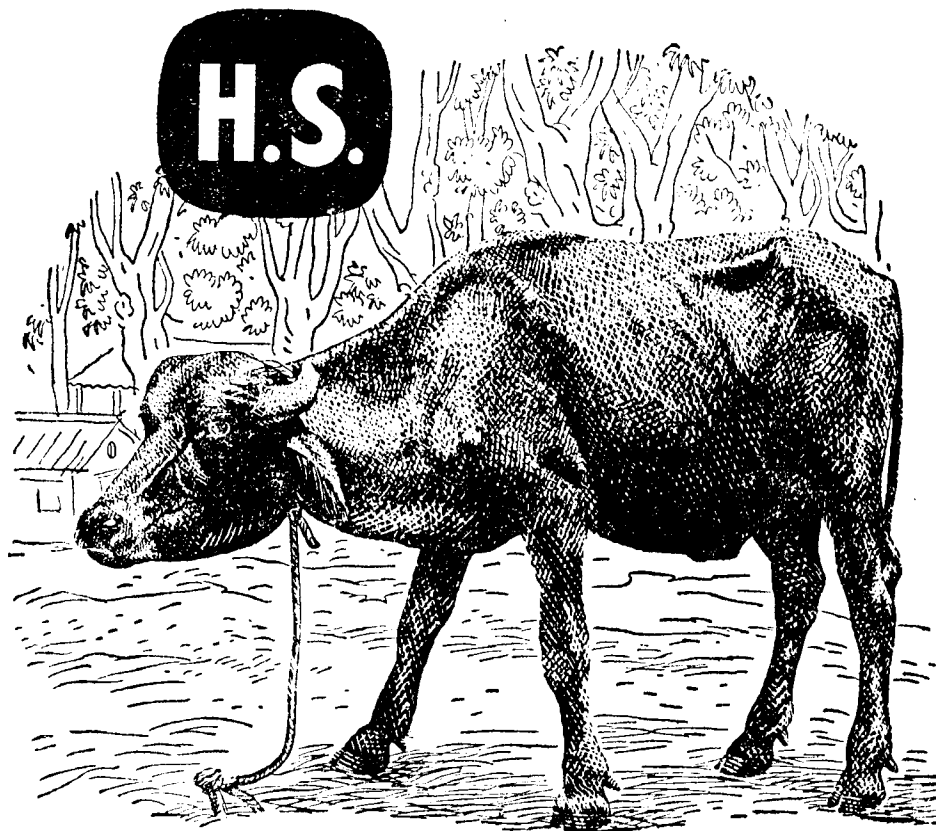
JULY, 1957

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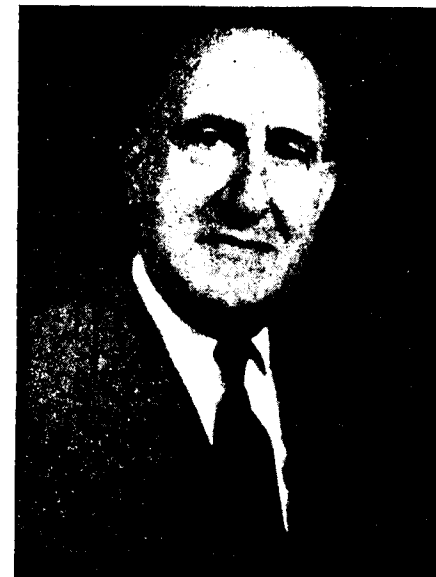
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SIR THOMAS DALLING,
SENIOR VETERINARIAN WITH F.A.O.
who retired recently.



Shri L. SAHAI, M.Sc., M.R.C.V.S.,

*who assumed the office of the Animal Husbandry,
Commissioner with the Government of India recently.*

THE Indian Veterinary Journal

(The Journal of the All-India Veterinary Association)

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Editorial

BOVINE INFERTILITY

One of the major hurdles confronting workers in the field of livestock development of any land, is the infertility of the breeding stock so constantly met with in the course of their zealous work. Quite undaunted, they have been pursuing a high level of research with the result we have to-day a fairly good accumulated knowledge of the several causes that have been contributing towards such infertility, whether temporary or permanent. The work will no doubt be pursued still, but it is worth while to broadcast the existing knowledge to be of benefit to field-workers and other village-level workers in Extension Centres.

The F.A.O. has done well in collecting and publishing in a highly readable manner, under their Agricultural Studies Series, three notable pamphlets on Bovine Infertility which we commend specially to concerned workers in the field. Nor can others afford to take no notice of such advances in Science. The pamphlets under reference are—

- (1) Brucellosis—First report (No. 14)
Second report (No. 24)
- (2) Vibrio Foetus infection of cattle (No. 32) and
- (3) Trichomonas Foetus infection of cattle (No. 33)

Unless there is a thorough grasp of these conditions, their epidemiology, their pathogenesis, their differential diagnosis, their treatment and management, etc., the work of their proper prevention and control is likely to suffer.

Now that an intensive campaign of Artificial Insemination is in progress in our land, the responsibility of the profession is all the more great to 'spot-light' such conditions and take effective steps against the spread of these diseases. To allow them to spread inadvertently due to lapses or lack of vigilance on the part of the workers in the field, will be a first rate calamity.

It was only in March 1956, Das and his co-workers in Calcutta have recorded the occurrence of *Trichomonas foetus* infection for the first time in India. And now comes a report from Bihar, which we publish in this issue. Evidently it is more widespread in this country than we are aware of and we feel confident that they will be brought to light by other workers and recorded.

The institution of a cadre of Regional Sterility Officers is a step in the right direction and we look up to them to probe into the mysteries of the several breeding difficulties of livestock ordinarily met with in this land and thus bring relief to the common man.

THE NEW ANIMAL HUSBANDRY COMMISSIONER

We are glad to note that Shri L. SAHAI, M.Sc., M.R.C.V.S., has been appointed as the Animal Husbandry Commissioner with the Government of India. He is an exceedingly happy choice for that high Office. We could well appreciate the difficulties of the Government of India to pick and choose the right men for the several posts that come up for consideration from time to time in these days of hurricanic development and under the existing dearth of suitable personnel. The high office of the Animal Husbandry Commissioner carries with it very heavy responsibilities and the person chosen is virtually the sole Technical Adviser on Animal Husbandry matters not only to the Central Government but to the several State Governments as well, when necessity arises. He must be a man of vision, imagination, courage, proper equipment and of admitted ability at planning and policy-making.

Shri Sahai has come into that high Office, after a good deal of experience in several fields of Animal Husbandry work. He was practically by turns a Research worker and an Administrative Officer and has had the advantage of widely travelling in several States as Special Research Officer for Tuberculosis and Johne's disease. He travelled widely also as a member of the Indo-American Team and as such had unique opportunities of studying the several problems confronting the advancement of Veterinary Science in this land. His dissenting minute in that report is an indication of his courage and right perspective.

His academic career, was to say the least, meteoric. He secured First Class at all University Examinations from Matriculation to M.Sc., degree, sometimes securing even first-rank in some of those Examinations. That helped him to be a Government scholar from the lowest standard at School right up to the M.Sc., degree. Again from among nearly 60 candidates, he was selected by the old United Provinces Government as a Government scholar for training at the Royal (Dick) Veterinary College, Edinburgh and having been exempted from the first year, he completed the entire course in three years as against four normally required. At that College, he secured as many as six medals. It was as though his academic career was one of *Veni, vidi, vici*. His official career has been quite varied and useful. He was started as a Deputy Superintendent in the Civil Veterinary Department of the United Provinces. Later he was selected as Disease Investigation Officer under an I.C.A.R. Scheme to serve in Bihar which he did for nearly six years. As a result of the work done there, he was appointed as Special Research Officer for Tuberculosis and Johne's disease at the Indian Veterinary Research Institute, Mukteswar. Later he held the post of the Director of Veterinary Services, Bombay State, for nearly seven years and finally assumed charge of the Office of the Director of the Indian Veterinary Research Institute, Mukteswar, in 1954. It is from there he is now selected for this high Office of the Animal Husbandry Commissioner. He was for some time on special duty to draw up plans and estimates for a once proposed Central Animal Husbandry College. He has served on several *ad-hoc* Committees and as such had sufficient experience in planning and policy-making also.

His immediate task would be to place the Interim Indian Veterinary Council on a Statutory basis and see that the several State Governments do not delay any further in getting the necessary Act passed. All livestock work needs to be re-vitalised and even stream-lined on higher scientific plane. Shri Sahai is fully equipped for the task and we wish him the best of luck in his new sphere of work!

Shri M. N. MENON, F.R.C.V.S.

We are glad to announce that Shri M. N. Menon, Professor of Surgery, Veterinary College, Madras, has achieved a unique distinction. He has been awarded the Diploma of the Fellowship of the Royal College of Veterinary Surgeons under the new rules on the basis of his thesis on "Canine Spirocercosis and its treatment with special reference to transthoracic surgery of the oesophagus for enucleation of the parasitic nodule". He is the first Indian to get this Diploma and has thus created a history for himself in our profession in India. We most heartily congratulate him!

We have known Shri Menon from his student days. He has had a brilliant academic career. He belonged to the first batch of the five-year-degree course of the Madras Veterinary College. Sometime after passing out, he secured a studentship from the University of Madras for study of the Bacteriology of Bovine Mastitis. But soon after, his services were lent to the Indian Army Veterinary Corps, where he served for two years and got released to take his training in Dairy Husbandry at the Indian Dairy Research Institute, Bangalore for 15 months. He took his Associateship (A.I.D.R.I.) of that Institute in 1947. He next underwent a short period of training in Radiology at the Barnard Institute of Radiology, Madras. Shortly after, he was appointed as Lecturer in Surgery at the Madras Veterinary College. After serving in that capacity for a period of three years, he went on study leave to take the Diploma of M.R.C.V.S., which he did standing first in Surgery and obtaining a second place in total ranking. He achieved all these, six months earlier than the full period initially prescribed by the Royal College.

On the top of all these comes this present distinction of F.R.C.V.S. Shri Menon is young—he is thirty-eight—and we dare say he has many more years of useful life to look forward to and earn even greater laurels. We wish him all the best in his future career!

OUR YOUNG MEN ON THE MARCH



Shri M. N. MENON,
Professor of Surgery Madras Vety. College,
who took his F.R.C.V.S. recently.



Shri J. P. PATE,
B.Sc. (Vet) Hons., M.R.C.V.S.,
who returned recently from abroad, after
taking his M.R.C.V.S.



Shri C. G. BHASKER,
B.V.Sc., M.R.C.V.S.,
who returned recently from abroad, after
taking his M.R.C.V.S.

Trichomonas Infection in Bihar



Fig. 1
T. foetus (moving).



Fig. 2
T. foetus (stained).

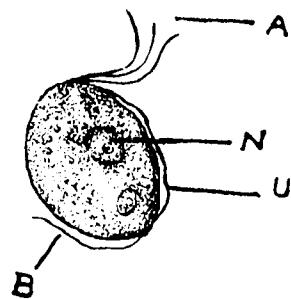


Fig. 3
T. foetus (stained) $\times 1000$
Camera Lucida diagram.

- A. Anterior Flagella.
- B. Posterior Flagellum.
- N. Nucleus.
- U. Undulating membrane.

To face page 271.

SIR THOMAS DALLING RETIRES

There is hardly a country in the world, which has not heard of that great Veterinarian, Sir Thomas Dalling. As FAO's Expert Veterinarian during the last five years, he has travelled widely and given the benefit of his advice to several countries. His professional career reads like a page from some book on the wonders of the world! "Not only has he made outstanding contributions in the fields of Veterinary Pathology, Bacteriology, Virology and Immunology, but he has had a profound influence on Veterinary Administration and Education, and the field control of diseases in many countries of the world". That is in a nut-shell a true and correct picture of that great personality. But the world would be poorer if it does not know its own great men in all essentials. The F.A.O., has therefore done well in issuing a complete and authenticated history of his professional career. We make no apologies for reproducing the same *in extenso* in this issue. We feel certain that every Veterinarian in the world would feel himself a foot taller when he goes through that highly stimulating document, recording the great potentialities of a veterinarian for highly scientific work and to benefit the humanity at large.

We pay our humble homage to that giant of our profession and wish him well in his retired life!

"Sir Thomas Dalling, one of the world's truly great veterinarians, has reached the end of yet another of the many phases of a brilliant and diversified career. On attaining the age of sixty-five he has retired from his position as Senior Veterinarian with the Food and Agriculture Organization of the United Nations. His services will continue to be available in a consultative capacity.

"There is virtually no branch of veterinary science which has not at one time or another claimed his attention. Not only has he made outstanding contributions in the fields of veterinary pathology, bacteriology, virology and immunology, but he has had a profound influence on veterinary administration and education, and the field control of disease in many countries of the world.

"His career has divided itself into a number of clearly defined phases, in each of which he has attained eminence. The profession to which he has in a unique sense devoted his life, has regarded him with pride and gratitude during his forty-three years as a veterinarian.

"The earliest, formative stage, came in the few years following his qualification as Member of the Royal College of Veterinary Surgeons in 1914. On leaving the Royal (Dick) Veterinary College, after a brilliant scholastic career, he went first into practice in the Midlands and then into the Royal Army Veterinary Corps. He served in France where he had charge of a number of laboratories. It was this wartime service which first attracted him to research. His experience of establishing and operating field laboratories, the preparation of autogenous vaccines for horses, and the use of the then famous Reading Bacillus, whetted his appetite for investigational work. After the War in which he was mentioned in the despatches of Sir Douglas Haig—and a further brief spell of practice, he joined the late Professor Gaiger at the Glasgow Veterinary College.

"At Glasgow he established certain principles which were later to be of the greatest importance to Dalling himself, and to the veterinary profession as a whole. Gaiger and he worked on original research in the field of sheep diseases, among other things, confirming earlier Danish findings that *Vibrio septique* was the cause of lamb dysentery. As assistant to Gaiger he lectured and demonstrated in pathology. Those were the lean days of the Glasgow College and there were many occasions when he was called upon to take over classes in anatomy and chemistry also. It was the combination of teaching and research which firmly established his interest in the whole question of veterinary education and enabled him to formulate his views on higher education.

"The third phase came with his appointment to the Wellcome Physiological Research Laboratories. Here he was to serve for fourteen years, continuing and extending the work of anaerobes and the practical application of cultural methods, which began at Glasgow. He played a major part in developing the veterinary department of the Wellcome Laboratories and in evolving sera, anti-toxins and other therapeutic products.

"In 1937, at the early age of forty-four, Dalling was elected into the Professorship of Animal Pathology at Cambridge. In this capacity he acted also as Director of the Institute of Animal Pathology, and during the next five years he initiated and supervised much valuable research and investigational work in such fields as tuberculosis and the use of tuberculin, fowl paralysis, and infertility in cattle. Under his inspired leadership the Institute played an ever-increasing part in the elucidation of problems concerned with the diseases of animals.

"The next phase, in what had by now come to be recognized as a notable career, came with his appointment as Director of the Ministry of Agriculture's Veterinary Laboratory at Weybridge. This coincided with the great advances which the Ministry's Animal Health Division was making in the field control of disease, and Dalling was influential in the conduct of the detailed research and practical work which were to result in the introduction and use of Strain 19 vaccine, PPD tuberculin, the rapid test for pullorum disease, and crystal violet swine fever vaccine.

"Dalling was appointed Chief Veterinary Officer of Great Britain in 1949 and for a considerable period he held this appointment in conjunction with the Directorate of Weybridge, a dual task which would tax the energy and ability of any man of lesser stature. This period saw, under his supervision and direction, the growth of artificial insemination techniques, the control of tuberculosis and the great advances made by the Attested Herds Scheme.

"Throughout all the phases of his active and colourful life, Dalling has found time to sit on innumerable committees and councils. He helped the work of the National Veterinary Medical Association, serving with distinction on many of its committees. He has held office in the Royal Society of Medicine, the Veterinary Research Club, the Medical Research Club, the Agricultural Research Council, and the International Veterinary Congress. For a period of two years he served as President of the Royal College of Veterinary Surgeons.

"The character and high standard of his scientific investigational work would alone ensure a worthy place for the name of Thomas Dalling in the records of the profession which he has served so nobly. With a series of brilliant teams of co-workers over the years—the names of Gaiger, Gordon, Mason, Glenny, Okell, Pugh, Bateman and MacIntyre come readily to mind—he carried out work with the anaerobes, the preparation of anatoxins and anacultures, leptospirosis, canine distemper, cat enteritis, a wide field of poultry conditions and tuberculosis of domestic animals. While much of his work has been of outstanding economic importance, a great deal of it has been primarily aimed at the relief of suffering in domestic animals and pets.

"Honours have come thick and fast, and lie lightly on the shoulders of this modest and unassuming man. He is a Fellow of the Royal College of Veterinary Surgeons, M.A., (Cantab.), LL.D. (Glasgow), D.Sc. (Belfast), D.Sc., (Bristol), D.V.M. (Hanover) and F.R.S.E. He is an honorary member of a number of Divisions of the British Veterinary Association and of innumerable veterinary associations abroad. He has been awarded the Victory Medal by the

Central Veterinary Society, the Dalrymple-Champneys Medal, the Sir Thomas Baxter Medal, and the John Henry Steel Medal.

"In 1951 he was knighted by H. M. King George VI in recognition of his meritorious public and professional services.

"On retiring from the British Ministry of Agriculture, Sir Thomas joined the Headquarters staff of the Food and Agriculture Organization of the United Nations and during the last five years, as FAO's Senior Veterinarian, he has made outstanding contributions to the control of many of the world's animal diseases. Prior to joining FAO Sir Thomas had travelled widely. Since those days he has travelled almost continuously. There are very few parts of the world in which he is not known and welcomed. He has been an esteemed ambassador to the world both for FAO and for the veterinary profession.

"Sir Thomas Dalling has played a remarkable part in the establishment of international methods for the control of disease. His work in the FAO program for the control and eventual eradication of rinderpest has been a major contribution to this important project. He is the architect of the European Commission for the Control of Foot-and-Mouth Disease which is already achieving notable results. For many years he has been intimately associated with the "Office International des Epizootics" and, under his guidance, FAO and OIE are cooperating closely and successfully in many common fields of endeavour.

"His interest in the younger generation has always been great. It is marked by his honorary membership of many veterinary student associations throughout the world. Now that he has reached what is euphemistically termed retirement, he plans to devote himself—among a number of other interests—to veterinary education. FAO has long realized the great need for qualified veterinarians, field assistants and research workers, on which foundations alone, proper veterinary services can be built. In this, and several other matters, the services of Sir Thomas will continue to be available to the Organization as a Senior Consultant.

"His wise advice and active guidance will thus continue, through FAO, to further the national and international control of animal disease which is of such vast economic importance in the world today.

"Sir Thomas Dalling lives in Rome and his home there, close to the Headquarters of FAO, is a meeting place for the veterinarians of the world. He carries his years lightly. He is a good companion with a wide range of interests in literature, music and the arts. He likes company and convivial occasions. He maintains a Scottish forthrightness

and, in spite of a notoriously soft heart, does not suffer fools gladly. Perhaps his outstanding characteristics, in these days of retrospect and stock-taking, are kindness, humour, a great sense of tolerance, and an undiminished zest for hard work.

"He has no desire or inclination to look back for long. Indeed, it is typical of the man that he regards the future with an unimpaired eagerness and a sense of adventure. His friends and colleagues all over the world will join at this time in wishing him many years of useful work and effort, not only for the great Organization, which he has served and is continuing to serve, but also for the profession whose interests and furtherance have been his principal concerns throughout life."

An Announcement

THE MYSORE VETERINARY MEDICAL ASSOCIATION
The Thirteenth All-India Veterinary Conference
stands postponed.

Due to unavoidable circumstances and the prevalence of Influenza on a fairly wide scale at Bangalore, it has been decided to postpone both the Silver Jubilee Celebrations of the Mysore Serum Institute and the Thirteenth All-India Veterinary Conference *sine die*.

Further intimation will follow in due course.

Mysore Serum Institute, }
Hebbal, Bangalore 6. }
17-6-1957.

R. D. NANJIAH,
Hon. Secretary.

Original Articles

STUDIES ON INFECTIOUS BOVINE KERATO-CONJUNCTIVITIS

By

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Infectious Keratitis and Kerato-conjunctivitis of cattle, commonly referred to as "pink eye" have been reported to be prevalent in Canada, India, Holland, the British Isles, Germany, France, South America and South Africa. The disease affects cattle of all ages and breeds and is characterised by an acute inflammation of the eyeball and its surrounding structures. Though there is a striking similarity in the symptoms manifested in these widely spread localities, the accurate nature of the etiological agent was not very well known. Recent studies by various workers, however, have shown that specific Kerato-conjunctivitis of cattle is caused by *Haemophilus (Moraxella) bovis* and is transmitted by contact as well as by mechanical vectors as flies.

In India, contagious ophthalmia is known to be prevalent amongst cattle and buffaloes (Mitter, 1915) and many clinical cases of Keratitis and Kerato-conjunctivitis are commonly encountered in the field. Notwithstanding the obvious economic importance of this disease, its low mortality has led to its neglect and very little authentic information is available as to its cause and the means by which it is transmitted so as to facilitate planning of suitable measures for control and treatment.

Most of the literature on infectious Keratitis deals with the symptoms, treatment and control and there are very few reports concerning its etiology. Billings (1888) in Nebraska, Mitter (1915) in Bengal and Poels (1917) in Holland were the early workers to study in detail the bacteriology of infectious Keratitis. Billings (1888) reported the occurrence of short, thin bacillus in stained sections of the diseased cornea but he never attempted the reproduction of the disease with pure cultures of this organism. Mitter (1915) in Bengal, giving the results of his investigation into an epidemic of contagious ophthalmia amongst conservancy cattle in which the cornea was seriously involved, stated that the outbreak appeared to be caused by *Micrococcus lancolatus* and partly by the bacillus of *Morax-Axenfeld*. He reported his inability to

reproduce the disease in experimental animals and concluded that organisms isolated in the epidemic had no action on *unbroken conjunctiva*. Poels (1917) incriminated *Bacillus pyogenes* as the causative agent of Keratitis infection in Holland and he could reproduce the disease not by instillation but by injection of cultures between the layers of the cornea. Allen (1918) reported the findings of a gram-negative diplo-bacillus in the ocular discharges of infected cattle and Jones and Little (1923, 1924) succeeded in reproducing the disease experimentally. Hauduroy (1927) later classified the organism as *Haemophilus bovis*. Baldwin (1945) and Reid and Anigstein (1945) confirmed the work of Allen. Though Farley *et al* (1950) could not confirm the work of Baldwin, Jackson (1953) showed that *H. bovis* was apparently the specific etiological agent of infectious bovine Kerato-conjunctivitis in Texas. Earlier investigators (Coles, 1935; Donatien, A. *et al*, 1939; Mitscherlich, E. 1939; Rudolf, J. *et al*, 1944) have reported the occurrence of intracellular organisms resembling rickettsiae, in the conjunctiva of infected animals but could not definitely establish that they were the etiological agents. Farley *et al* (1940) have conclusively proved that no filtrable agent was associated with or responsible for this condition.

As no systematic investigation has yet been undertaken in India to throw light on the problem of the etiology of infectious Keratitis, these studies were started no sooner a culture isolated by the Disease Investigation Officer, Hyderabad (Deccan) from an outbreak of infectious conjunctivitis in cattle reported by Ahmed and Rao (1956) was received at the Institute for typing and detailed study. The following is the record of its morphological, cultural and biochemical characteristics and pathogenicity in experimental animals and cattle.

Morphological and colony characteristics

A gram-negative, non-acid-fast rod with rounded ends, measuring 1.5 to 2.0 μ in length, 0.5 to 1.0 μ in width and occurring principally in pairs end to end; highly pleomorphic; bipolar staining and meta-chromatic granules were observed in old cultures; they were capsulated, non-flagellated, non-motile and non-sporulating. The organism grew as punctiform colonies on horse blood agar plates (5 per cent V/V) upto 2 m.m. in size, with a smooth, moist and glistening surface resembling tiny dew drops. They were greyish white, circular with an entire edge, convex, and translucent. Colonies were surrounded by a clear zone of *beta-haemolysis* which reached about 2 m.m. in width. The colony was firm and broke when touched with an inoculating loop. Haemolysins were not formed in nutrient liquid media.

Bordet-Gengou potato glycerine agar medium was used for the isolation and propagation of *H. bovis*. Oxalated bovine blood was added

to give a 5 per cent concentration. Stock cultures were maintained on Bordet-Gengou potato glycerine agar containing 35 per cent bovine blood and sub-cultured after 2 weeks in the refrigerator.

Cultural characteristics

Gelatin :—After 6 days at 22°C, liquefaction took place.

Nutrient agar :—Scanty or no growth.

Nutrient broth :—Growth scanty and slow; 'X' and 'V' factors are not required for isolation or for growth, but when they were present growth was greatly enhanced. Optimum pH, 7.2 to 7.4 : optimum temperature, 37°C ; Thermal death point, 60°C for 4 minutes.

Biochemical :—Facultative anaerobe ; carbohydrates not attacked ; Indole not formed ; litmus milk alkaline, no clot after 7 days with the formation of precipitate of casein after 10 days ; nitrates not reduced to nitrites ; M.R. negative ; V.P. negative ; sodium hippurate and arginine not hydrolysed ; starch and cellulose-negative ; urea hydrolysis-negative ; catalase—negative ; M.B. reductase—negative.

Pathogenicity :—0.5 ml. of an 18 hour old broth culture of the organism in Todd-Hewitt broth given intravenously to albino mice brought about death in 3 to 5 days ; organisms were recovered from heart blood and spleen. The injection of 0.5 c.c. of Todd-Hewitt broth cultures of the organism into the scrotal sac of rabbits produced severe haemorrhagic necrosis of the scrotal skin and adjacent tissue. The instillation of virulent cultures into the eyes of rabbits failed in every instance to produce any symptoms or lesions of the disease and intra-ocular injections of guinea-pigs and rabbits produced severe conjunctivitis in less than 24 hours ; swelling of the eyelids, conjunctivitis and circum-corneal infection were observed after 48 hours. No corneal lesion was observed and resolution was complete within 5 days. From the above observations in regard to the morphological and cultural characters of the organism under study, its biochemical reactions and pathogenicity, the culture was identified as *Haemophilus* (*Moraxella*) *bovis*.

Experimental reproduction of infectious Kerato-conjunctivitis in cattle

With a view to select a few calves for producing the disease experimentally, bacteriological examination of the eyes of twenty young calves was carried out on alternate days for a period of two weeks. Out of these, two animals (3 months of age) free from any discernible eye disease and negative for *H. bovis*, *P. septica* or *Rickettsial* bodies were selected and housed in an insect-free stall. Their sera were tested

against a formalinised antigen of the organism under study and none of them showed a titre above 1 : 10.

Technic of infection :—The technique followed for experimental production of Infectious Keratitis on young calves was that of Jackson (1953). The Palpebral Conjunctiva of the left eye of the calves was swabbed with a sterile cotton swab and then smeared with a swab soaked in a suspension of smooth colonies of the organism picked from a blood agar plate after 24 hours incubation in nutrient broth. Both lids were then held closed and the eye was gently massaged.

Both the calves developed a sub-acute form of the infection after eight and fifteen days respectively. The same organism was isolated in pure culture from the infected eyes after ten and twenty days respectively. Resolution was complete by thirty days and no organisms could be recovered forty days after inoculation. The sera of the infected animals showed an agglutination titre of 1 : 320 after twenty days.

Summary

From the clinical syndrome of the disease under study as reported by Ahmed and Rao (1956) it appears to be identical with "pink-eye" or Infectious Kerato-conjunctivitis reported by other workers in Texas and different parts of U.S.A. and United Kingdom. *H. bovis* was isolated from infected eyes during the above outbreak of Kerato-conjunctivitis. The success achieved in artificial reproduction of the disease in calves and our failure to isolate *H. bovis* from the conjunctiva of apparently normal cattle lead us to postulate the bacteriological etiology of this condition. This is in agreement with the findings of Jackson (1953) and other workers abroad.

The morphological, cultural, biochemical, serological and pathogenic characters of the organism isolated from cattle in Hyderabad and the clinical syndrome produced by the same organism resemble the description given by other workers in Texas and different parts of U.S.A. and U.K. and was therefore, designated as *H. bovis*.

Acknowledgement

We are indebted to Shri M.R. Dhanda for his guidance in this study and Shri K. Raghavachari, Disease Investigation Officer (Cattle), Hyderabad, for isolating the culture from an outbreak of epidemic conjunctivitis amongst cattle and sending it for typing.

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**MORAXELLA (HAEMOPHILUS) BOVIS ISOLATED IN
BOVINE INFECTIOUS KERATO-CONJUNCTIVITIS IN
HYDERABAD (Deccan)**

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Introduction.—Infectious Keratitis in bovines associated with *Moraxella (Haemophilus) bovis* has been recorded in America, Canada, British Isles, Africa and Australia. Morax (1896) and Axenfeld (1897) have isolated an organism from cases of conjunctivitis in human-beings and the organism was designated after these workers as Morax-Axenfeld bacillus. Eyre (1900) suggested the name *B-lacunatus* for this organism. Petit (1900) has isolated an organism called *B-duplex* from conjunctivitis cases. Another organism which is closely related to Morax-Axenfeld bacillus was isolated by Jones and Little (1923) from cattle suffering from acute conjunctivitis and corneal ulceration. The classification of organisms thus isolated is not as yet precise. Lwoff (1939) has created a new genus *Moraxella* for recognising the 3 main species—*lacunata*, *duplex* and *lwoffi*. The authors in the year 1955 have isolated an organism which is confirmed as *Moraxella (Haemophilus) bovis* from Kerato-conjunctivitis outbreaks in bovines in India.

History of the outbreaks encountered.—The Veterinary Surgeon incharge of the Veterinary Hospital, Parbhani has informed this office

that about a dozen animals were suffering from eye troubles and were under treatment in the hospital. Investigation was undertaken to find out the etiology of this condition. Smears from scrapings from conjunctival mucous membrane of all ailing cases at different stages of the disease were made, stained and examined on the spot. Smears were negative for *Rickettsia conjunctivae*. *Rickettsia* having been eliminated, the problem presented two aspects in regard to its etiology. One bacteria and (2) Virus. In those smears which were stained by Gram's method, small gram-negative bacteria measuring 0.5 μ by 1.5 to 2.0 μ approximately have been consistently encountered, both freely and in the neutrophils. As facilities were not available in the field for the type of study required, a healthy calf was procured and the discharge from the eye of an ailing case was swabbed on to its conjunctival mucous membrane and brought to headquarters for further study. After about one week, the calf showed signs of picking up the disease.

Symptoms.—The earliest symptom noticed by us both in experimental animals and in the field was copious lachrymation, occasionally mixed with slight mucopurulent discharge. The conjunctiva at this stage is found merely congested. In slightly advanced cases, granular growths at isolated places on the conjunctival mucous membrane were encountered. When the disease advanced the sclera was also found congested and the net work of blood vessels stood out very prominently fully engorged. At this stage of the disease the lachrymation was replaced by a fairly thick viscid creamy mucopurulent discharge which after collection at the inner canthus ran down along the Zygomatic ridge forming along its course a thick crust of varying degrees of dryness. The skin looked very dirty, hairs got matted together and in few instances the cheek was denuded of hairs due to rubbing of the face by the animal on account of itching sensation. Numerous flies (*musca viscina*) were found feeding on the discharge round about the eye and the cheek, causing annoyance to the animal. The animal shook its head too frequently and licked the discharge when it trickled down over the nose. The animal resented handling of the eye in the first few phases of the disease due to pain as a result of severe congestion and tension of the eye ball. When one eye is affected, the animal turned itself in such a way as to protect it from direct sunlight, on account of severe photophobia. When taken out in sun and walked about the lachrymation increased due to effects of direct sunlight. Whenever any person approached, the animal got nervous and tried to hide the eye from the observer either by turning itself away or by closing the eye. In much more chronic and prolonged cases, the eyelids were so much swollen that the supraorbital depression appeared filled up and flat. The granular growths on the conjunctival mucous membrane got ulcerated at their

apices and discharged creamy and stringy pus-like material which obscured the vision of the animal by forming a thin translucent film in front of the cornea by connecting both upper and lower eyelids. The mucous surface of the eyelid normally not visible was found considerably exposed due to the intervening papillomatous growths on the mucous layer which separated the eyelid quite wide from the eye-ball. In neglected and old cases opacity of the cornea developed due to the friction of the papillomatous growth on the cornea. In such advanced cases, the animals did not evince severe pain as in earlier stages and photophobia was not so marked. The above symptoms have been noticed both in the experimental and natural infections.

Host Specificity :—To ascertain the host specificity of this infection a couple of buffalo-calves, rabbits, guinea-pigs, goats, sheep and a dog were swabbed with eye discharges from the suffering case directly on to their conjunctival mucous membranes and were kept under observation for a couple of months. Whereas the heifer calf thus treated developed the disease as described above none of the above species similarly infected reacted to the disease in spite of repeated swabbings with the discharges from an ailing case. In the outbreaks in the field only the cattle were found affected.

Bacteriological Examination :—Cultures were first made from the conjunctival mucous membrane of the suffering case at headquarters. The technique employed was as follows :—

The cheek, eyelids and all the exterior were washed with soap and water. Eye was irrigated with normal saline until all the sticking discharges were cleared off. The eyelid was everted on to the index finger and sterilized platinum loop was rubbed on the mucous membrane once or twice mildly and the material thus collected was transferred on to blood agar slants in series to obtain isolated colonies. The blood agar slants after an incubation of 48 hours amidst a few colonies of contaminants like Cocci, revealed fairly large number of minute colonies of a gram-negative organism. These organisms morphologically were indistinguishable from those encountered in the conjunctival mucous membrane smears of all the ailing cases.

Cultural Characters

Morphology :—The organism is gram-negative measuring 0.5 μ by 1.5 to 2.0 μ , occurs in singles and pairs but not in chains.

Blood Agar Slants :—On blood agar 24 hour old colonies are very fine and measure about 0.2 m.m. in diameter. The colonies have a more or less circular border and are slightly raised. At the end of 48 hours, the colonies measure about 0.5 m.m. in diameter. The margin of the

colony is fairly regular and circular and central part of the colony is slightly raised. Between the margin and central part of the colony a depression of the shape of a concentric circle with the margin is seen. The colonies are of a light cream colour with a not well recognised zone of haemolysis around.

Broth :—The growth is not appreciable in this medium. The medium is turned slightly turbid with a small amount of sediment.

Broth with blood extract :—The growth is fairly rich with a considerable amount of sediment at the bottom and on the sides of the tube when kept inclined, a fine powdery deposit of the growth of the organism is seen which when viewed against light appears granular. The medium practically remains clear. On shaking, the growth rises up like a smoke curl and gets dispersed through the medium in clumps giving the appearance of an agglutinated antigen and when left undisturbed the growth resettles at the bottom of the tube leaving the medium clear.

Chicken broth :—Same as in broth enriched with blood extract.

Litmus Milk :—Alkaline, coagulation not very perceptible.

Coagulated Serum :—Greyish white colonies similar to those seen in blood agar.

Indol :—Not produced.

Growth on media without blood or blood extracts :—Scanty to nil.

Penicillin :—The organism is found sensitive to Penicillin and inoculated tubes remain sterile.

As facilities for further bacteriological examination were not available with us, the cultures were sent to Central Research Institute at Mukteswar, and they have confirmed the organism as *Moraxella* (*Haemophilus*) *bovis*.

Distribution of the disease :—The disease was brought up for investigation by the Veterinary Surgeon incharge Veterinary Hospital, Parbhani. The District Veterinary Officer, Parbhani, reported the prevalence of a similar outbreak in the surrounding areas in the district viz Manwath, Sailu and Jalna. From another district Raichur which is approximately separated from Parbhani by 300 miles, another outbreak was brought to light by the Veterinary Surgeon and District Veterinary Officer, Raichur. In all these outbreaks the disease was confirmed by bacteriological and microscopic examination of the material collected or received at headquarters.

Transmission of the disease with cultures :—A couple of calves, sheep, goats, G. pigs, rabbits and a dog were used for transmission

of the disease by instillation into eyes of an young vigorously growing 24 hours old *Moraxella (Haemophilus) bovis* cultures freshly isolated from clinical cases, and all the experimental animals used (including calves) proved refractory to infection inspite of repeated attempts.

Treatment:—Early cases without complications were easily amenable to treatment. The cases at the hospital were given Zinc, Alum, Boric wash and Argyrol and Sulphanilamide eye ointment were applied. In advanced cases where there were profuse granulations styptics like copper sulphate and silver nitrate were employed besides the above treatment. Where there was opacity of cornea boro-calomel dusting of the eye was resorted to. Reports received from the field mention that the treatment was quite successful.

Discussion

In our experimental transmission of the disease we have used two types of material :—

- (1) discharge as a whole collected from the ailing case, and
- (2) the cultures isolated from the lesion.

Our attempts to reproduce the disease in cattle by swabbing normal eye with the natural discharges from the lesion have been successful, but not the repeated attempt of instilling young cultures isolated successfully from over a half a dozen natural cases into normal eyes.

The failures with the culture may lead one to think that besides the bacterium there is some other agent responsible for the disease probably a virus which is present in the normal discharges but not in culture. The spread of the disease from animal to animal may under the circumstances appear to be due to the mechanical transference of the natural discharges from an infected to the normal eye through the agency of the fly (*M. viscina*). The abundant number of flies feeding on the discharges in the herd collected in bunches and resting in close contact bears evidence to this observation. As stated in infections due to *Rickettsia conjunctivae* animals gathered in such close contacts can get the infection through droplets of discharges which get deposited on healthy eyes when sneezed or blown by the infected animals. Bearing all this in mind we have chalked out further transmission experiments using *Musca viscina* as vector, spraying of whole discharge and filtrates etc., and this forms the subject matter of a further communication as the present preliminary note is intended only to record the occurrence of the disease.

Summary

The incidence of Kerato-conjunctivitis in cattle associated with *Moraxella Bovis* is recorded for the first time in India.

Moraxella (Haemophilus) bovis has been successfully isolated from all the cases (half a dozen) subjected to bacteriological examination from two outbreaks involving over 150 animals in two districts.

Natural discharges when swabbed on to healthy eyes of animals reproduce the disease.

Cultures isolated from the cases when instilled alone did not reproduce the disease.

Symptoms as observed in the outbreaks in India are described in detail.

Cultural characters of the organism confirmed as *Moraxella (Haemophilus) bovis* isolated from the outbreaks are described. Early cases are easily amenable to ordinary treatment and advanced cases require cauterization of the growths.

The disease broke out in cattle only and could not be communicated artificially to other species like buffaloes, sheep, goats, dog and laboratory animals experimentally both with the natural discharges and cultures. The incubation period in artificially infected cases with natural whole discharges is about one week.

The possibility of the existence of a virus besides *Moraxella (Haemophilus) bovis* is discussed.

Acknowledgment

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The authors are deeply indebted to Shri M. R. Dhanda, Head of the Division of Pathology & Bacteriology, Indian Veterinary Research Institute, Mukteswar for confirming the identity of the cultures as *Moraxella (Haemophilus) bovis*.

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STUDIES ON ANTHRAX

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Section. I. Strain variation

Introduction.—Since Anthrax among livestock is one of the major problems in the Madras state, the authors have proposed to undertake a series of studies on the various aspects of the disease and intend publishing the results by sections. In the present paper, the question of strain variation of Anthrax bacilli as it affects the different species of animals is discussed at some length and conclusions arrived at with the experimental data obtained. Owing to limited facilities available in the laboratory and lack of funds, it was not possible to keep the experiments to high statistical standard and the authors are quite well aware of this in the interpretation of the results of their experiments.

Purpose of experiment:—It has been observed under field conditions that when outbreaks of Anthrax occur among cattle and buffaloes, the disease has not been generally noticed among sheep and goats. Similarly when there is an outbreak among sheep and goats, cattle and buffaloes of the locality are found to be free, even though these animals are in the same village. On very rare occasions, simultaneous outbreaks occur among cattle sheep and goats and they are very severe. It is also seen that while the bovine outbreaks mainly occur in areas of wet cultivation in places like the delta tracts of Nellore (Andhra), Periar tract of Mathurai, Athur of Salem district, Manjeri of Malabar district, etc. the ovine and caprine outbreaks are common in the dry and hilly taluks of Udayagiri (Andhra), dry tracts of Trichirapalli, and sandy and dry tracts of Ramanathapuram. When the disease occurs in cattle, sheep and goats, it was also noticed in human beings. While certain specific factors regarding the epizootiology of the disease such as grazing

habits, housing conditions, method of disposal of carcasses, are peculiar to the different species of animals affected, yet these alone could not be taken as the sole criteria for the above phenomena.

The grazing habits of the different species of animals may have some bearing in the dissemination of the disease. While cattle and buffaloes graze in low lying areas where they get abundant growth of grass, sheep and goats always prefer to graze in dry upland tracts where there is scanty growth of grass. Further, the former are "top grazers" while the latter "close grazers". Hence, it is evident from the above that there is a certain amount of appreciable variation both in the mode of grazing and the locality they graze. Further, with regard to disposal of carcasses also, the practices followed in the villages are varied according to the species. With regard to the bovine it is generally taken away from the village site, mostly to the open fields, in the vicinity of the cheri where there is some shade and some water source. Whereas in the case of sheep and goats, the carcasses are generally skinned and cut in the very premises where they die. Generally they are not taken to the fields or to the same place where the bovine carcasses are skinned and cut open.

Though from the above observations, the grazing habits and the method of disposal of carcasses prevent to some extent the different species mingling together and picking up infection from the same source, yet this cannot be said as always true. There are cattle in the village either housed or moving about in the premises where sheep and goats are cut and disposed of and similarly sheep and goats also at times may come to the water source or shade where the bovine carcasses are handled. But one important thing which has to be remembered in this connection is that the congregation of cattle is more and that of sheep and goats less in wet areas and the congregation of sheep and goats more and that of cattle moderate in dry areas.

With regard to the areas affected, the infection seems to occur both in wet and dry areas, the bovine infection being confined to the former and the ovine and caprine to the latter. In this connection it is very interesting to quote the contradicting views of authors on the subject. While Minnet and Dhanda (1941) appear to hold the view that the Anthrax Bacillus is an obligatory parasite multiplying on the surface of the soil and cannot survive under natural conditions in the marshy areas, Topley and Wilson (1948) are of the opinion that the bacilli may grow under such conditions as evident from the greater prevalence of Anthrax in low lying marshy areas. While the authors reserve their opinions on the subject either for or against this view pending the results of their own experiments which they have to undertake shortly, they are for the time being satisfied that the bacilli can survive both in dry

and wet areas and can flare up when there is alternate warmth and moisture. They have come to this view necessarily from the observations they have made in the field.

Hence from the foregoing observations, it is clear that the disease occurs both in wet and dry areas and that the bovines are affected in the former and ovines and caprines in the latter. Since simultaneous outbreaks have not been commonly noticed among these species the following experiments were undertaken with a view to finding out whether the grazing habits and housing conditions alone are the cause for the above phenomena or if there is any strain variation either absolute or relative of the Anthrax organism with regard to the different species of animals affected and if so, to what extent.

Experimental

Methods :—

1. Isolate virulent strains of Anthrax from cattle, sheep and goats.
2. Prepare 18 to 24 hour broth culture of the three strains.
3. Inject subcutaneously 0.2 c.c. of the culture of the bovine, ovine and caprine strains to the allied and heterogenous species.
4. Note reactions such as temperature, local reaction, and general systemic disturbances in all the above animals and if they die, confirm for Anthrax.
5. Immediately after inoculation of the culture take a tentative count of the number of organisms by making serial dilutions from the broth culture in saline and then taking the count by the pour plate method. This gives an indication of the number of organisms injected.

Note:—This method of vegetative count had to be adopted since the more accurate, glycerine passed spore count causes long delay and could not be adopted since the time at our disposal was very short. Further, the error in the count if any will be common to all since uniform procedure had been followed throughout the experiment.

GROUP I

In this group of experiments, it was decided to find out if cattle strain, sheep strain and goat strain of Anthrax was infective to the heterogenous species and also the allied species was used as a control. Under this group, three cattle, three sheep and three goats were injected with 0.2 c.c. of a 24 hour broth culture of bovine, ovine and caprine strains. The reactions were observed and the results analysed.

A tentative count of the bovine, ovine and caprine strain showed that there were 60 lacs of organisms present in 1 c.c. of the bovine strain,

culture 50 lacs of organisms were present in 1 c.c. of the ovine strain and 20 lacs of organisms were present in 1 c.c. of the caprine strain.

1. Cattle strain isolated from guinea-pig. No. 39.

(a) Bull No. 97 weighing 259 lbs. was injected with 0.2 c.c. of the above culture containing 12 lacs of organisms on 12-3-56 at 4-15 p.m. The injection was made subcutaneously on the right side of the neck. The bull showed a severe local reaction and developed a big oedematous swelling at the site of injection on the next day. It recorded a maximum temperature of 106.8°F on 14-3-56 and had blood stained diarrhoea the same day. The animal was thereafter off feed, for 4 days and then gradually recovered. Smears taken at the height of temperature either from the auricular vein or from the lesion were negative for Anthrax. The local swelling gradually disappeared and animal came to normal within a week.

(b) Goat No. 98 weighing 85 lbs. was injected on 12-3-56 with the same culture containing 12 lacs of organisms, at 4-20 p.m. The injection was made subcutaneously on the right side of the neck. The next day there was a slight thickening at the site of injection and the animal was dull. The maximum temperature of 101°F was recorded on 13-3-56. On 14-3-56 morning it was found dead, and the blood was positive for Anthrax. There was no nasal discharge.

(c) Sheep No. 99 weighing 60 lbs.

This was injected on 12-3-56 at 4-25 p.m., with the above culture containing 12 lacs of organisms. The injection was made subcutaneously on the right side of the neck. The maximum temperature recorded was 104°F on 13-4-56. There was no local reaction. The animal was found to be feeding till 8 p.m., on the night on 13-3-56. It was found dead on 14-3-56 and the blood was positive for Anthrax. There was bleeding from nostrils and anus.

2. Goat strain isolated from guinea-pig No. 52.

(a) Bull No. 100 weighing 229 lbs. was injected subcutaneously with 0.2 c.c. of the 24 hour broth culture of the above strain containing 4 lacs of organisms at 4-30 p.m., on 12-3-56. The animal developed a slight oedematous swelling at the site of injection, on 13-3-56. The maximum temperature recorded was 105°F on 14-3-56. The animal was dull for 2 days from 14-3-56 and was slightly off feed also. It gradually recovered and was discharged on 24-3-56. Smears examined at the height of temperature revealed no organisms. The reaction noticed in this animal was milder than that in Bull No. 97 injected with the cattle strain.

(b) Goat No. 101 weighing 86 lbs. This was injected with the above culture containing 4 lacs of organisms at 4.35 p.m., on 12-3-'56. The injection was made subcutaneously on the right side of the neck. There was an oedematous swelling at the site of injection on 13-3-'56 and the temperature was 104°F the same day. The animal was feeding but was slightly dull. Blood smears taken at the height of temperature revealed no organisms. It was found dead on the morning of 14-3-'56 and was positive for Anthrax. There was bleeding from the nostrils.

(c) Sheep No. 102 weighing 60 lbs. This was injected with the above culture containing 4 lacs of organisms at 4.30 p.m., on 12-3-'56. Injection was given subcutaneously on the right side of the neck. The temperature was 104.8°F on 13-3-'56 but there was no local reaction excepting a very slight thickening. The animal was found dead on the morning of 14-3-'56 and it was positive for Anthrax. There was bleeding from nostrils.

3. Sheep strain isolated from guinea-pig No. 61.

(a) Heifer No. 103 weighing 248 lbs. This was injected subcutaneously with 0.2 c.c. of the above culture containing 10 lacs of organisms at 4.35 p.m., on 12-3-'56. The injection was made subcutaneously on the right side of the neck. The animal showed a maximum temperature of 105.4°F on 15-3-'56. There was absolutely no local swelling and the animal was quite normal otherwise.

(b) Goat No. 104 weighing 90 lbs. This was injected subcutaneously on the right side of the neck with the above culture containing 10 lacs of organisms. There was a slight thickening at the site of injection on 14-3-'56. The maximum temperature noted was 106°F on 13-3-'56. It died at 3.15 p.m., on 14-3-'56, and was positive for Anthrax. There was no bleeding from nostrils and anus.

(c) Sheep No. 105, weighing 59 lbs. This was injected subcutaneously on the right side of the neck with the above culture containing 10 lacs of organisms at 4.45 p.m. on 12-3-'56. It showed a maximum temperature of 103.4°F on 13-3-'56. There was a slight thickening at the site of injection on 14-3-'56 and the animal was also dull. It died at 3 p.m. the same day, and was positive for Anthrax. There was bleeding from nostrils.

Results

Out of 9 animals injected excepting the three cattle, the remaining six had died two days after injection. Symptoms were almost identical and Anthrax was confirmed in all the six animals.

Discussion :—In cattle, while the bull injected with 12 lacs of the bovine strain reacted very severely with a huge oedematous swelling,

general systemic disturbances and blood stained diarrhoea, the bull injected with the caprine strain (4 lacs) developed only a slight oedema without much systemic disturbance, and the heifer injected with the ovine strain (10 lacs) practically had no reaction, either local or general excepting a rise of temperature. The maximum temperature recorded for the three animals were 108.8°, 105° and 105.4° F respectively. In goats, all the three animals receiving 12 lacs of cattle strain, 4 lacs of goat strain and 10 lacs of sheep strain died showing almost identical symptoms. Similarly in sheep, all the three animals receiving the same dose of cattle strain, sheep strain and goat strain had died showing the same symptoms.

Findings :—From the above experiment, it would appear that :—

(a) 12 lacs of cattle strain can produce a very severe reaction in cattle and is fatal to sheep and goats.

(b) 4 lacs of goat strain produce a slight local reaction in cattle and is fatal to sheep and goats.

(c) 10 lacs of sheep strain produces no appreciable reaction in cattle and is fatal to sheep and goats.

(d) All the three strains invoked a thermal rise in the three species of animals.

GROUP II.

From the previous experiment, it was learnt that while the bovine strain could be fatal to both sheep and goats, the caprine and ovine strain did not even evoke a severe reaction in cattle. Hence, it was further decided to establish this fact on more precise grounds, based on the correct presumption to susceptibility in relation to the body weights of the animals. For this second experiment, an 18 hour broth culture of the above cattle strain was used. This is to ensure maximum growth and virulence.

A tentative count of this culture showed that 1 c.c. contained 7 lacs of organisms. Based on fact that 12 lacs of organisms of cattle strain produced a very severe reaction in cattle, the weight of which was 259 lbs. and killed both sheep and goats weighing 60 and 85 lbs. respectively, a decreased dose of the above culture was given in proportion to the body weight of the animal in order to determine the relative susceptibility of the heterogenous species. Two sheep and two goats were used.

Cattle strain, guinea-pig No. 39.

(a) Goat No. 106, weighing 88 lbs. This was injected subcutaneously with 0.5 c.c. of the above 18 hour broth culture containing 3½ lacs of organisms on 23-3-'56 at 10.30 a.m. The injection was made on the

GROUP IV

The experiment was further continued to find out the lethal dose of cattle strain to cattle by increasing the dose and observing the reaction. Accordingly the following experiment was carried out using 48 and 24 lacs of cattle strain, on two cattle.

Cattle strain guinea-pig No. 39.

(a) Bull No. 112 weighing 275 lbs. was injected subcutaneously on the right side of the neck with 0.8 c.c. of the 18 hour broth culture of the above cattle strain containing 48 lacs of organisms on 26-3-56 at 12-40 p.m. The animal showed a maximum of 106.4°F on 27-3-56 and was very dull. There was a local oedematous swelling measuring 4" x 9" which persisted for 4 days. The animal gradually recovered and was discharged on the 10th day.

(b) Heifer No. 101 weighing 210 lbs. was injected subcutaneously on the right side of the neck with 0.4 c.c. of the above culture containing 24 lacs of organisms on 26-3-56 at 12-45 p.m. The animal showed a maximum of 107°F on 27-3-56 and was very dull and off feed. There was not much local reaction. The animal came to normal by the 6th day, and was discharged on the 10th day.

Results:—Two cattle were used and both of them survived.

Discussion:—From the above experiment, it is seen that cattle strain is not lethal to cattle even in a dose of 48 lacs of organisms.

Findings:—Even 24 to 48 lacs of bovine strain could not prove fatal to cattle.

GROUP V.

Since even as much as 48 lacs of cattle strain could not prove fatal to cattle, another attempt was made to find out the lethal level of the above strain to cattle along with those of sheep and goats on cattle by increasing the dose still further. Three cattle were injected with the three different strains and the results were recorded.

Cattle strain guinea-pig No. 39.

(a) Bull No. 1 weighing 245 lbs. was injected subcutaneously with 15 c.c. of a 24 hour broth culture containing 75 lacs of organisms on 24-6-56 at 4 p.m. The injection was made on the right side of the neck. The animal developed a huge oedematous swelling 8" x 8" at the seat of injection on 27-4-56 and it recorded a maximum of 106.8°F on 26-4-56. From the 26th, the animal was dull and off feed and it died at 1-30 p.m. on 27-4-56. Smears taken at the height of temperature and also from the local oedematous swelling were negative for Anthrax. After death, nasal and anal bleedings were present and the animal was positive for Anthrax.

Sheep strain Guinea-pig No. 61.

(b) Bull No. 2 weighing 240 lbs. was injected subcutaneously with 10 c. cs. of the 24 hour broth culture of the above strain containing 100 lacs of organisms on 24-6-56 at 4-5 p.m. There was absolutely no local reaction. The temperature ranged from 98°F to 103°F till 29-4-56. The animal was feeding quite normally, and showed no symptoms at all. On the morning of 30-4-56 the temperature suddenly dropped down to 95.8°F and in the same evening it rose upto 105.4°F. The animal was a bit dull but was feeding alright. On 1-5-56 morning at 8 a.m. temperature was 101.8°F and the animal even though dull was still feeding. The same day at 1-30 p.m. the animal died. After death, there was bleeding from anus and nostrils. The animal was confirmed for Anthrax.

Goat strain guinea-pig No. 62.

(c) Bull No. 3 weighing 260 lbs. was injected subcutaneously on the right side of the neck with 10 c. cs. of a 24 hour broth culture of the goat strain containing 100 lacs of organisms on 24-3-56 at 4-10 p.m. There was absolutely no local reaction and the animal was perfectly normal and feeding well. The maximum temperature recorded was 104.2°F on 25-4-56 and 104°F on 2-5-56. From 24-3-56 to 2-5-56 the temperature ranged from 96.4°F to 104.2°F. The animal was discharged on the 10th day.

Results:—Out of the three cattle injected with the three strains two died and they were the ones that received the cattle strain and the sheep strain. One animal survived and that received the goat strain.

Discussion:—The above experiment had shown that 75 lacs of cattle strain had killed cattle in 72 hours with marked, typical local and general reaction; whereas 100 lacs of sheep strain injected to another cattle of identical weight size and breed caused its death only after 7 days. During the period of incubation the animal showed absolutely no symptoms. Again the third animal injected with 100 lacs of the goat strain did not show any symptoms whatsoever, and the same was discharged, quite healthy on the tenth day. Thus it is very interesting to note that while a smaller dose of cattle strain can produce death in cattle much earlier, a heavier dose of sheep strain was able to produce death in cattle after a much longer period the disease running a sub-acute course, and the goat strain was practically harmless to cattle.

Findings:—

1. Cattle strain in 75 lacs just proves fatal to cattle and this appears to be the minimum lethal dose.

2. Sheep strain in 100 lacs dose produces only a sub-acute form of the disease in cattle. Hence it is less virulent than cattle strain.

3. Goats strain in 100 lacs dose could not produce any symptoms in cattle. Hence it can be considered as far less virulent or non-virulent to cattle.

GROUP VI

Group V of the experiment had clearly indicated that cattle strain of Anthrax was definitely more virulent to cattle, than either sheep strain or goat strain. It was recorded that 75 lacs of organisms of cattle strain killed cattle in 3 days producing acute symptoms whereas 100 lacs of sheep strains could kill cattle only after 7 days the disease taking a sub-acute course and showing only very mild symptoms, and 100 lacs of goat strain produced absolutely no symptoms in cattle. In this group of experiment it is decided to find out the M.L.D. of cattle strain for sheep and goats and then by giving the same M.L.D. of sheep strain and goats strain to sheep and goats respectively, find out their comparative virulence.

(a) Goat No. 15 weighing 91 lbs. was injected with 1 c.c of a 24 hour broth culture of the cattle strain (dilution 10:1) containing 12,000 organisms on 21-5-56 at 10-20 a.m. The injection was made at the right side of the neck. There was a slight thickening at the seat of injection. The animal was apparently normal and feeding on 22-5-56 evening and a maximum temperature of 104°F was recorded then. The animal was found dead on 26-5-56 morning, and it was confirmed for Anthrax.

(b) Goat No. 16 weighing 93 lbs. was injected on 21-5-56 at 10-25 a.m. with 0.5 c.c of the above culture containing 6,000 organisms. The injection was made on the right side of the neck. There was a slight swelling at the seat of injection. The maximum temperature of 104°F was recorded on 22-5-56. Till 22-5-56 evening the animal was feeding. On 23-5-56 morning at 8 a.m. the animal was very dull with temperature 101.4°F and it was unable to get up. Blood smears revealed the organisms. The animal died at 9-30 a.m.

(c) Sheep No. 17, weighing 70 lbs. was injected with 1 c.c of the above culture containing 12,000 organisms on 21-5-56 at 10-30 a.m. The injection was made on the right side of the neck. There was a slight swelling at the site of injection. The animal was dull on 22-5-56 morning and the temperature was 100.4°F. The same day at 4-30 p.m. it died and was positive for Anthrax.

Sheep No. 18 weighing 66 lbs. was injected with 0.5 c.c of the above culture containing 6,000 organisms on 21-5-56 at 10-35 a.m. The animal was dull on 22-5-56 morning and the temperature was 100.4°F. The same day it died at 1-30 p.m. and was positive for Anthrax. There was nasal bleeding 3 hours after death.

The experiment was further continued to determine the exact M.L.D. of cattle strain to sheep and goats and to find out if this M.L.D. of sheep strain and goats strain is lethal to sheep and goats. This was to find out the comparative virulence of cattle strain, sheep strain, and goats strain to sheep and goats.

Two goats and two sheep were injected with 120 and 60 organisms of the cattle strain and the results are recorded.

(a) Goat No. 21 weighing 95 lbs. was injected with 120 organisms of cattle strain on 26-5-56 at 4-30 p.m. There was appreciably no reaction. The maximum temperature recorded was 103.8°F on 28-5-56. The animal was quite active, on 28-5-56 evening. It was found dead on 29-5-56 morning and was positive for Anthrax.

(b) Goat No. 22 weighing 92 lbs. was injected with 60 organisms of the cattle strain on 26-5-56 at 10-35 a.m. There was absolutely no local reaction. The animal exhibited a maximum temperature of 106.4°F on 29-5-56, and it was also quite lively at that time. The same day at 6 p.m. the animal suddenly died and was positive for Anthrax. The blood picture in this animal was quite normal and the red blood corpuscles were all intact, and not disintegrated as seen in cases of Anthrax;

(c) Sheep No. 23 weighing 73 lbs. was injected with 120 organisms of the cattle strain on 26-5-56 at 10-40 a.m. It recorded a maximum temperature of 104.8°F on 26-5-56. It was slightly dull from 27-5-56 and had slight diarrhoea. The animal was found dead on 30-5-56 morning and was positive for Anthrax.

There was profuse bleeding from the nostrils and anus after death.

(d) Sheep No. 24 weighing 75 lbs. was injected with 60 organisms of cattle strain on 26-5-56 at 10-40 a.m. The injection was made subcutaneously on the right side of the neck. It exhibited a maximum temperature of 104.8°F on 29-5-56. The animal exhibited no other symptoms and it was discharged on the 10th day.

Results :—4 goats and 4 sheep were used of which 4 goats and 3 sheep died.

Discussion :—From the results of experiments it is indicative that the cattle strain of Anthrax is able to kill goats when 60 organisms are injected and sheep when 120 organisms are injected.

Findings :—The minimum lethal dose of cattle strain to goat is below 60 organisms, and that of cattle strain to sheep is between 60 and 120 organisms.

GROUP VII

In group VI of the experiment it was found that 60 organisms of cattle strain were lethal to goats and 120 organisms of cattle strain lethal to sheep. It is therefore tentatively fixed that 60 organisms or below is the M.L.D. for goats and 120 organisms or below is the M.L.D. for sheep. In this group of experiments it was decided to find out whether goats strain and sheep strain equivalent to the M.L.D. of cattle strain to goat's and cattle strain to sheep will be lethal to sheep and goats. If by this it is found that sheep and goat do not die it may be said with considerable certainty that sheep strain and goat strain are less virulent than cattle strain.

Goat strain guinea-pig No. 62.

Goat No. 25 weighing 95 lbs. was injected on 2-6-'56 with 2 c.c.s of a 24 hour broth culture (dilution 10:5 containing) 70 organisms. The injection was made subcutaneously on the right side of the neck. There was absolutely no local reaction and the animal was perfectly alright. It recorded a maximum temperature of 103.8°F on 7-6-'56. The animal was discharged on the 10th day.

(b) Sheep No. 27 weighing 75 lbs. was injected as above with 2 c.c. of broth culture containing 70 organisms on 2-6-'56. Nothing alarming was produced in the animal excepting a thermal reaction on 8-6-'56 of 103.6°F. It was discharged on the 10th day.

Sheep strain guinea-pig No. 61.

Goat No. 26 weighing 95 lbs. was injected with 0.75 c.c. of a 24 hour broth culture of the sheep strain containing 135 organisms. The injection was made subcutaneously on the right side of the neck. The animal exhibited a maximum temperature of 104°F on 5-6-'56. Nothing else was noted, and the same was discharged on the 10th day.

(b) Sheep No. 28 weighing 75 lbs. was injected as above with 135 organisms of the sheep strain. The animal showed a maximum temperature of 103.8°F on 8-6-'56. No other symptoms were seen and the same was discharged on the 10th day.

Results :—Two sheep and two goats were used, and all of them survived.

Discussion :—The dose of sheep strain and goat strain equivalent to the M.L.D. of cattle strain to these species did not prove lethal to sheep and goats. The animals exhibited no symptoms at all, excepting a thermal rise.

Findings :—From the above experiment, it is definitely proved that sheep strain and goat strain of Anthrax are less virulent than cattle strain to sheep and goats.

GROUP VIII

This is the last group of experiments and was conducted to establish that even in higher doses sheep strain and goat strain are less virulent than cattle strain when compared to M.L.D. of cattle strain to sheep and goats. Two sheep and two goats were used for the experiment and 5 M.L.Ds. each of the sheep strain and goat strain equivalent to that of cattle strain was injected.

Goat strain guinea-pig No. 62.

Goat No. 29 was injected on 16-6-56 with 1.0 c.c of a 24 hour broth culture containing 350 organisms. The animal exhibited a maximum temperature of 104°F on 20-6-56 and no other symptoms were seen. It was discharged on the 10th day.

Sheep No. 32 was injected on 16-6-56 as above with 350 organisms of goat strain. A maximum temperature of 104.6°F was recorded on 19-6-56. No other symptoms were noticed. It was discharged after 10 days.

Sheep strain guinea-pig No. 61

Goat No. 30 weighing 95 lbs. was injected on 16-6-56 with 0.5 c.c. of 24 hour broth culture containing 900 organisms. The injection was made subcutaneously on the right side of the neck. A maximum temperature of 103.4°F was recorded on 19-6-56. No other symptoms were seen. The same was discharged after 10 days.

Sheep No. 31, weighing 76 lbs. was injected as above with 900 organisms of sheep strain. A maximum temperature of 103.2°F was recorded on 17-6-56. No other symptoms were seen. On 21-6-56 the sheep died but it was not positive for Anthrax.

Results :—Two goats and two sheep were injected and two goats and one sheep survived. One sheep died but it was negative for Anthrax.

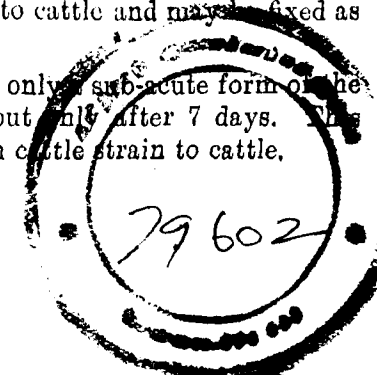
Discussion :—Even with an increased dose of sheep strain and goat strain no appreciable reactions were noticed in sheep and goats. The dose used was 5 M.L.Ds. of cattle strain in the case of goat strain and even more in the case of sheep strain.

Findings :—It is definitely proved that sheep strain and goats strain are less virulent to cattle strain than cattle strain even to sheep and goats.

Summary of Findings

1. 75 lacs of cattle strain is lethal to cattle and may be fixed as the M.L.D. for cattle.
2. 100 lacs of sheep strain produced only a sub-acute form of the disease in cattle. Death was brought about only after 7 days. This shows that sheep strain is less virulent than cattle strain to cattle.

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3. 100 lacs of goat strain could not produce any symptoms in cattle. Hence, it could be said that goats strain is by far less virulent than cattle strain and sheep strain to cattle.

4. The M.L.D. of cattle strain to goats is 60.

5. The M.L.D. of cattle strain to sheep is 120.

6. The dose of sheep strain equivalent to M.L.D. of cattle strain is not lethal to sheep.

7. The dose of goat strain to sheep equivalent to the M.L.D. of cattle strain is not lethal to goats.

8. The dose of sheep strain equivalent to 5 M.L.D.'s of cattle strain to sheep is not lethal to sheep.

9. The dose of goats strain equivalent to 5 M.L.D.'s of cattle strain to goats is not lethal to goats.

Conclusions

From the above experiments it could be now understood that when out-breaks of Anthrax occur among sheep and goats cattle do not simultaneously get because the strain of Anthrax Bacilli in sheep and goats is definitely less virulent to cattle. Regarding sheep and goats not getting the disease when outbreaks occur among cattle should only be reasonably suspected to be due to the other environmental conditions such as the grazing habit of cattle and also the disposal of the carcasses of cattle. It may also be suspected due to the fact that generally in most of the villages cattle graze away from sheep and goats.

The above work has also thrown out the following important conclusions observed in the field in natural outbreaks of Anthrax. These are

1. The sub-acute cases of Anthrax occurring among cattle may quite likely be due to infection by the sheep strain and goats strain of Anthrax.

2. In natural outbreaks it has been recorded in some cases that deaths have occurred among cattle sheep and goats and also human beings and in such cases it is quite likely that the cattle strain which is proved to be very highly virulent may be the cause of the same.

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General Articles

INCIDENCE OF TRICHOMONAS INFECTION IN THE VAGINA OF A COW IN BIHAR

By

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Geographical distribution:—*Trichomonas foetus* which causes early abortion, pyometra and sterility in cattle was recognised early in the 20th century in Europe. Kunstler (1888) in France and Mazzanti (1900) in Italy were the earliest workers to discover the parasite now known as *Trichomonas foetus*. Emmerson (1932) described *T. foetus* and the condition caused by it for the first time in U.S.A. In British Isles the parasite was first described in 1937. Laing (1955) described pyometra in cow due to *T. foetus* infection. Now *T. foetus* is known to occur in cattle in many other countries. In India for the first time Das and others (1956) described the occurrence of *T. foetus* infection in a cow suffering from severe vaginitis.

Trichomonas Infection in Bihar:—A cross-bred cow locally known as 'Patania' breed, aged about seven years, belonging to a private owner was first examined on 12-7-56. She had last calved one and half years ago and was said to have been served by a bull eight months back. It was reported that since then the animal was not coming on heat but whitish discharge from the vagina, for the last three or four months, was noticed by the owner. Examination per rectum revealed both the uterine horns, particularly the right one very much enlarged. The vaginal discharge which was mucopurulent, was examined microscopically for the presence of *T. foetus* but with negative result. The cow was examined again on 30-8-56, and the vaginal discharge was obtained under strict aseptic conditions by massaging the horns of the uterus per rectum. A wet smear preparation was made and examined microscopically on the spot by the first author, and *Trichomonads* moving in zigzag manner were noticed under low power. Under high power the wavy movement of the undulating membrane and the axostyle were partially visible. A sample of the vaginal discharge was sent to the second author for examination and confirmation of the diagnosis. A microphotograph of the living organism was taken (Figure No. 1.) and the following further studies were made by him.

1. Wet preparations of the vaginal discharge were examined microscopically with and without dark ground illumination. The motility was so fast and the flagella so refractile that it was not possible to study all the morphological characters. The parasite was found rotating round and round and progressing forward along an irregular path in a jerky manner so typical of *Trichomonads*.

Staining:—In order to study the morphology and establish its identity, it became necessary to stain the parasite. Staining of the parasite by Leishman's and Giemsa's stain with and without previous fixation by Schaudin's solution were tried but these did not give satisfactory results. So the second author employed other methods to stain the parasite particularly its flagella. The intensified form of the Mercurochrome-Methyl violet stain indicated for staining spirochaetes described by Vago (1953) was tried with successful result. In the smear stained by this method the flagella were visible clearly as seen in the microphotograph and the camera lucidia diagram of the parasite (Figures Nos. 2 & 3). The method of staining adopted was as follows:—

1. Fix the smear of the vaginal discharge for one minute in a solution of acetic acid 1 part, formalin (con) 2 parts and distilled water 100 parts. Smears without fixation also gave equally good results.
2. Stain for 3 to 5 minutes with a 10% aqueous solution of mercurochrome, heated just to the appearance of steam.
3. Wash with water.
4. Stain for 3 to 5 minutes with a similar heating in a 6% aqueous solution of Methyl Violet.
5. Wash with water.
6. Treat for 3 minutes with Lugol's solution (Iodine 1 gm. Pot. Iodine 2 gms. and distilled water 200 c.c.)
7. Wash with water.
8. Drain or blot, allow to dry and examine under oil immersion. The heating during staining and the additional treatment with strong Lugol's Iodine solution which is said to intensify the staining, specially of the refractory bodies, is probably responsible for the successful results obtained by the author in staining the parasite and its flagella. Since the method is a simple and quick one and also, appears very efficient, this can be adopted as a routine one for staining the *Trichomonads*. The parasite and the flagella are stained deep violet.

Morphology:—The parasite is pear shaped sometimes spherical. The one under study is 16.5μ in length and 12μ in breadth. There are three anterior flagella and these originate from the blepharoblast

located in the extreme anterior part of the body. These anterior flagella 12.5μ each in length extend forward as free lashes. The posterior flagellum which is also clearly seen runs along the free margin of the undulating membrane and extends posteriorly as a free flagellum. The nucleus is large oval and located anterior to the centre of the cell. In the above stained specimen, the axostyle is not clearly visible but in unstained living specimen it could be seen extending from the blepharoblast to the posterior end of the cell. The cytoplasm is slightly dense, vacuolated and contained small rounded bodies. From the above morphological features etc., the parasite is indistinguishable from *Trichomonas foetus*.

The following line of treatment was adopted by the first author on 30-8-56.

15 mg. of stilboestrol was injected I/M to get the expulsion of the pus contained in the uterus and about 2 ounces of Lugol's Iodine was introduced into the uterus by the Obel's apparatus. The Lugol's Iodine treatment was repeated on 2-9-56, 4-9-56 and 13-9-56. The examination made on the last date showed that the uterine horns had become reduced in size and the vaginal discharge was thinner in consistency and slightly reddish in colour. The examination of the vaginal discharge carried out on the days subsequent to treatment after 30-8-56, did not show any *Trichomonads*. The cow is still under observation and so far no *Trichomonads* could be found again in the vaginal discharge. The bull, which was said to have served the cow is being traced for examination of its preputial wash to locate the source of infection.

Summary

1. *Trichomonads* indistinguishable from *T. foetus* were detected for the first time in Bihar, in the vaginal discharge of a cow suffering from pyometra.
2. A quick and efficient method of staining the parasite and its flagella is described.
3. Morphology of the parasite is described and micro-photograph and camera lucidia diagram are given.
4. Treatment by introduction of Lugol's Iodine solution into the uterus resulted in the disappearance of the parasite from vaginal discharge.

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TREATMENT OF JAUNDICE IN DOGS WITH AN INDIGENOUS PREPARATION — *LIV. 52

A Preliminary Report.

By

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Introduction

Prevalence of Jaundice is fairly common in almost all domesticated animals. Horses, cattle, sheep, dogs, pigs, and cats show icterus condition as a result of varied etiological factors. An outbreak of Enzootic toxemic jaundice in cattle and sheep was reported from Australia by Rose & Edgar (1936). Icterus Neonatorum has been seen in young calves and foals during first few days of birth. Catchpole (1949) has recorded an outbreak of *Leptospira Icterus* in Silver foxes. Malignant canine jaundice due to *Piroplasma canis* and *Leptospira icterohaemorrhagica* (Weil's disease) has been recorded in some countries, though very rarely in India. Jaundice due to other causes in dogs is often seen in Bombay state. Though some literature is available about

* LIV. 52 is a product of the Himalaya Drug Co. This project was partly supported by the Himalaya Drug Co.

jaundice in dogs, in India, the need for systemic planned work on canine jaundice, with detailed laboratory investigation and etiological classification is keenly felt. Catarrhal, hepatogenous, toxæmic, infective, malignant, obstructive and haemolytic forms of jaundice are of usual occurrence in dogs. False jaundice or pseudo-jaundice occurring in some animals due to feeding of particular green plants which contain colouring substances such as Lutein is not commonly seen in this country.

Results of treatment in absence of etiological diagnosis have been very poor, the mortality being nearly hundred percent. The present work was undertaken to observe the effects of an Ayurvedic preparation (Liv. 52) which was favourably reported in treatment of human cirrhosis by Sule *et al* (1956). Cases of jaundice referred at Bai Sakarbai Dinshaw Petit Hospital for Animals, Bombay-12, between June 1956 and December 1956 were treated with Liv. 52. No attempt has been made to diagnose the type of Jaundice at this stage.

Materials & Methods

Twenty-six dogs suffering from Jaundice admitted to Bai B.S.D.P. Hospital between June 1956 and December 1956 were taken up for this study. The age varied from 4 months to 6 years and they belonged to different breeds such as, Spanials, Bull-Terriers, Alsations and some of mixed breed.

A careful clinical examination of each dog was done and depth of icterus, and colour of stool and urine, were noted. Body weight and body temperature were recorded. Blood was collected for Icteric Index determination, both before and after treatment. Liver biopsy was done in a few cases. Clearance of icterus from mucous membranes and gain in appetite was noted from day to day. Autopsies were performed in 10 cases.

Liv. 52 was administered orally as powder in the dose of 200 mg/kg of body weight divided in three daily doses. The drug was continued on an average for about two weeks. In addition, the dogs received intravenously 25% glucose saline and 5 cc of Redoxon Forte (Vit. C. 500 mg.) for a period of 10 to 14 days. Vit. B complex was given orally or injected daily.

All the dogs were kept on a diet of raw meat juice, bread, cooked meat and sugarcane juice. Synthetic protein was added to the diet. Fats and fatty foods were not allowed.

These dogs were taken out for stroll twice a day to enable them to empty bowels and bladder. Whenever necessary treatment for intestinal worms was administered.

Cured cases are kept under regular periodic observation.

Progress and Results

Out of total 26 cases of Jaundice, 14 died within seventy-two hours of admission. Remaining 12 cases cleared up of Jaundice completely in an average period of two weeks and are in normal health till now.

On admission most dogs were in deep state of icterus with highly coloured urine. Body temperature was normal in most cases, except in two, where it was found to be subnormal. There was much variation in regard to colour and consistency of stools, e.g. slate coloured, yellowish with streaks of blood, dark yellow, black and in some cases liquid with mucus. On admission most of the dogs had aversion to food, and five of them showed tendency to vomit. One dog had chorea, probably as a sequence to previous attack of distemper. Chorea, persisted even when Jaundice cleared up.

Icterus index of blood varied between 50 to 100. Examination of urine for *Leptospira* was carried out in some cases, with negative results.

The mucus membranes started clearing up of this icterus condition, within 4-5 days of commencement of treatment and cleared up completely within 10 to 14 days, the appetite improving simultaneously the icterus index also returned to normal. Total duration of stay in hospital was about two weeks.

Fourteen cases died within 72 hours of commencement of treatment. After 72 hours there was no mortality. Autopsy was performed in 10 cases and findings are summarised in Table I.

TABLE I
Autopsy record of 10 cases.

No. of Dogs	Autopsy findings
1	Intussusception.
2	Heavy intestinal parasitic infection.
2	Acute gastro-enteritis.
1	Haemangioma of liver.
2	Duodenal ulcers.
1	Abnormal enlargement of spleen.
1	Foreign body.

Discussion

Treatment of Jaundice in dogs would be more rational, if the cause of jaundice could be determined and cases could be observed from the early onset. But usually dogs are brought to the veterinarian when the icterus condition of mucus membrane and skin is un-mistakably seen by their owners. By this time the disease is fairly well advanced. Early symptoms, such as rise of temperature, rigors, scratching and high coloured urine are often missed. There are very few reports available of detailed laboratory investigations and liver biopsy studies which would help to determine the cause of jaundice prevalent in dogs here. On an average 40-50 dogs suffering from jaundice are admitted every year at B.S.D.P. Hospital in Bombay. The total average number of dogs admitted at this hospital per year is 1800. There is no particular seasonal incidence and no epizootic is recorded in last 3 years.

One of us (G.R.M.) has not come across any case of gall stones in dogs, during last 10 years of hospital practice. No cases of jaundice due to *Leptospira* or *Piroplasma canis* has been recorded since 1953. In our series, autopsy in ten cases showed varied causes of death (Ref. Table I) like duodenal ulcers, acute gastro-enteritis, haemangioma of liver, foreign body and heavy parasitic infection. All the 14 deaths occurred within seventy two hours of admission.

Treatment so far has been very unsatisfactory. The usual symptomatic line of treatment with diet restriction, multiple vitamins, choline, methionine etc. was followed, but the results were unfortunately bad. During 1953, 42 cases were admitted with jaundice, with no survivals (Table II). In 1954, 36 cases were admitted with 100% mortality. In 1955, 38 cases were admitted with similar results. More than 50% of these cases died within 72 hours of admission. The rest died within 4 to 5 days of admission. From June 1956 to December 1956, twenty-six cases of jaundice were admitted. These cases resembled in their general pattern and severity the cases admitted during last three years. All these cases were treated with Liv. 52 orally in addition to routine systematic line of treatment outlined above. Fourteen dogs died within 72 hours of admission. Twelve survived and were normal in about two weeks and have retained normal health without any recurrence of Jaundice till now. One cat was admitted with jaundice and treated successfully with Liv. 52.

TABLE II

Year	No. of cases admitted	No. of cases died within 24 to 72 hours	No. of cases died after 72 hours	No. of cases cured
1953	42	22	20	—
1954	36	24	12	—
1955	38	20	18	—
1956 7 months	26	14	—	12

Liv. 52 is an Indigenous preparation of the following composition :

Capparis spinosa	Terminalia arjuna
Cichorium intybus	Achillea millefolium
Solanum nigrum	Tamarix gallica
Cassia occidentalis	Mandur Bhasma

Favourable clinical results in human jaundice treated with Liv. 52 were reported by Sule *et al.* (1956). These results induced us to try this drug in canine jaundice. No attempt has been made to establish a diagnosis of the cause of jaundice in this series. But it is of interest to note that in the cases where Liv. 52 was added to the routine treatment, the mortality was only 53.8%. In 14 cases which died, autopsy in 10 cases showed probable cause of death other than jaundice, (Table I) and in these cases jaundice was probably a secondary manifestation. It is difficult to decide whether the pattern and cause of Jaundice in the cases reported in this series was identical to the patterns observed in previous three years. The diet, general care and supportive treatment have been same in last three years and the only change made in this series was addition of Liv. 52. The reduction in mortality from 100% of previous three years to 53.8% in cases treated with addition of Liv. 52, has encouraged us to publish this preliminary report. Further detailed work with adequate laboratory investigation and liver biopsy studies and control studies is under progress and will be reported later.

Summary

1. Twenty-six cases of jaundice in dogs were treated orally with Liv. 52.
2. Fourteen cases died within 72 hours of admission.
3. Twelve cases recovered completely and have remained normal till now.
4. In comparison to 100% mortality of dogs suffering from Jaundice during last 3 years, a decrease in mortality to 53.8 after introduction of Liv. 52 as a part of treatment seems fairly promising.

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SUCCESSFUL CHEMOTHERAPY OF AVIAN PASTEURELLOSIS (FOWL CHOLERA) WITH SULPHAMEZATHINE 16% SODIUM SOLUTION *

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Introduction

It is opined that the incidence of Fowl Cholera (F.C.) is uncommon in India, and what was previously mistaken for F.C. were all outbreaks of New-castle disease (N.D.), which lacked laboratory diagnosis. This was to a large measure true some time back, but with the currently used accurate methods of diagnosis for both, and an unfailing prophylactic vaccination against N.D., outbreaks of F.C. are less likely to be confused for N.D. The annual reports of Poultry Research Division, Indian Veterinary Research Institute, over several years show that F.C. exists in chicken flocks, exhibiting both morbidity and mortality, and worse still, after an ephemeral attack, insidious 'carrier' condition occurs in some birds, which later gives rise to a general burst up when birds are subjected to physiological stress, as in summer followed by monsoon rains.

Literature

"Biological measures for prevention and control of fowl cholera have so far proved unreliable and unsatisfactory, other measures pertaining to the protection of the flock must be adopted" states Charless Murray (1948). De Volt (1948) reported that mortality due to

* Paper presented in the Section of Medical and Veterinary Sciences of the 42nd Session of the Indian Science Congress, 1955, *vide*, proceedings.

experimental fowl cholera was reduced from 93 to 16% in Sulphathiazole treated groups, in 2, 1, and 0.5% concentrations as compared with the controls showing 85% deaths. In three Turkey flocks the drug was fed at a level of 1% and losses stopped in 3 to 4 days and the disease did not recur. When the drug was fed in mash at 0.5% level in two chicken flocks where the disease was chronic, the losses were prevented but appeared again in a few days in both groups after medication was stopped. Peterson (1948) fed several sulpha drugs in different concentrations in the mash and inoculated *Pasteurella aviseptica* in 4-6 week old White Leghorn chickens using 10 birds in each group. He found Sulphamezathine and Sulphaquinoxaline most effective. The former at 0.2% and the latter at 0.3% levels in mash reduced the mortality to zero in 49 hours. Delaplane and Higgins (1948) found prolonged dosing with Sulphaquinoxaline in the mash at 0.33% level checked effectively the respiratory form of fowl cholera but it did not prove effective under field conditions once the disease got a hold in the flock. In a brief report Kiser *et al* (1947) stated that 0.5% Sulphamerazine in the mash and at 0.1% level in drinking water lowered the mortality in experimental fowl cholera by 50-85%, while in a natural outbreak involving 27,600 birds mortality was lowered by 50-70% by intermittent dosing to permit development of resistance.

Experimental

In one of the experimental reserve flocks on a hill station, a severe outbreak of fowl cholera occurred in a mixed lot of 64 cockerels of White Leghorn and Rhode Island Red breeds of about six months of age. The mortality was low, birds dying in twos and threes daily. The disease was diagnosed as Fowl cholera, by cultural and biological tests.

The pen containing the remaining 59 birds, after a loss of five birds in two days, was partitioned with wire-net with 49 birds in three quarters of the pen and ten birds in the rest. No attempt was made at disinfection or sanitation except the routine cleaning of the litter by the same attendant. Sulphamezathine 16% Sodium solution (I.C.I), the only Sulpha drug which was readily available was dosed in drinking water at 0.2% level (1 in 80) to the larger lot for three days with a break of one day and continued for another three days. Deaths ceased after a loss of two more within 24 hours and did not recur, while in the control pen of 10 birds a 100% mortality was recorded within the course of 4 days. The treated lot was under observation for only six weeks, (*vide table*).

In another uncontrolled experiment in a pen of 51 layers in their pullet year, eleven suspicious cases of yolk peritonitis occurred within a fortnight. Early cases passed muster as sporadic due to non-specific causes, but the increasing tempo of mortality necessitated a bacterio-

logical investigation. A scrutiny of the records showed that 57 days previously a natural outbreak of fowl cholera had occurred in this pen but had been controlled promptly by Sulphamezathine at 0.2% level for 3 days in drinking water. Examination of the blood smears from dead birds showed no bipolar organisms and heart blood cultures failed to prove pathogenic to rabbits. Subsequent culturing, however, from discoloured ova from fresh cases and biological tests confirmed the condition to be due to pasteurellosis. A second time Sulphamezathine was dosed in the same strength as previously (0.2% level) but continued for 6 days with a break of one day in the middle. The yolk peritonitis due to pasteurella ceased altogether ten days after the commencement of the treatment and did not recur later.

Discussion

In our experiments Sulphamezathine has been found to combat fowl cholera outbreaks successfully both in acute and chronic forms. In our first experiment it was not possible to observe whether a carrier condition occurred after dosing and/or insufficient dosing of the drug. Our second experiment suggested a possibility of the disease becoming latent when the dosing was carried out for insufficient number of days, but a subsequent regular course of treatment on the recurrence of the disease controlled it effectually, presumably the organisms not having become drug resistant.

TABLE

Showing mortality record in a Sulphamezathine dosed and a check pen in a natural outbreak of Fowl Cholera.

Fowl Cholera contact infected pens.			
No medication check-pen, 10 infected birds.		Sulphamezathine 16% Sodium solution dosed to 49 infected birds at 0.2% level.	
Hours	Deaths	Hours after dosing	Deaths
0	0	0	0
12	1	12	2
24	3	24	0
36	2	36	0
48	2	48	0
72	1	72	0
90	1	90	0
90 hours 100% deaths in 90 hours.		No deaths were recorded 24 hours after dosing.	

Summary

Fowl cholera occurs occasionally in chicken flocks in the Indian Union exhibiting both morbidity and mortality. Chemotherapy with Sulphamezathine, 16% sodium solution at 0.2% level of Sulphamezathine in drinking water, proved successful in controlling both acute and chronic forms of fowl cholera when dosed continuously for 6 days. An incomplete course of 3 days medication in an acute form of the disease resulted in a residual 'Carrier' infection and yolk peritonitis, which was however controlled by a subsequent regular course of treatment.

Acknowledgment

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INFERTILITY IN BUFFALOES AS A RESULT OF ABSCESSSES IN THE VAGINAL PASSAGE

By

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The occurrence of abscesses in the vaginal passage is rare. Abscesses of various sizes are reported to have been observed, but serious complications thereby resulting in infertility or sterility have not been recorded. Abscesses blocking the entire calibre of the vaginal passages are not on record. Howsoever large, they are usually adherent to one surface and break at the tender spot on the mucous membrane. Abscesses usually result as a sequelae to injury to the mucous membrane during vaginal examination either due to bad finger nails of the operator or due to faulty and forceful introduction of speculum and subsequent infection. Abscesses, due to foreign bodies have also been recorded but

• none resulting in infertility or sterility. Injury due to pointed glass inseminating pipettes or metal catheters is also likely and may result in abscess formation. Severe laceration during labour also results in abscess formations. All such abscesses usually terminate after they ripen and burst and the local infection clears up after irrigation with antiseptic solutions or use of antibiotics.

Two cases of vaginal abscesses resulting in infertility and subsequent discarding of the animals were recently detected. The details of which are as under :—

CASE No. I

Owner :—Not known. (The animal waiting for slaughter at the Bandra slaughter house near Bombay).

History :—No previous history except that the cattle contractor reported that the buffalo is sold to him by the owner on the ground that she is sterile.

Species :—She buffalo.

Breed :—Murrah.

Age :—About 8 years.

Body weight :—1200 lbs. approximately.

General condition :—Very good.

Condition of the Genitalia :—On rectal palpation of the genitalia it was revealed that at a very short distance of about 4", there was a distinct doughy swelling that of the size of a small cocoanut (3½" long—5" broad) slightly pointing towards extremities. There was a clear space anteriorly of about 4", and the cervix was clear and distinct. Palpation also revealed that at the site of the swelling, the vaginal passage was completely involved and no loose folds could be palpated to say that the vaginal passage is clear. Examination of the vaginal passage revealed that fingers could be introduced hardly upto 4" to 5" and further only a hard cicatrix blocking the passage could be felt. The genitalia was collected after slaughter and the postmortem findings were as under :—

The condition and size of the genitalia was suggestive that the buffalo must have had 3 to 4 lactations. The weight of the entire genitalia was 1900 gms. (including abscess).

On palpation of the doughy swelling, a distinct fluctuation could be felt. On opening the genital passage from vulva onwards it was found that the swelling was clear of the suburethral diverticulum and a tough cicatrix could be seen in the centre, where the vaginal passage was

blocked, and even forceful attempts with fingers to make way forward failed to enucleate the hard tissue. On opening the swelling proper a frothy liquid of greenish yellow colour with very foetid odour spurted out. The quantity was approximately 8 to 10 ozs. On careful examination, it was noticed that the vaginal passage itself has acted as a sac for accumulation of pus and another hard cicatrix was observed at the anterior end of the abscess. There was no discharge accumulated in the anterior part of the vagina nor there were any signs of inflammation either of the vagina or cervix. The anterior third of the vagina measuring about 3" was quite clear. It was observed that between the two cicatrices the whole of the middle third of the vagina was imprisoned with the consequence that the continuity of the passage was broken resulting in infertility. Slight inflammation of the posterior third of the vagina was noticed with granulations, scattered here and there. The cervix and the uterine cornua were clean and fallopian tubes patent. Ovaries were found to be normal, with a persistent corpus luteum on the Rt. ovary.

The report on material forwarded for bacteriological and pathological examination is as under:—

"On bacteriological examination of the pus, a strain of *pseudomonas pyogenus* and *corynebacterium* could be isolated; while on microscopical examination of the pus smear, gram positive micrococci could also be detected.

Section from vaginal wall does not show presence of epithelial layer which is probably desquamated. The sub-epithelial layer shows excessive infiltration of inflammatory cells which are predominantly lymphocytes and large monocytes."

CASE No. II

History:—Similar to case No. I. (Animal waiting for slaughter at the abattoir at Bandra.)

Species:—She buffalo.

Breed:—Murrah.

Age:—About 7 years.

Body weight:—Over 1200 lbs. approximately.

General condition:—Very good.

Results of examination on palpation per rectum:—Similar to case No. I except that the size of the swelling was a bit small—3" x 4½".

Post-mortem findings:—Similar to case No. I except that there was severe vaginitis in the posterior third. Area round about clitoris and the ventral surface of the vagina and commissures of the vulval lips

were studded with granulations. The weight of the entire genitalia including the abscess was 1670 gms. Persistent corpus luteum on the Rt. ovary was present.

Bacteriological and Pathological findings:—Similar to case No. 1.

Discussions:—In both the cases cited above, it is observed that the entire middle third of the vagina was blocked anteriorly and posteriorly by cicatrix formation. The question arises as to how these cicatrices have formed with subsequent closure of the entire passage. No doubt it is primarily due to vaginitis, most probably as a result of "Phooka" the anterior cicatrix must have formed first and the posterior later on. (As is well known this malicious practice of "Phooka" is caused by various means like blowing in of air, insertion of irritant powders of various types and insertion of the tip of the tail. In this particular case it is suspected to have been due to insertion of rough shaven tip of the tail). With ultimate blockage, the effete material got imprisoned. On account of the induration, the vaginal wall was found to be very thick. It is surprising how no infection was present in the anterior third of the vaginal passage and the cervix. This is the only possible explanation the authors can offer in these cases. The damage to the entire middle third of the vaginal wall was extensive and it is doubtful if recovery could have been effected by puncture of the abscess or even after cutting the cicatrix. Both the animals were exceptionally in good condition and had healthy genitalia, and had it not been for this condition, the animals could have served for few more lactations. In both the cases, no idea could be had about the internal damage from the external appearance of the genitalia which only showed swelling of the vulval lips and slight inflammation of the vaginal passage after dilating the vulval lips. One may be inquisitive to know that when the genitalia was normal in both the cases, question arises as to what may have happened to the oestrus flow at each cycle. The only probable explanation that may be offered is, that in both the cases there was presence of persistent corpus luteum and as is usual with the buffaloes it is evident that both the buffaloes were in the prolonged lactational dioestrus period. This evidently indicates that while selecting animals, a thorough check up of genitalia is necessary. While palpating genital organs per rectum, such large full blown abscesses in the vicinity of bladder may mislead the examiner in that it may give impression that of a distended urinary bladder. All such swellings if located in the vicinity of the bladder should therefore be well palpated to ascertain the exact structures involved, and in all such cases vaginal passage should invariably be examined by means of a speculum. It is a pity that such valuable animals should be damaged by such malicious means with the greed to obtain more milk. It is ultimately a national loss. The owners could certainly

have avoided loss of this nature if they could have kept the practice of getting their stock examined from time to time by Veterinary Surgeons. By regular sexual health control measures this could have been detected early and by necessary timely measures the loss could have been prevented and the animals brought to their normal reproductive function. This is the first time cases of this nature have been seen and since there were no such cases on record, special mention of these have been made with a view to enlighten the Veterinarians and caution them against such likely conditions which may lead to infertility and if not attended to in good time, to sterility.

Summary

Two cases of vaginal abscesses blocking the entire middle third of the vagina have been placed on record. Such cases have not hitherto been recorded. It is discussed how infertility has resulted as a sequelae of this and even though the rest of the genitalia *i.e.* ovaries, fallopian tubes, uterus and cervix were normal the animals had to be discarded as a result of late detection. It is discussed how timely sexual health control will help in early detection of such cases and thus the colossal loss that is being caused to livestock industry as at present can be well avoided.

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AN UNUSUAL RECORD OF GUINEAWORM FROM *BUFO MELANOSTICTUS* IN ASSAM

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The occurrence of Guinea worm (*Dracunculus medinensis* Lin, 1758 and *D. insignis*, Leidy, 1858) is quite common in man, dog, horse and reptiles (*Varanus sp.*). But so far there is no record of its occurrence in birds, amphibians and fishes. A species *Ichthyonema cylindraceum*, (Ward and Magath), has been recorded from the body cavity of a Teleostean fish in North America. In India there are no such records.

About 12 adults and 3 young female parasites were recovered from the body cavity of a toad during a parasitological examination. They were found clinging to the visceral peritoneum covering the duodenum in clusters. The study of the worms was made and following features were observed.

Length 38 mm. to 44mm ; Thickness :—0.45 mm. to 0.58 mm.

Anus, vulva, vagina atrophied. Body delicate, semi-transparent, and very fragile. The main bulk of the worms was occupied by a greatly distended uterus ; filled up with spherical undeveloped ova, 0.04 mm. in diameter. In few specimens uterus burst through the body wall few millimeters (1.28 mm.) behind the anterior end. The tails coiled ventrally and terminated in a small conical process. Oesophagus cylindrical 1.08 mm. long $\times$ 0.07 mm. No lips and papillae were seen. Breadth of the intestine 0.18 mm. Breadth of the gravid uterus 0.34 mm.

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Clinical Article

CLINICAL SYNDROME OF A BOVINE DISEASE SUCCESSFULLY TREATED WITH PROMETHAZINE HYDROCHLORIDE

By

LILARAM BORA, B.Sc., Vet. (Hons.), M.R.C.V.S., P.G.,

Professor of Medicine, Assam Veterinary College, Gauhati.

Following continuous and heavy rains in the months of May and April 1956 a number of cases (bovines) exhibiting a peculiar but typical clinical syndrome were presented for treatment at the College Hospital. The clinical symptoms of the disease and the successful treatment of the same with Promethazine Hydrochloride (Phenergan M. & B.) are recorded below :—

History and symptoms :—Animals were observed by the owners to be suddenly ill. On clinical examination they appeared very dull with staring coat. Complete cessation of rumination; bowels were highly constipated and urination was almost nil. Respiration was hurried and shallow. Pulse was quick, strong and full. Above all, the peculiar but characteristic symptoms observed in all the cases were the hot and painful oedema of the eyelids, ears and the region of the dewlap. In most of the cases the extremities were also swollen with lameness in in some. Some animals were found to shake their heads frequently as if to get rid of something.

Microscopical examination of blood smears did not reveal any infection either parasitic or bacterial.

Treatment :—Except one case (case No. 75) which was brought in *extremis* the rest were treated with Promethazine Hydrochloride. All of them responded remarkably well and their recovery was quick and uneventful.

Details of cases with reference to their symptoms, treatment etc., are shown in the following table.

Serial No.	Description of the animal.	Date of admission.	Symptoms and other recorded observations.	Treatment adopted.	Remarks.
1	Heifer-calf, (Non-descript; 2½ years, Case No. 50).	30—4—56	Extremities oedematous hot and painful; oedema of eyes, ears and dewlap. T. 103.8° F. P. 96 per minute.	6 ccs. of Phenergan (2.5%) I/M. and 50 ccs. of 40% Cal. Boro-Gluconate S/C.	Animal was normal the next day.
2	Bull-calf, (Non-descript 2 years, Case No. 65).	6—5—56	Symptoms as in the previous case with lameness of the forelegs. T. 104° F. P. 94 per minute.	3 ccs. of Phenergan I/M.	do.
3	Heifer-calf, (Sindhi-cross 11 months Case No. 72).	15—5—56	As in the previous case. T. 104.4° F. P. 88 per minute.	3 ccs. of Phenergan I/M.	do.
4	Bull-calf, (Non-descript 2 years, Case No. 79).	19—5—56	As in the previous case; the joints of the forelimbs were distinctly swollen; pre-scapular, supra-scapular and pre-cubital lymphatic glands were greatly enlarged. T. 104.4° F. P. 84 per minute.	4 ccs. of Phenergan I/M. 25 ccs. of 40% Cal. Boro-Gluconate S/C.	do.
5	Heifer-calf, (Sindhi-cross 2½ years, Case No. 80).	24—5—56	Oedema of eyes, ears and dewlap present; skin lesions resembling insect bites were seen T. 103.6° F.	4 ccs. of Phenergan I/M.	Animal normal after 48 hours.
6	Heifer-calf, (Sindhi-cross 2 years, Case No. 75).	17—7—56	The animal was brought to the hospital in <i>extremis</i> after being ill and treated for 8 days at home. Oedematous swellings of eye-lids, ears and dewlap were cold to touch.	nil.	Animal died the same after noon.

Discussion

Clinical syndrome presented was of an acute nature and almost identical in character. Their remarkable response to treatment with Promethazine Hydrochloride makes one to suspect that the condition may be due to release into the system of excessive histamines or histamine-like substances.

In equine medicine diseases like Purpura Haemorrhagica, Laminitis, Monday Morning Sickness and Azoturia are commonly known

to be due to the effect of histamine production. In bovine medicine no such clear-cut clinical entity is linked with the liberation of histamine though certain types of bloats and laminitis have been treated successfully with anti-histamine drugs.

Acknowledgment

My thanks are due to the Principal Sri J. M. Buzarbarua for his kind permission to keep these cases on record.

REFERENCE

British Veterinary Codex-1953.

News and Views

Dairy Science College:—The Government of India have advertised that a Dairy Science College is to be opened at the National Dairy Research Institute, Karnal (Punjab), on the 15th of July 1957. The course is for 3½ years and will be equivalent to a degree standard. The College will be ultimately affiliated to a University. This is happy news indeed as it is the first time when a course of studies in Dairying equivalent to a degree standard is to be instituted in this country. We would have preferred a more central place like Anand, Aarey or Jabalpur to attract students from all parts of the country. We look forward to the rectification of this error in the wake of experience of the working of this new College.

Electrocardiograph in Racing:—The Sunday Standard of Bombay, dated 3rd March 1957 has the following interesting account:—

“Mr. J. D. Steel, an Australian Veterinary Surgeon, who attended a recent Science Congress in New Zealand, has developed a method of determining the worth or otherwise of a horse by means of an electrocardiograph examination. After a long period of trial and error Mr. Steel has worked out a “score card” based on the examination.

The score runs between 86 points and 146. Below 86 the horse can be counted out. The best horses are those which score 120 or higher.

Mr. Steel has an example of a horse with a score of 130 which contested in more than 40 races and won on an average of £950 on each start.” No other details.

Fellowship in Agricultural Research:—The Indian Council of Agricultural Research has decided to offer in 1957 two senior Fellowships

and two Junior Fellowships of Rs. 200 each and Rs. 150 each per month respectively in 12 branches of Agriculture. They include Dairying and Animal Husbandry also. Let the profession note this.

Shri J. F. Patel, B.Sc., (VET.) Hons., M.R.C.V.S.:—We are glad to note that Shri J. F. Patel of Nadiad, Bombay State, returned recently from abroad. He took his B.Sc. (Vet.) degree with honours from the University of Bombay in 1953. He served for some time as Artificial Insemination and Veterinary Officer at Anand Milk Union. He left India in October 1954 for U.K., and joined the Glasgow Veterinary College and took his M.R.C.V.S., in June 1956. Then he undertook a study tour in Britain itself and returned home on 24th May 1957. We wish him all success in life!

Shri C. G. Bhasker, B.V.Sc., M.R.C.V.S.:—Yet another officer to return from abroad after taking his M.R.C.V.S. is Shri C. G. Bhasker. He is posted as Lecturer in Bacteriology, Andhra Veterinary College Bapatla. We wish him all success in life!

In a personal communication Capt. Will Judy, Editor of ‘Dog World’ writes to us:—“I have just returned from judging three Dog Shows in India—Calcutta, Bombay and Bangalore. I had the honour and pleasure of addressing the student body of the Bombay Veterinary College on the Modern Technical Management and Care of Dogs. I was pleasantly surprised with the appreciation of good dogs for type at these Dog Shows. Also I found that the dog fanciers and dog breeders clearly had a knowledge of what is required to keep a dog in good physical condition”. That is a good ‘chit’ from a great authority.

Milk Supply in Bombay:—The Bombay Government has decided on starting a second Milk Colony for Bombay City at an estimated cost of Rs. 4.5 crores.

The Aarey Milk Colony at present handles about 4,200 maunds of milk daily and about 15 lakhs consumers are catered for under the scheme.

The new Colony is to be built well outside the limits of Bombay island.

It is explained that there has been an unrestricted expansion of cattle stables in Bombay suburbs and it was causing pressure on the limited resources of grass, water, rail transport and other available services. The reorganisation of milk supply in the City, the authorities feel, would not be complete until the remaining cattle and the quantity

of milk sold to the public are brought under Government control. This is sought to be achieved by removing the cattle from private stables and accommodating them in the second milk colony.

The dairy farm units proposed to be constructed at the second Milk Colony may not follow the pattern of Aarey Colony. It is proposed to keep the milking, dry cattle and the young stock all in one unit and avoid the "floating herd" as at Aarey. "Hindu" 27-6-57.

Block Development Corner

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

DUCK REARING IN KOLLERU AREA

By

ABDUL KHADDAR,
District Veterinary Officer, Eluru.

and

Y. V. SUBBA RAO,
Veterinary Assistant Surgeon, Akiividu.

Introduction:—In recent years, duck rearing on a fairly large scale has developed in and around the Kolleru lake area of the West Godavary District in Andhrapradesh. Conditions best suited for this industry do no doubt exist in this area and the ryots have not been slow to take advantage of the growing demand for duck eggs in restaurants, bakeries and confectionaries, at Calcutta, Hyderabad, Bombay, etc. With the result, a regular trade has been built up and probably with a few more facilities granted, the trade is likely to assume great proportions.

To start with there were a few professional duck keepers who moved from place to place trading in eggs and when they found that the demand for duck eggs was increasing by leaps and bounds, they roped in a few of the local ryots to take to duck-rearing and supplying them with eggs. This in turn brought in acute business men who advance money for the trade or arrange to supply ducks on a credit system and recover the cost by way of eggs sold to them at a concessional rate. The ryots soon realised that it was a profitable trade in spite of the activities of the middle-men and they have now developed it as a major cottage industry in this area.

Description of the area and seasonal migrations:—Kolleru lake is more a shallow water basin, nearly 161.2 square miles in area and 56.8 miles in perimeter, serving to receive all the storm water from the surrounding high-level areas from June to November, when there are torrential rains in this part of the country. A small rivulet Upputeru begins to serve as a drainage channel to drain off this accumulated water into the sea. Even so, the lake is too deep with water till the end of January and as such is unfit for duck rearing then. But from February to May, when there are no rains, the lake gets dried up except for small water channels of 20 feet width and some water logged slushy areas, so ideal for ducks to get their food of animal origin such as snails, crabs, small fish, earth worms, etc. This is the peak season for ducks to thrive in this area but when once the rains start in June, they move towards the villages and try to depend on what they could pick up in fields and channels and what the duck-herds provide as scanty grain ration which is anything but satisfactory. The ducks are found at this part of the year very weak and debilitated and mortality is high. The out-put of eggs is naturally very low. This goes on from the latter half of June to September every year. From October onwards, short-term paddy is harvested in villages and the paddy fields with their shed and immersed grains and animalcules are available for these ducks and they begin to re-condition and lay eggs in plenty. They retreat again to Kolleru lake in February for their sustenance.

Management Practices:—Flocks of ducks from four to five hundred in strength are maintained by each duck-keeper. Birds of six to eight months of age are obtained from places like Kanchipuram, Tiruttani, etc., in Madras State at a cost of about Rs. 325 per hundred birds. Ten Drakes are maintained for every 100 ducks for breeding purposes. They begin to lay at the age of about six months and continue to be productive till 3 or 4 years of age unless otherwise disposed of. The duck-keepers claim that these ducks lay continuously for 3 months at a time and then break off for a month. Thus there are nine months of laying season and 3 months of non-laying season in a year and the average claimed is about 200 to 250 eggs in a year by each bird, which is far above the average computed for the whole of India. It would be interesting to verify this claim under proper control and checking.

These ducks are penned at night in a coir-net fencing yard measuring about 12 feet long, 12 feet broad and 2½ feet high. This provides space for nearly 500 ducks. They are given some paddy grains as feed. These birds start laying eggs at about midnight with 'Quack' 'Quack' sound and continue laying till day-break when they are let out and the eggs are collected and stored until the egg collectors come and take delivery of them. Each egg weighs from 3 to 5 ounces and

the average may roughly be put down as four ounces. The eggs are sold at Rs. 6/- per hundred to the egg traders. The local residents buy them at one anna each. Culled out ducks are sold at Rs. 125/- per hundred for table purposes. A section of the people at Delhi, Bhadrachalam, Vijayawada, Srikakulam and Rajahmundry is habituated to consume duck eggs.

Feeding:—Grain feed mainly consisting of paddy is given three times a day - at 7 A.M., 3 P.M., and 7 P.M. - at the rate of 4 seers for five hundred birds. This is in addition to what they pick up in shallow ponds and slushy soil. In sandy soils, the seeds of grass locally known as *Udaginjal*, are said to increase egg-production and give a lot of vim and vigour to the birds. During non-laying season, grain feed is given only once a day or none at all.

Breeding:—This area has concentrated its attention only on egg-production and trade, with proper feeding and management and has not cared to try any breeding operations. No hatching and rearing of ducklings is undertaken. There is a feeling that ducklings reared in this area do not thrive well; but this needs proper trial and confirmation. Duck eggs hatch in 28 days.

Moulting:—These ducks moult twice in a year, once in February and again in August-September, when they practically stop laying eggs.

Ducks and Drakes—how to differentiate:—The feathers at the tail end of a drake are slightly turned up and those in a duck have a slanting or drooping finish. The voice of a drake is a mild shrill or a shriek whereas the duck has a harsh and coarse 'Quack', 'Quack'. In some drakes the knob at the base of the beak will be quite prominent whereas it is comparatively insignificant in ducks. The cloacal region or the 'under-carriage' is well developed and more roomy in a duck than in a drake.

Disease Position:—Excepting for cases of under-feeding, starvation and death during the unfavourable seasons, no diseases of any serious nature have so far been reported.

Transport:—This is the main snag in the development of this trade. Being an interior place the egg baskets are transhipped in several of the branch line stations before they are put on the main line to Calcutta, Bombay and Hyderabad. This naturally lends itself to severe breakages and pilferage and the trade suffers quite a lot. The provision of a specially built motor-van will go a long way to help this trade. This is a matter for the Government to look into.

Other facilities:—Land-owners in the area should also co-operate to build up this trade and not harass these duck-keepers. In the adjacent

Districts of Krishna and Guntur, no objection is raised to allow these ducks in fields with standing paddy crops; but in West Godavari they say these ducks uproot the seedlings and destroy the crops. This needs closer study and advice to the ryots. Some form of provision to house these birds during heavy rainy season seems to be urgently called for. This is again a matter for consideration on the part of the authorities concerned.

Statistics:—The duck population in Bhimavaram taluk as ascertained during 1956 is 6,381 consisting of ducks 4,475, drakes 1,169, ducklings 737. During 1956 duck egg baskets booked at Akivadu Railway station are as follows:

January 1956 to December 1956.

Month.	No. of baskets booked.	Maunds.	Seers.	Freight amount.	Stations booked to in general.
				Rs. a. p.	
January	382	289	20	714 12 0	Bombay and Hyderabad.
February	617	448	30	1396 12 0	
March	654	487	30	1107 10 0	
April	495	376	30	960 9 0	
May	99	69	10	108 8 0	
June	163	111	00	368 2 0	Delhi, Bhadrachalam.
July	232	162	10	608 10 0	
August	71	50	00	142 12 0	Vijayawada and Howrah.
September	37	25	00	24 7 0	
October	129	94	15	149 5 0	
November	78	55	10	126 1 0	Chicacole Road and Rajahmundry.
December	325	247	15	887 5 0	
Total	9282	2417	10	6589 13 0	

* Each basket booked contains 300 duck eggs. So much so during the year 1956, 9,84,600 eggs were exported from Akivadu Railway Station.

Association News

THE MYSORE SERUM INSTITUTE BANGALORE

Proceedings of the Staff meeting

An inaugural meeting of the staff of the Mysore Serum Institute, Bangalore, was held in the Library Hall of the Institute at 10 A.M., on 6-4-57. All the Officers of the Institute attended the meeting and the Superintendent Sri V. S. Kuppuswamy Mudaliar was in the Chair.

In his opening remarks, the Chairman said that it was his desire to have a monthly meeting of the staff so as to serve as a forum for discussion of scientific subjects of interest to the profession, the opener of the discussion being usually one who has worked or studied the

subject in some detail. This, he said, would be useful to all those participating in the meeting. He added that it was not possible for every one to have a good knowledge of all the subjects and that such meetings would give an opportunity of knowing some of the problems in fields, other than the one of his own special study. Again it was only by mutual discussion, that one could get a correct idea of the subject in proper perspective. He said it was also contemplated to invite prominent scientists and members of the profession, who may happen to pass through this metropolitan City, to speak on scientific subjects. Next he called upon Dr. N. S. Krishna Rao, Parasitologist, to open the discussion on the subject "Immunity in parasitic diseases".

Dr. Rao opened the subject by saying that the production of immunity in parasitic diseases has only been recently recognised and that some literature has accumulated since 1940. He then gave several examples of parasitic diseases where the production of anti-bodies has been definitely established and explained how the anti-bodies act against the parasites including the helminths. He dealt in detail the immunological responses in sheep in the infection of *Haemonchus* and *Trichostrongyles* and said that only the larval stages of *Haemonchus* has antigenic effect whereas in *Trichostrongyles*, the adults, too, stimulate the production of anti-bodies, as effectively and that as the period of sojourn of the larval stages of the parasite in the host's body is short, the immunity produced in *Haemonchus* is slight and in *Trichostrongyles* much stronger and more steady. This explains the fact that *Haemonchus* affects sheep of all ages whereas, *Trichostrongyles* is more a disease of the young stock as the older sheep will have acquired some immunity by previous infections. He explained the phenomenon of "Self cure", often noticed in sheep during the infection of many nematodes, as an anaphylactic reaction, created by the sudden ingestion of a large number of the larval stages of the worms. He gave an interesting explanation for the absence of Nasal Granuloma in buffaloes, in spite of the presence of the parasites in them. He said that *S. nasalis* is a parasite well adapted to the buffalo but it does not produce a severe tissue reaction, leading to granulomatous growths and that if further investigations confirm this view, buffaloes may serve as "Carriers" thus complicating the control of the disease still further.

Drs. Syed Mohiyuddin, R. D. Nanjiah, C. K. Abdulla Khan, P. N. Mukundu, S. A. Rahiman raised several points and there was a lively discussion. Dr. Rao gave explanations to some of the points raised and said that further investigations are necessary to understand a few others.

Dr. Syed Mohiyuddeen proposed a vote of thanks and the meeting terminated.

THE MADRAS VETERINARY ASSISTANT SURGEONS' SERVICE ASSOCIATION

Proceedings of the Annual General Body Meeting held at the Congress Grounds Teynampet, Madras on 24—3—57.

The meeting commenced at 4 p.m. in the Open air Theatre put up at the Congress grounds. Fifty-nine members were present.

Dr. T. A. Natarajan, G.M.V.C., was elected to the chair. Dr. D. Pattabhiraman, G.M.V.C.A.I.D.I., Director of Animal Husbandry, Madras was present by special invitation to inaugurate the plenary session in the after-noon. Amongst the distinguished invitees were the State Deputy Directors of Animal Husbandry and the Editor, The Indian Veterinary Journal, Madras.

The proceedings began with a prayer by Sri. Purushothaman a student of the third year B. V. Sc. class of the Madras Veterinary College.

Moved by the Secretary, two minutes silence was observed in memory of late Drs. Kelappan and J. C. David.

In his opening remarks the President, Dr. T. A. Natarajan thanked the members for having elected him as President of the Association for the year, thereby conferring on him a unique honour. He thanked the Director of Animal Husbandry for having so kindly consented to inaugurate the meeting and said "The importance of this annual meeting has been very much enhanced by the presence of the Director of Animal Husbandry and his acceptance to address the members. He needs no introduction to you..... His association with Livestock work for over two decades now has made him one of the authorities in that sphere of work in the Union.....I congratulate the Office bearers of the association for getting him to address us to day". He further stated "The role of the Veterinarian has multiplied many fold in recent years unlike the time when some of us entered the department. At that time we were only attending to the treatment and prevention of livestock diseases, or what was known as Negative phase of our work. But after the transfer of the livestock section to its rightful custodian viz. the Animal Husbandry department our work has expanded to include the positive aspect also".....He added he was conscious that the responsibilities of the Veterinary Assistant surgeons were very great indeed and that he was sure that his colleagues would rise equal to the occasion whatever be their grievances and difficulties. He strongly pleaded for a "living wage" for the Veterinary Asst. Surgeons and hoped their reasonable request for the very modest scale of Rs. 200-10-400 would meet with the approval of the benevolent government.

Dr. V. Satchidanandam, the Secretary next presented the report of the Managing Committee on the working of the association for the period from 18-1-55 to 19-3-57, which was adopted.

Dr. D. Pattabhiraman, Director of Animal Husbandry, Madras, addressing the members said that he valued the opportunity extended to him to meet and address so many of the Departmental Officers. He exhorted them to be 'duty-conscious' and render service in the interest of the poor ryot and the State as a whole. He reminded them that "Rights flowed from duty well-performed and not otherwise". He added that so far as he could see there was very bright future for the Department.

The President then requested Rao Sahib Dr. T. Vinayaka Mudaliar, Editor, The Indian Veterinary Journal who was himself one of the early founders of the Association, to speak a few words to the members. Dr. Mudaliar briefly and in a most moving manner narrated the hurdles they had to cross in those days - more than thirty years ago, in forming the association and to make it function effectively. He advised the members to prove worthy of those great Pioneers, who are no more with us by keeping the association alive and active.

After the President's concluding remarks Dr. N. Balasubramanian Vice President of the Association proposed a vote of thanks.

II

The members reassembled at 9 p.m. after dinner.

A paper "On the comparative merits of the Recto-vaginal and Speculum methods of Insemination in Buffaloes" was read by Dr. K. S. Narasimhan, B.V.Sc.

A number of resolutions was then considered and adopted.

The following Office bearers were elected for the year 1957.

President :	... Dr. T. A. Natarajan, G.M.V.C.
Vice President :	... " T. Sivaraman, B.V.Sc.
Secretary :	... " V. Satchidanandam, B.Sc., B.V.Sc.
Treasurer :	... " R. Krishnan, B.V.Sc.
	... " R. Venkatakrishnan, B.V.Sc.
	... " M. S. Jayaraman, B.V.Sc.
Managing Committee Members :	... " A. Ramachandran, G.M.V.C.
	... " T. G. Abdul Khader, B.V.Sc.
	... " M. Ranganathan, B.V.Sc.

The Secretary at the end thanked the President for conducting the proceedings of the day in the able manner in which it was done and also the members for all their cooperation.

Madras, }
12-4-57. }

V. SATCHIDANANDAM,
Secretary.

Statement of Receipts and Expenditure from 18-1-55 to 23-3-57.

EXPENDITURE		RECEIPTS	
	Rs. nP.		Rs. nP.
Balance on hand on 18-1-55 ...	162 00	Stationery ...	8 56
Subscription collected and remittances from districts ...	385 00	Postage ...	37 84
Interest on S. B. Account ...	3 00	Printing charges etc. ...	42 00
		Trophy ...	57 00
		Servicing charges for typewriter ...	4 00
		Refreshments garlands etc. for General Body Meeting of 24-3-57 ...	58 94
		Balance on hand ...	291 66
	Rs. 500 00		Rs. 500 00

The accounts were audited by :

1. C. M. Lalitha, B.V.Sc. and
2. V. Shanmugasundaram, G.M.V.C.

R. H. SUNDARAM,
Treasurer.

Obituary

SHRI RUSTOM MANEKJI KALAPESI.

We deeply regret to record the sad demise of Shri Rustom Manekji Kalapesi, Professor of Pathology, Bombay Veterinary College, at Glasgow, where he had been to for higher studies. In his early days he had worked in the Market Department and Victoria Gardens of Bombay Corporation and later took up an appointment under the Gladders and Farcy Department of the Government, wherefrom he was taken on the staff of the Bombay Veterinary College and he finally succeeded the late Professor K. R. S. Iyer as Professor of Pathology. Once before he had been to Edinburgh for Post-graduate studies and now again to Glasgow. It is a pity that so promising a life should have been cut off at its prime.

It is a great loss to the profession and we offer our heartfelt condolences to the members of the bereaved family.

Shri P. R. KRISHNIER, G.M.V.C., PASSES AWAY

It was in July 1956, we had to take note of the retirement of Shri P. R. Krishnier from the post of a Research Officer at the Indian Veterinary Research Institute, Mukteswar. Rarely has the ink with which we wrote about him has dried, when we have received the shocking news of his passing away on 13-6-'57.

It is a sad news indeed to the profession which he served with such distinction for well over 33 years. The respect and regard which the profession bore towards him is well reflected in the resolution passed at an urgent meeting of the "Teachers of Bacteriology from various Veterinary Colleges in India" held at the Indian Veterinary Research Institute,

Mukteswar, which we publish below. It is a spontaneous outburst of feeling by a number of senior members of the profession and we join with them in conveying our heartfelt condolences to the members of the bereaved family.

Shri P. R. Krishnier had the unique advantage of working early in life under such eminent Scientists as Dr. J. T. Edwards and the late Mr. Hugh Cooper. His record of work is far too numerous to be reviewed in an article of this nature. But the mere mention of some of them should serve to inspire similar workers in the field. He has worked on Tuberculosis, Piroplasmosis, Acute Theileriasis in cattle, Bovine Anaplasmosis, Contagious Bovine Pleuro-pneumonia, Surra in horses, Contagious Caprine Pleuro-pneumonia, Periodic Ophthalmia in horses, Johne's disease, Encephalomyelitis in sheep and goats, Immature Amphystomiasis, etc. In 1929, he recorded for the first time in India six natural cases of Tuberculosis in goats. In 1935 he standardised the technique of Pregnancy Diagnosis in Equines with great success. He prepared "Synthetic Johnin" and tested it on animals with excellent results. Mr. Iyer's services were requisitioned wherever there was prevalence of any obscure disease. Mr. T. J. Hurley who was Director of Veterinary Services in Madras in 1947 wrote to Dr. F. C. Minett, the then Director of the Indian Veterinary Research Institute, Mukteswar, "Kindly convey my thanks to Mr. K. Iyer for his prompt, thorough and successful investigation about which he should feel happy especially as it is to the benefit of his province." It was in connection with what was known as "Pitto" a fluke disease in sheep at the Hosur Cattle Farm in Madras. In 1937, he was called upon to speak on "Blood Pathology" before a gathering of distinguished personages at Lahore. His Excellency Lord Linlithgow, the then Viceroy of India and the Hon'ble Ministers of the State attended the lecture, which was very much appreciated.

It is such a distinguished member of our profession that we have lost. We are grieved beyond measure. May his soul rest in peace!

Resolution

"We the teachers of Bacteriology from various Veterinary Colleges in India now undergoing a special course at the Indian Veterinary Research Institute, Mukteswar are deeply grieved to hear the sad and untimely demise of Shri P. R. Krishna Iyer, an eminent Veterinary Pathologist and an outstanding Research Officer of the I.V.R.I. who retired recently and convey to the members of the bereaved family our heartfelt condolences.

May his soul rest in peace and may God Almighty give courage and fortitude to the members of the bereaved family to sustain this great loss!"

Officer-in-Charge, Special Course in Bacteriology,

and

Teachers of Veterinary Bacteriology, now undergoing the Course at the I.V.R.I. Mukteswar, Kumaon, U.P. (14-6-57).

The Clinical Article "Two Cases of Distomatiasis in Dogs" appearing on Page-214 Vol. 34, No. 3, 1957, was from Mr. Kulanand Purohit, Veterinary Officer, Haldwari Hospital, U.P., and not from Shri R. P. S. Tyagi. The error is regretted.

Vol. 34, No. 3, Page 190, I.V.J. Please read G. S. Singh instead of C. S. Singh, under authors of the article.

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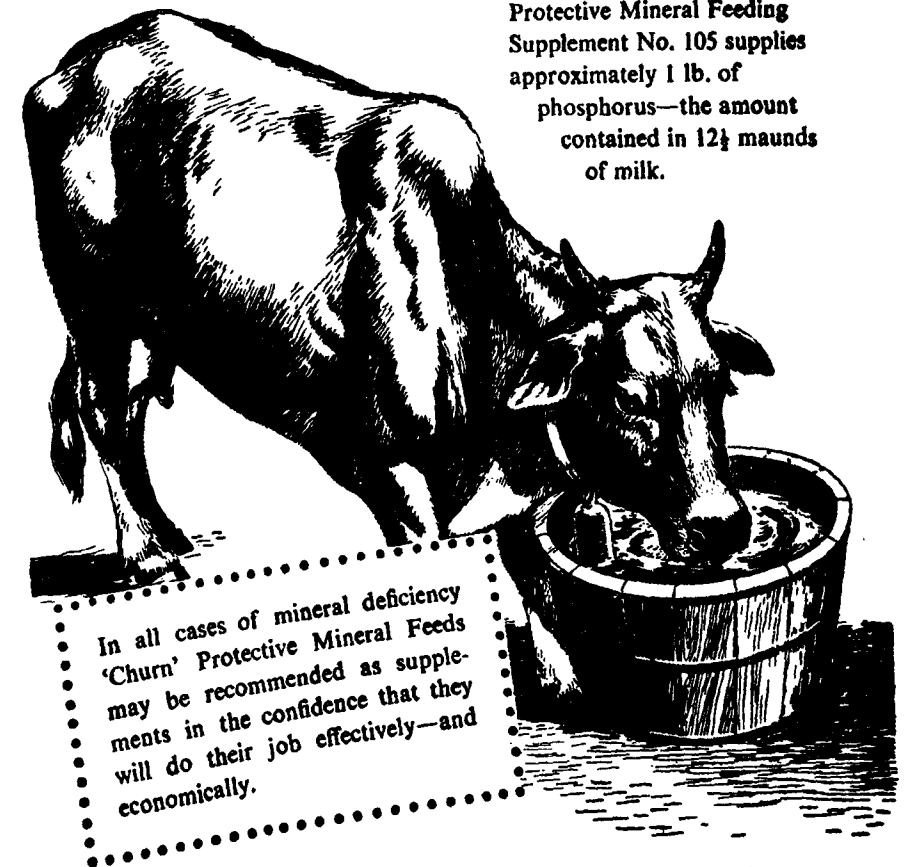
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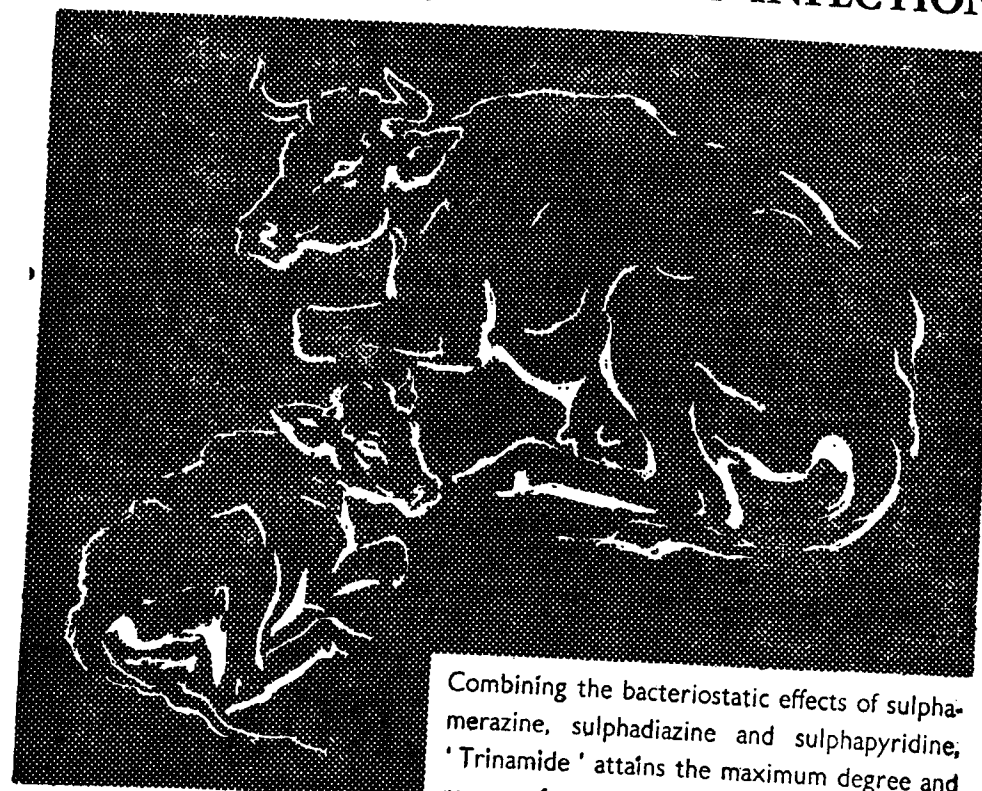
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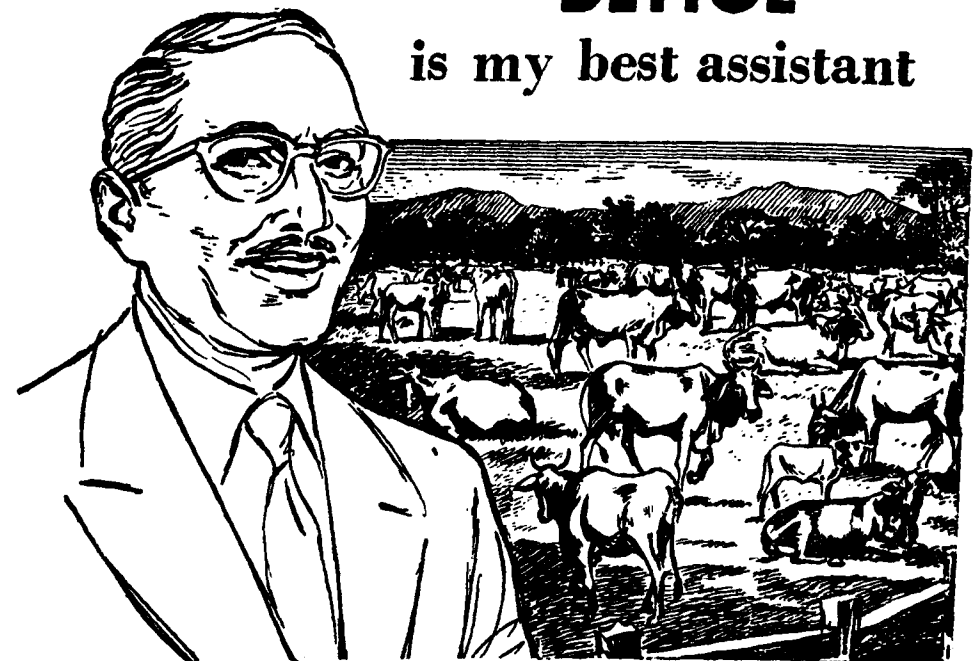
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