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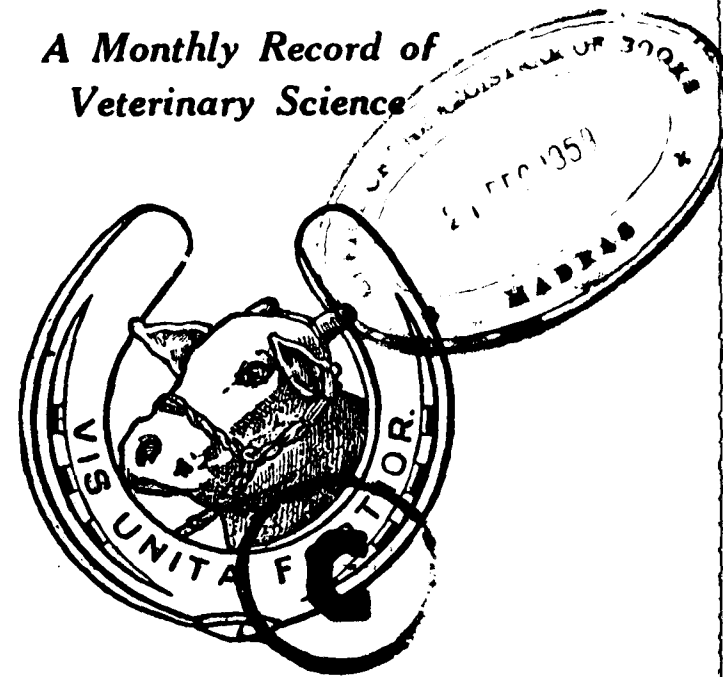
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(The Journal of the All-India Veterinary Association)

*A Monthly Record of
Veterinary Science*



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PUBLISHED MONTHLY

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

★
EDITOR

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THE

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Editorial

REVISION OF EDUCATIONAL PATTERNS

In recent years, India has been undergoing kalidoscopic changes in the general educational field of Arts. Politicians assume the role of educational experts and begin to dictate new patterns of education, because they had seen them succeed in other countries, during their 'hurricane' global tours! They even lend a helping hand in prescribing text books! With what results, it is painful to contemplate. Every body admits that the standard of education has suffered considerably and that the present day Arts Graduate is no match to the old Matriculate! This tendency of making the educational field, the sporting field of borrowed ideas, is now spreading to the technical education as well.

Change is necessary no doubt for progress. Society cannot afford to be static and yet aspire for advancement. But such change should be evolved from within and not implanted from outside, unmindful of other considerations. However much we may admire the American systems, we cannot produce in this country their conditions of literacy, industry, land-holding, unity, co-operation, communications and above all finance. In assessing what is best for this country, we need not ignore what we have achieved so far both under the old British administration and after Independence.

In our own field, the thin end of the wedge was introduced when they brought in the word Animal Husbandry as if it is separate from Veterinary. We as usual cried ourselves hoarse that the word Veterinary, as per its accepted definition is all — inclusive and the introduction of such a term will only bring in a difference without a distinction. But this first false step was allowed to persist and further complications ensued.

After due consideration by the several Universities and State Governments, it was decided to incorporate Animal Husbandry subjects, like Nutrition, Genetics, Dairying, etc., in the curriculum of the Veteri-

nary Colleges and it has worked exceedingly well for nearly two decades now. Our B. V. Sc's can compare very favourably with the best of the Veterinarians in the world. What more, with their basic training in Veterinary Science, they have shaped so well for Animal Husbandry work, that the country has applauded their achievements so far. We shall be the last to claim that the present curriculum is perfect in all respects. For instance every Veterinary College is not yet self-contained in the matter of Dairying and Dairy Technology. This defect should receive the serious consideration of the authorities concerned immediately. Some may think that the period of training is too crowded and that some of the Animal Husbandry subjects do not receive that amount of intensive practical training that is necessary and as such the course of studies should be extended to six years. The economic position of an average Indian student cannot permit of a six year course of studies after Inter-Science. Added to that is the poor pay and prospects offered by the Government. These are the bottle-necks.

The remedy does not lie in opening Rural Universities or in starting separate professions for Animal Science, Animal Husbandry, Animal Industry, Animal Nutrition, Animal Diseases, etc., etc. That may suit American conditions but not the present Indian conditions. For centuries to come the Veterinary profession in India cannot hope to get the high level of emoluments through private practice as probably is the case in America. Government service is their only refuge in India.

We have therefore been insisting that specialisation or in other words intensive study of particular subjects should come in at Post-Graduate level. If this is insisted upon for all special posts in particular branches of service, this constant cry for revision of curriculum or extension of course of studies or for creation of separate professions, will be found to be unnecessary. Why should they create divisions within a single profession with all its attendant evils?

We repeat therefore that the present basic qualification of B. V. Sc., is quite good and sufficient for all ordinary purposes and that specialisation in particular branches of this Science should commence at Post-Graduate level. This is the easiest and best way of bringing about the necessary changes and not undoing what has been built so far and launching upon new schemes and new schedules.

General Articles

HAEMORRHAGIC ENCEPHALOMYELITIS OF SHEEP AND GOATS ASSOCIATED WITH FOCAL ENCEPHALOMALACIA (LUMBAR PARALYSIS ?) IN SHEEP AND GOATS ; A DISEASE OF UNKNOWN AETIOLOGY

Histopathological Studies

By

DR. K. S. KHERA, B.Sc., M.V.Sc., D.Sc.,

Principal, College of Veterinary Science, and A. H., Hissar.

Introduction

A disease of seasonal occurrence and of unknown aetiology, named on the basis of clinical observations as "Lumbar Paralysis", is prevalent among the sheep and goats of the Government Livestock Farm, Hissar for the last 15 years. Symptoms and clinical features of the malady have already been described by Sharma and Bhatia (1956). A disease with similar clinical syndrome was also noticed in the Bhatia Farm, U. P. as early as 1934 (Annual Report of the Mukteswar Laboratory, India, 1934; p. 31). The morbid changes caused by the latter, were of the form of encephalomyelitis characterised by meningeal congestion and haemorrhage, perivascular infiltrations, destruction of nerve cells and neuronophagia (Annual Report of the Mukteswar Laboratory, India, 1940; p. 28). A nervous disorder which apparently manifests similar symptomatology and with which the disease at the Livestock Farm, Hissar has so far been confused, is known to have occurred in Japan and Ceylon since about two decades and is described to be a focal discrete form of necrotising encephalomyelitis, with apparently haphazard distribution of lesion or lesions in the brain and spinal cord. Apart from these isolated lesions, whose number may be one or more than one, the remainder of the nervous tissue was practically normal. Aetiology of this particular syndrome was established to be due to invasion of central nervous system by immature *Setaria digitata* (Innes, 1951; and Innes *et al*, 1952). A similar condition has been described to occur in lambs in New York caused by invasion of the spinal cord and brain by a filarial worm *Neurofilaria cornellensis* (Kennedy *et al*, 1952 and Whitelock, 1952), and in sheep in the Far East region of U.S.S.R. by Kadenatsi (1956) to be due to *Setaria marshalli*.

Material from Government Livestock Farm, Hissar, comprising of three brains and spinal cords from affected cases was studied at the Indian Veterinary Research Institute (Sharma and Bhatia, 1956) for histopathological alterations. It revealed changes associated with

encephalomyelitis such as haemorrhagic foci, nerve cell degeneration and neuronophagia. Shoho *et al* (1958), however, on the basis of studies of the central nervous system sent from India from one case of Rampur Bushair ewe and another from Bikaneri sheep, opined that the sheep lumbar paralysis in India was caused by a nematode wandering in the central nervous tissue. Sharma and Bhatia (1956) on the other hand, reported that a deficiency of trace elements plays some role in the aetiology of this disease and encouraging results were noticed by administration of thiamine.

The diversity of opinion is due to the fact that the disease occurring at the Livestock Farm Hissar never attracted attention for a detailed histopathological examination, which is indispensable to define and to distinguish a particular disease condition. In view of the paucity of literature and to elucidate the sequence of neuropathological changes, it was considered necessary to study and to provide an account about the pathogenesis of this paralytic syndrome which might probably furnish some avenue for future research.

Material and Method

Brains from 16 animals and spinal cords from 12 of them (Table I) formed the basis of this study. Most of these animals were destroyed at different stages of the disease, and nervous system immediately collected in 10% neutral formol saline. Coronal sections were cut 3-4 mm. thick, starting from the frontal poles and working backward; cut surfaces were carefully examined by means of a hand lens. About 20 pieces representing the various parts of brain and 8 from the spinal cord when it was available, were processed for sectioning. These also included the pieces showing lesions of malacia and their serial sections were taken up for study when required. Sections were stained with the routine method of staining with haematoxylin and eosin, Geimsa's method, Gram-Weigert technique for fibrin etc. It is however, regretted that due to certain laboratory limitations, changes in the state of myelin induced by the disease process could not be studied.

Microscopic Observations

1. *Meninges* :—Blood vessels of the meninges were deeply congested and dilated. Occasionally they were haemorrhagic, slight mononuclear infiltration around their walls was only rarely met with.

2. *Cerebrum* :—From the very outset of the malady, the degenerative changes of nerve cells appeared to be of a generalized character with uniform involvement of whole of the gray matter.

Small and medium sized pyramidal cells showed pronounced changes in the form of coagulation necrosis (Fig. 1) with karyolysis of

their nuclear chromatin. Quite commonly neuronophages were seen embedded in their cytoplasm and with the progress of the disease process there was seen satellitosis and neuronophagia of the necrotic cells.

TABLE I

Showing animals with probable duration of the disease and naked eye lesions of the Central Nervous tissue.

Serial No.	No. of the animal	Probable duration of the disease in days after the onset of symptoms.	Naked eye lesions
1	Kid No. 216	2	Intense congestion of meninges
2	Goat No. 918	3	do.
3	Ram No. 115	5	Intense congestion of meninges, brownish malacic foci involving extensive areas in the medulla oblongata.
4	Goat No. 859	6	Intense congestion of meninges.
5	Lamb No. 597	7	do.
6	Goat No. 322	9	do.
7	Goat No. 360	11	Intense congestion of meningeal vessels, foci of softening in the medulla oblongata.
8	Sheep No. 211	11	Congestion of meninges, one small focus of malacia in medulla oblongata, pinpoint haemorrhages in the brain substance.
9	Ram No. 33	12	Intense congestion of meninges with pinpoint haemorrhages in the brain substance.
10	Goat No. 731	13	Numerous small lesions of malacia in the midbrain.
11	Lamb Hissari No. 964	14	Numerous lesions of liquefaction leading to formation of cysts, in the midbrain, medulla oblongata & white matter of cerebrum (Fig. 18).
12	Goat No. 89	15	—
13	Goat No. 63	16	—
14	Goat No. 117	16	Numerous foci containing oedematous fluid varying in size from a pin point to 2 mm in diameter in medulla oblongata (like fig. 18).
†15	Goat No. 108	21	—
16	Sheep No. 217	25	Intense congestion of meninges with haemorrhages. One minute brownish focus in medulla.

† Histopathological lesions have been separately described.

In the strain below the pyramidal layer, the neurons which morphologically were of different appearance, manifested quite a distinct sequence of retrogressive changes. Some of these cells showed neuronophages in their cytoplasm although no abnormal cytological changes could be recognized in them. Nuclei of these nerve cells were ballooned to various degrees, with slight thickening of the nuclear membrane and the chromatin was arranged irregularly towards the periphery, the nucleolus having been shifted to an eccentric position

The astrocytes and oligodendroglia distributed in the layer of polymorphous cells showed marked bloating (Fig. 3).

Earlier changes in the capillaries were in the form of swelling of endothelial cells and at places the lumen was obliterated. About five days after the onset of the disease, perivascular haemorrhages were commonly seen.

White matter showed an increased number of microglia cells, dilatation and engorgement of the capillaries.

In the gray matter of animals which died 20 days after the onset of symptoms, the degenerating nerve cells were readily distinguished and even retained their pyramidal shape. Ground tissue, having undergone rarefaction now consisted of loosely arranged reticulum containing numerous large lacunae. They had resulted partly due to the replacement of necrosed neurons and partly due to enlargement of perivascular spaces.

In one of the animals (lamb Hissari No. 964) were seen a few areas of liquefaction of large size in the white matter of the cerebrum (Fig. 18).

3. *Hippocampus major* :—Pyramidal cells showed coagulation necrosis. Their neuronophagia, though less marked as compared to that in the gray matter of cerebrum, was quite distinct.

Nerve cells of fascia of dentata showed ballooning of their nuclei with gradual shifting of the chromatin to a peripheral disposition. In this region, however, neuronophagia of the degenerating nerve cells was very evident (Fig. 2).

In the stratum radiatum, the capillaries were markedly dilated and engorged; perivascular spaces around them increased with the progress of the disease and the spaces occasionally contained oedematous fluid (Fig. 10).

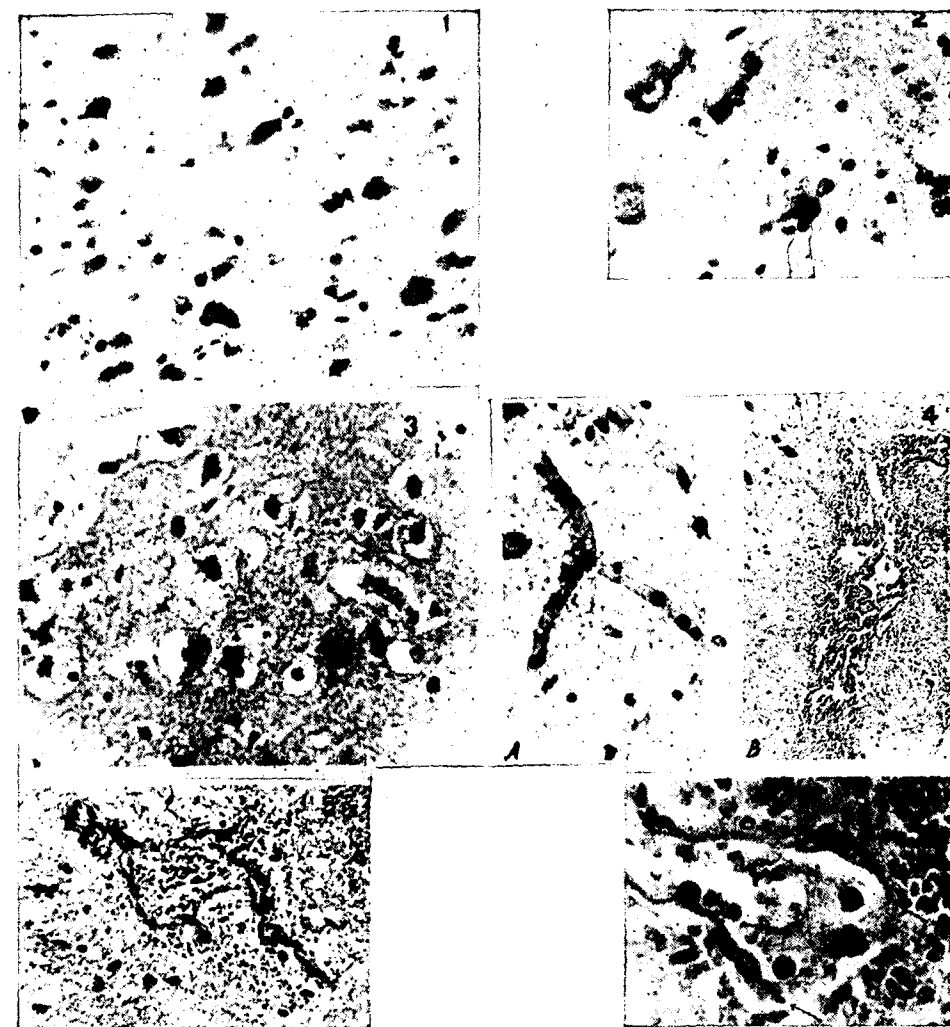
4. *Cerebellum* :—Degenerated changes could be identified in Purkinje cells in the form of granularity of the cytoplasm with increased acidophilic propensity, while the nucleus showed a gradual karyolysis. Neuronophagia of these cells, however, remained markedly in abeyance and could be seen only in one case.

5. *Interbrain* :—Nerve cells of the gray matter uniformly exhibited the retrogressive changes. Later, however, were slightly more intense in *mesial nuclei*, *ganglion of habenula* and *gray matter of corpora mammillaria* than in *lateral nuclei*, *corpora geniculata* and *anterior nuclei*. The morbid changes were of the type of abnormal ballooning with occasional rupture of the nuclei and neuronophagia or due to gradual

Haemorrhagic Encephalomyelitis of Sheep and Goats Associated with Focal Encephalomalacia (Lumbar Paralysis?) in Sheep and Goats; A Disease of Unknown Aetiology

BY

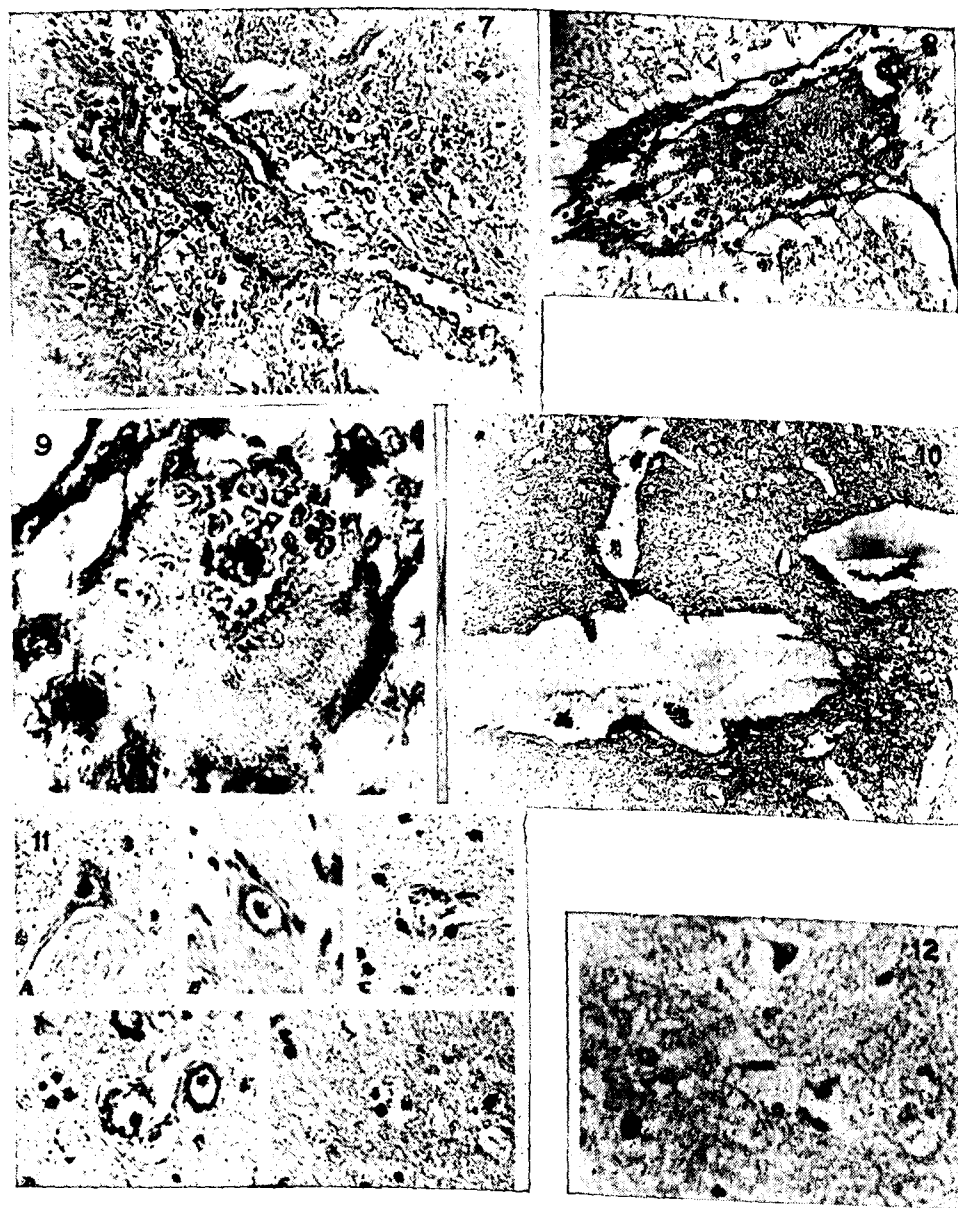
DR. K. S. KHERA



Haemorrhagic Encephalomyelitis of Sheep and Goats Associated with Focal Encephalomalacia (Lumbar Paralysis?) in Sheep and Goats; A Disease of Unknown Aetiology

BY

DR. K. S. KHERA



karyolysis and shrivelling of neurons. Neuronophagia of apparently normal nerve cells was also commonly seen.

In the white matter, there was seen an increased number of microglia cells.

Vascular changes in the gray as well as in the white matter were characterised by dilatation followed by rupture of capillaries giving rise to perivascular haemorrhages (Fig. 5).

Thalamus of animals running a course of disease for more than 20 days, showed numerous large spaces occasionally containing oedematous fluid and situated around the capillaries. There was seen an increased number of capillaries probably arising from the previous ones in addition to the replacement of necrotic neurons by sclerosis.

6. *Midbrain*:—Sections prepared at different levels showed that there was a diffuse and widespread involvement of the whole of the gray matter of midbrain.

Neurons of the *corpora quadrigemina* presented coagulation necrosis and neuronophagia. Nerve cells situated deep in the midbrain such as those of *tegmentum*, *central gray matter*, *substantia nigra*, *interpeduncular ganglion* etc. presented various degrees of ballooning and rupture of the nuclei, neuronophagia of the cellular debris and sclerosis (Figs. 11 and 12).

Tempo of degenerative process in giant neurons of the *red nucleus*, however, appeared slower leading to chromatolysis. Neuronophagia of these cells remained remarkably absent even upto the last stage of the disease reported here.

In the gray as well as in the white matter, there was seen swelling of the endothelial cells (Fig. 4a), followed by marked dilatation and haemorrhages around the capillaries. Rupture of the capillary wall was also commonly seen (Fig. 6). In cases of more than 14 days duration perivascular spaces were enlarged and were occasionally oedematous. In some of these spaces the vessels were present while in others they were absent.

In two of our cases, were seen numerous softened areas wherefrom the nervous structure had been absolutely wiped out. Histologically these were advanced lesions with complete necrosis of all nervous elements and with pronounced central haemorrhages. Around these foci, some of the capillaries showed dilatation with fibrinous thrombi partly or wholly occluding their lumen (Fig. 7 & 8). Softened areas were seen to be almost wholly comprised of histiocytes with vacuolar cytoplasm. The vacuoles in these cells probably represented myelin, which disappeared during the process of embedding

in paraffin. The foamy histiocytes also contained between their vacuoles, acidophilic granular material and red cells. Some of the foamy phagocytes showed necrosis. Around the softened focus were seen a few swollen axis cylinders and mononuclear cell infiltrations around the vessels.

In the white matter increased number of microglia could be noticed.

(7) *Medulla oblongata*:—Degenerative changes of nerve cells and vascular lesions closely simulated to those described for midbrain.

In the region extending between *pons* and *calamus scriptorius*, haemorrhagic softenings of variable dimensions were noticeable (Fig. 13). Such lesions were present in 5 animals (3 sheep and 2 goats). In two of these, the area involved was approximately 3 cm. × 1 cm. × 1/2 cm. In sheep No. 211, numerous such small lesions were widely distributed in the lateral half of the medulla and study of the serial sections revealed that they neither communicated with each other nor with the exterior.

Microscopic appearance and probably the genesis of these softened areas were similar to those described in midbrain. They were essentially constituted by foamy histiocytes, necrotic nervous tissue and red blood cells (Figs. 14 & 15.) Occasionally around the focus, one could come across a vessel being completely or partially occluded by a thrombus (Fig. 9). The picture closely simulated a haemorrhagic infarct and with the advancement of disease process, leads to liquefaction and replacement by oedematous fluid. At the periphery of the lesion a few axis cylinders showed marked swelling.

(8) *Spinal cord*:—Main changes in the gray matter of the spinal cord may be summarized as engorgement of capillaries with perivascular haemorrhages. Degenerative changes of giant neurons were of the type of karyolysis; neuronophagia, however, was not marked.

In the spinal cord of female Hissari lamb No. 964 swelling of few axis cylinders in *fasciculus gracilis* and *fasciculus cuneatus*, *crossed pyramidal tract*, *direct pyramid-tract* and *tract of Loewenthal* could be traced from the medulla upto a part immediately posterior to the cervical enlargement. This portion of the cord was accompanied by sub-arachnoid haemorrhages all around the cord. Midbrain, Interbrain and white matter of the cerebrum from this animal showed numerous liquefied areas filled with oedematous fluid (Fig. 18).

Lesions in goat No. 108

In addition to the general lesions described for all the animals, there were lesions in this animal whose morphology and probably the

genesis did not conform to the description given above. In the cervical region of the spinal cord, there was seen focal discrete type of malacia with bizzarre swelling of axis cylinder. In the medulla oblongata there was a narrow track connecting the fourth ventricle with the sub-arachnoid space at the base of the medulla (Fig. 16); from this other two tracks branched out and which after leading a tortuous course passed into substance of the medulla. These breaches at places, contained histiocytes which had apparently completely filled them and had partially fallen off during the manipulation of cutting and staining sections. Along the track numerous swollen axis cylinders would be seen (Fig. 17), and amongst them a whorled hyalinized structure could be identified which presumably was a dead nematode.

Discussion

Lesions seen in cerebrospinal nematodiasis (Innes, 1951) are distinct and so far as their pathogenesis is concerned, they hardly bear much analogy to the histopathological changes described. However, one out of the 16 cases reported here, showed concomitant infection with immature nematode together with the lesions associated with it. In view of the circumstantial evidence it hardly appears that parasitic invasion of the central nervous system is the real cause of this nervous disorder.

Sections stained with specific stains did not reveal that the bacteria or protozoan parasite may be responsible for the disease.

Degenerative changes of nerve cells in the different parts of the gray matter of central nervous tissue, were seen in all the animals and were striking in most of the sections. The retrogressive process slightly varied in intensity and was more marked in any one part of the brain than in others. Three different types of degeneration of neurons could be classified.

(a) Coagulation necrosis in pyramidal cells of cerebrum and hippocampus major etc.

(b) Ballooning of the nuclei with consequent rupture probably due to an increased intracellular osmotic pressure as suggested by Gersh and Bodian (1943).

(c) Gradually progressing karyolysis of the nuclei commonly seen in big sized neurons such as those of *red nucleus* and gray matter of the cord.

It is not possible to say whether this diverse pathological response manifested by these neurons is due to a difference in the behaviour of the cells or their cytological make up or else due to the selective effect of aetiological agent.

One of the constant lesions was associated with changes in the capillary endothelium. In the beginning of the disease process, swelling of endothelial cells was seen and it was succeeded by engorgement and dilatation of capillaries. It is obvious as indicated by McGovern (1956) that the permeability of capillaries depends upon the thickness of endothelial-cell layer in addition to the consistency and depth of surface protein film. Dilatation of the vessels attenuates the surface film and causes thinning of the endothelial cell layer. The changes in the capillary permeability were responsible for an extravascular accumulation of blood elements while in subacute cases running a milder course only, transudations were apparent around the vessels. Formation of thrombi in the capillaries of medulla oblongata and midbrain is responsible for destruction of nervous tissue over extensive areas. Swelling of endothelial cells followed by dilatation, high permeability and thrombosis of the capillaries suggest an underlying action of some virus or blood borne toxic agent.

In the light of observations detailed above, it is more logical to name this disease as Haemorrhagic Encephalomyelitis instead of calling it by the convenient term of "Lumbar Paralysis"; as otherwise it will cause confusion with the disease entity known as Cerebro-spinal Nematodiasis.

Summary

Central nervous tissues from 16 animals (spinal cords from 12 of them) suffering from an obscure disease prevalent at the Livestock Farm Hissar, was studied for histopathological changes. Degeneration of the nerve cells was seen throughout the nervous system. Vascular changes were evident as marked dilatation, congestion and rupture of capillaries leading to perivascular haemorrhages. In some of cases haemorrhagic infarcts in medulla oblongata and midbrain resulting from vascular thrombosis and giving rise to extensive areas of liquefaction were noticeable. On the basis of these findings the name Haemorrhagic Encephalomyelitis is suggested. Lesions associated with immature nematode were, however, visible only in one of the 16 animals.

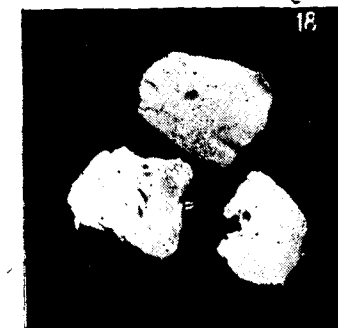
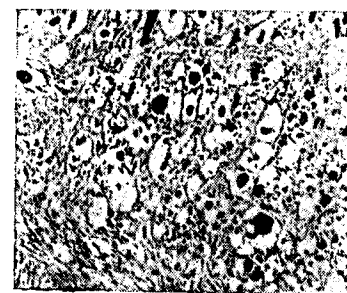
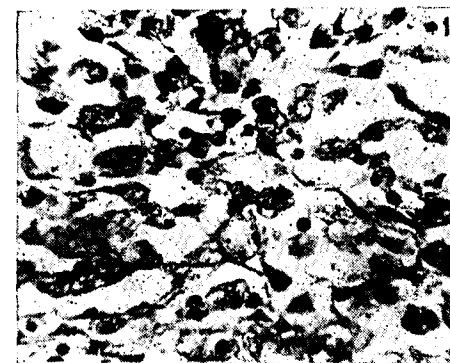
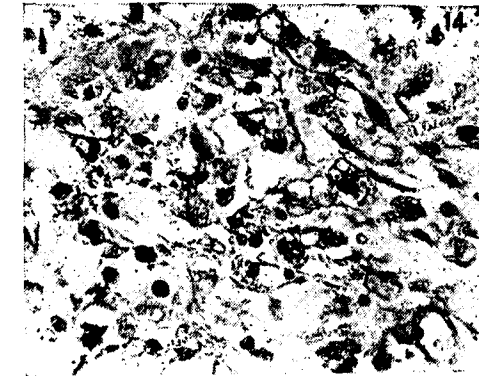
Acknowledgment

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Haemorrhagic Encephalomyelitis of Sheep and Goats Associated with Focal Encephalomalacia (Lumbar Paralysis?) in Sheep and Goats; A Disease of Unknown Aetiology

By

DR. K. S. KHERA



An Opisthorchid Trematode from the Domestic Cat
(*Felis catus domesticus*) with a Report on three other Helminths

BY

B. B. BHATIA, S. M. SOOD & B. P. PANDE.

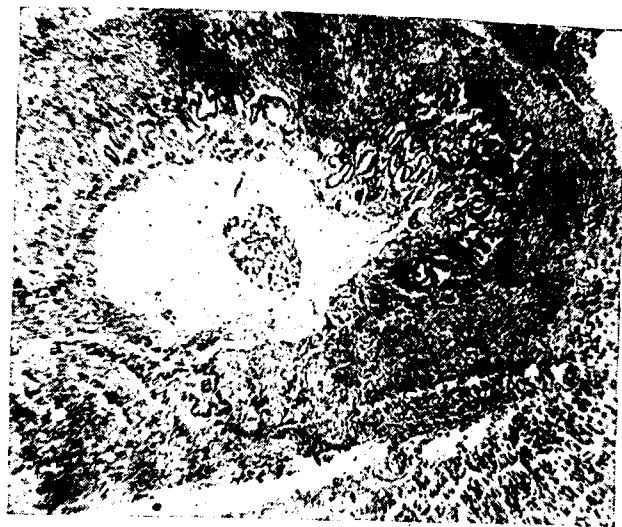


Fig. 1

Photomicrograph of a section of bile duct with fluke cut transversely (testicular area).

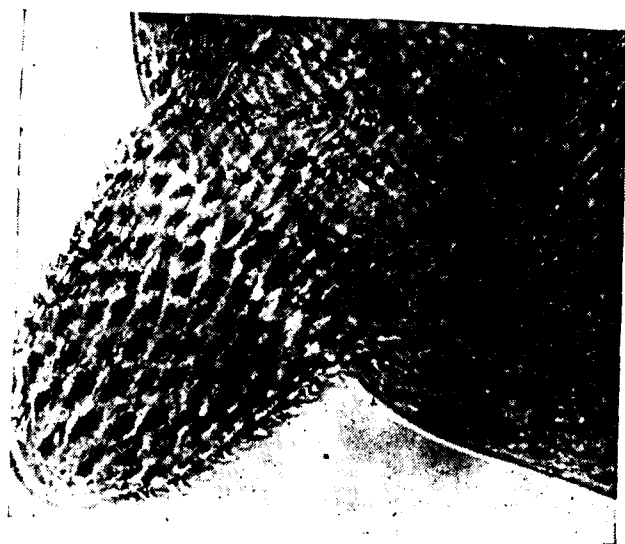


Fig. 2

Photomicrograph of rostellum with hooks of *Dipylidium gervaisi*.

cords and thus initiating the present investigation and most useful suggestions form time to time.

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PHOTOGRAPHS

- Fig. 1. Cerebral cortex. Coagulation necrosis of pyramidal cells.
- Fig. 2. Hippocampus major. Nerve cells of fascia dentata showing neuronophagia.
- Fig. 3. Cerebrum. Bloating of astrocytes.
- Fig. 4. (a) Midbrain. Capillaries showing swelling of the nuclei of the endothelial cells. (b) Medulla oblongata. Perivascular haemorrhage along the course of a capillary.
- Fig. 5. Interbrain. Rupture of the capillary wall with consequent perivascular haemorrhage.
- Fig. 6. Midbrain. Rupture of the capillary wall with haemorrhage all around (limits of the ruptured capillary are marked by arrows).
- Fig. 7. Midbrain. Longitudinal section of a capillary showing thrombus (arrow). Posterior to the thrombus the vessel is dilated.
- Fig. 8. Midbrain. Capillary showing thrombus with fibrinous strands at its periphery and numerous red cells entrapped.
- Fig. 9. Medulla oblongata. Thrombus formed of platelets and fibrin.
- Fig. 10. Hippocampus major. Stratum radiatum with numerous perivascular spaces containing oedematous fluid.
- Fig. 11. Stages of the degeneration of neurons from the gray matter of midbrain; (a) normal cell, (b) ballooned nerve cell, (c, d) ruptured cell (outlines of one ruptured cell marked by arrows), and (e) cellular debris of ruptured cell with neuronophages.
- Fig. 12. Sclerosis of the space created by phagocytosis of the ruptured nerve cell.
- Fig. 13. Medulla oblongata. Extensive areas of softening resulting from thrombosis of the vascular capillaries. Longitudinal section of the capillary running at about the centre.
- Fig. 14. A small portion from Fig. 13 showing foamy histiocytes, red cells and degenerating nervous tissue.
- Fig. 15. Foamy histiocytes, (described in the text).
- Fig. 16. Medulla oblongata. A track most probably caused due to the wandering of immature nematode.
- Fig. 17. Medulla oblongata. Swelling of axis cylinders.
- Fig. 18. Pieces of midbrain, medulla oblongata and white matter of cerebrum showing areas of liquefaction leading to formation of numerous cysts of variable sizes.

AN OPISTHORCHID TREMATODE FROM THE DOMESTIC
CAT (*Felis catus domesticus*) WITH A REPORT
ON THREE OTHER HELMINTHS

BY

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Trematodes belonging to Family Opisthorchidae (Braun, 1901) are known to occur in the biliary system of fish eating vertebrates and of these nearly six species, for which the generic assignment in the literature shows some amount of disagreement, have been described as parasites of domestic cat from different parts of the world. The first systematic attempt to compile the then known records of helminths parasitising Indian domestic cat is seen in the work of Bhalariao (1935) who includes liver-flukes, *Pseudamphistomum truncatum* (Rudolphi, 1890) and *Opisthorchis felineus* (Rivolta, 1884) with one species of nematoda and two of acanthocephala as its parasites and also appends brief diagnostic features of these forms. *P. truncatum*, known also from dog, was reported for the first time by Gaiger (1910) and by Baylis (1929) and *O. felineus* was recorded by Chandler (1925) from Bengal and later by Verma (1927) and Faust (1929). There is as yet no report of any other species of liver-fluke from domestic cat in this country.

During the postmortem examination of a cat found dead on a nearby road, out of the four different species of helminths collected, an Opisthorchid fluke was encountered in the bile-ducts, and the liver exhibited marked pathological changes with linear type of fibrosis over its surface and a large number of specimens were collected from the enlarged bile ducts. The parasites along with small portions of affected liver were fixed and preserved for subsequent studies. The specimens encountered are clearly assignable to the species, *Paropisthorchis caninus* (Stephens, 1912) which was described by Stephens from the material available with the museum of the Liverpool School of Tropical Medicine and the additional supply from the same host animal - a non-descript dog, which he had received from Kasauli (Punjab). This fluke was believed by him to be of wide occurrence in North-West India. After describing the anatomy in detail, Stephens based his new genus *Paropisthorchis* on the sole character of a protrusive process carrying the ventral sucker and the genital pore a feature which distinguished it from genus *Opisthorchis* (Blanchard, 1895). Baylis (1929) quoted Leiper who held that the characters on which this genus and the allied genus *Amphimerus* (Barker, 1911) were separated could not be accepted as

valid. Skryabin (1950), however, designated this parasite as *Opisthorchis caninus* (Lewis et Cunningham, 1872) reducing *Amphimerus caninus* (Barker, 1911) and *Paropisthorchis caninus* (Stephens, 1912) as its synonyms. Yamaguti (1958), on the other hand, has recognised both these genera and following him the fluke recovered from the liver of cat is assigned to the species *Paropisthorchis caninus* and this is therefore, the first record of this fluke from an Indian domestic cat.

A study of stained sections of the portions harbouring the parasites showed some prominent reactions in and around the bile-ducts. The liver, as stated above, superficially exhibited small seed-like bodies additionally and in the stained preparations there was seen a marked cirrhosis, dilatation of bile-ducts and proliferation of the lining cells around the smaller bile-ducts with copious eosinophilic infiltration. These features, alike in other liver-fluke infection in cats as well, are also for the first time recorded herein (Fig. 1). Bol and Yakovleff (1932) had examined twelve cats infected with *Opisthorchis felineus* and reported that typically the lesions consisted of catarrhal condition of bile-ducts with epithelial proliferation or cystic dilation. Freeman and Ackert (1937), while describing the dog fluke *Metorchis albidus* from North America, had mentioned carcinoma of the liver additionally with constrictions of the intestine caused by fibrous bands from the liver. According to them the pathological conditions shown by this fluke in dog were similar to those that had been described by Essex and Bollman (1930) in case of cirrhosis of cat liver infected with flukes. In a recent paper Levine *et al* (1956) have, in describing hepatitis in a cat caused by *Amphimerus pseudofelineus*, found distension of bile-ducts containing many flukes, proliferation of the ducts with centrilobular fatty changes and chronic passive congestion of the liver tissue.

Subsequently *Paropisthorchis caninus* was also found locally in a non-descript dog (*Canis familiaris*) that too had died on road side and was available for collection work. The carcass was found extremely emaciated. The liver superficially showed discoloration, a few haemorrhagic irregularly shaped areas with seed-like bodies over the entire surface, and the intestine at places exhibited marked constriction. Evidently, the death of the dog might have resulted from this infection. This record indicates that the fluke may be common in domestic carnivores of this area.

It may be worthwhile to mention that the specimens recovered from dog are larger than those obtained from cat and also from that of the dog described by Stephens. In the immature specimens from cat the ovary has entire margin, and the measurements given for the internal organs by Stephens are larger than those seen in cat specimen.

The three other helminths encountered are *Dipylidium gervaisi* (Setti, 1895) reported from *Felis viverrina* from Zoological Gardens, Calcutta, *Rictularia cahirensis* (Jagerskoild, 1904) and *Physaloptera praeputialis* (V. Linstow, 1889). Two immature specimens of *D. gervaisi* were found and it was the character of the rostellum with ten rows of rose-thorn shaped hooks of 5.5μ length and with the discoidal base of 3.5μ diameter that could only be relied upon for the identification (Fig. 2). According to Wardle and McLeod (1952) this species had been assigned to a different genus, *Joyeuxiella* Fuhrmann (1935) and reduced as synonym of *J. echinorhynchoides* by Witenberg (1932) who was of the opinion that the species *D. gervaisi* was too insufficiently described. Surprisingly, Witenberg in differentiating the two species of this genus, characterised *J. echinorhynchoides* as possessing 23-24 rows of rostellar hooks but this number of the rostellar rows of hooks is much larger than in the specimens available for study and on this ground the older nomenclature viz. *D. gervaisi*, is retained for the present. The presence of this tapeworm in cat would also constitute its first record in this host animal. Of the two spiruroid worms, *R. cahirensis* was first reported by Srivastava (1940) and the other species, *P. praeputialis*, by Baylis and Daubney (1923) and by Chandler (1925). Both these species have subsequently been recorded from the S. India by Alwar and Lalitha (1958).

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CONGENITAL DEFECTS, LETHAL AND SUBLETHAL FACTORS IN CATTLE AND BUFFALOES IN INDIA

By

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Various types of structural and functional abnormalities have been recorded in different species of farm animals. Thus Mohr and Wreidt (1930) reported such cases in cattle, Yamane (1927) in horse, Roberts (1929) in sheep, Lush (1930) in goats, Nordby (1931) in pigs and Hutt (1948) in fowl. The affected animals exhibited in varying degrees the structural and functional abnormalities of one or more organs of the body. These conditions have been accounted for lethal and sublethal factors (Lerner, 1944; Hutt, 1946).

The occurrence of different types of hereditary and congenital defects in farm animals are not uncommon in India. Viewed from that angle the present study aims at the illustration of lethal or sublethal factors and congenital defects in cattle and buffaloes in our country. The study may prove beneficial in two ways. Firstly, the breeders and the investigators engaged in stock improvement projects might become more aware of the harmful characters resulting from lethal and sublethal factors. Secondly, the diagnosis and early elimination of such condition will be facilitated.

The recorded cases of lethal and sublethal factors and congenital defects in cattle and buffaloes in India are described as under :—

Cattle

(a) Bull-dog calves.

Calves present the facial features like that of a bull-dog. Condition is extremely lethal. Affected calves are unable to survive.

Shah (1934) and Murty (1946) recorded two cases of bull-dog calves. The monsters presented the above features in association with some of the complications mentioned below :—

Hydrocephalus, absence of scrotum, absence of tongue, upper jaw almost missing, hooves turned upward etc.

Bull-dog calves in Dexter breed of cattle is a classical example of the operation of a dominant lethal gene which behaves like a Mendelian character (Colin, 1956). This factor in homozygous condition is fatal to the young ones but in heterozygous state it causes merely a shortening of the limbs in the affected animals. When two such heterozygous animals are mated we get progeny in the ratio of one normal; two short legged; one bull-dog which proves its segregation in Mendelian fashion. Similar characters in the Telemark breed of cattle in Norway have been reported by Wreidt (1930).

The case recorded by Shah (1934) was the only incident in 1574 calvings in the farm. No other observable abnormalities were mentioned to have occurred in any other animal belonging to the herd so that the dominance of the lethal gene could be given any consideration. The frequency of the lethal gene supposed to have appeared in homozygous state also seemed to be very low-1 in 1574 calves. Therefore, the evidence cited above indicates the recessive nature of the lethal character at least in the case detected by Shah (1934).

(b) *Hydrocephalus*.

Accumulation of fluid in the cranial cavity. Distension of the cranium is conspicuous; this causes dystocia. Affected individual never survives.

This condition along with other complications was the feature of monstrosity cases reported by Shah (1934), Ayyar (1934) and Raju (1939). Operation of a lethal factor seems probable, since the affected ones usually die during birth or soon after one or two respirations (Fleming 1952). Colin (1956) listed it as a Mendelian character with a recessive mode of operation in cattle. Internal hydrocephalus accompanied by bone abnormalities in cattle was recorded by Cole and Moor (1942) as a lethal character in cattle.

(c) *Distortion of the spinal column*.

Fusion of vertebrae resulting in shortened spine, discontinuous spine etc. The spinal column may be bent like a bow. Affected ones die early.

Joseph (1931), Srinivasan (1940) and Basu (1956) described independently three monstrosity cases in cattle where one of the features was the distortion of the spinal column in all those three cases. One reported by Joseph (1931) was the only isolated case detected in a period of 20 years in the Pusa Agricultural farm; the other recorded by Srinivasan (1940) was from a Rath cow at the Govt. Cattle farm, Alwar, and the last one from a non-descript cow in the field, in West Bengal.

Mher and Wreidt (1930) recorded in Norwegian cattle similar abnormality which resulted in still-born calves or in death of the young at birth. The condition was attributed to a recessive lethal factor (Lerner, 1944).

(d) *Imperforate anus*.

Absence of anal passage. Faeces cannot be voided until surgically intervened.

This condition was noticed in the records published by Kuppaswami (1937), Basu (1956) and Mukherjee and Banerjee (1956). Prevalence of its occurrence was observed in Ganjam cattle in which a survey revealed an incidence of 105 cases in the year 1936-37. The condition is believed to be fairly common in Eastern part of Indian territory where the cases are mostly handled by the veterinarians but very rarely recorded. Surgical intervention is said to give temporary relief to the animal but most of the cases terminate in death in due course.

The inquiry into Ganjam cattle further elicited that in case of cows which calved, second, third and fourth time the preceding calves were normal. Thus the author concluded "it is obvious that most of the calves are produced in a normal condition and therefore the character appears to be a recessive one".

The cases reported by Basu (1956) and Mukherjee and Banerjee (1956) exhibited the above defect along with other abnormalities, as for example, completely open abdominal, thoracic and pelvic cavities, under-developed ribs, two penis, incomplete pelvic girdle, adventitious kidney etc.

David (1933) Subbarajudu (1934), Haffiz (1943), Raichur (1950) and Damely (1951) recorded the following cases of monstrosities with abnormalities of different organs of the body. The gross structural deviation of all those cases can be pooled together and presented as under:

Double head and double neck, shortened appendages, harelip, discontinuous spinal column, one sided development of the head and face, absence of nose, poorly developed cranium, posterior half folding over the anterior half of the body, tail and scrotum, flexed on the back, all internal organs attached to the ribs etc.

Short limb condition in some Swiss cattle has been described as the effect of lethal factor which behaves like a Mendelian character in its operation (Colin, 1956).

Some of the abnormalities as for example harelip mentioned above have been found to be due to faulty development of the affected parts at certain stages of embryonic life.

(e) *Syndactylism.*

Unbifurcated hooves in cattle.

The operation of a sublethal recessive gene has been illustrated in the study, by Singh and Bhattacharya (1949), of the conditions of both unilateral and bilateral syndactylism of the fore limbs in 2 Haryana calves born between 1937 and 1941 at Madhurikund Cattle Farm, Muttra U. P. To the same study, may be incorporated another report by (Patel and Roy, 1956) in which a bilateral syndactylism of the fore-limbs was recorded in a 10 year old bullock.

The condition presents unbifurcated hoof in cattle where the locomotive power of the animal used for draft purposes is adversely affected in various degree.

Singh and Bhattacharya (1949) concluded that "all known carriers were normal and the expression of the character came to light as a result of inbreeding.

The data available are scanty but are indicative of the operation of an abnormal recessive mode of inheritance.

(f) *Congenital blindness in calves.*

Calves are born blind or go blind soon after birth.

Datta (1933) reviewed the incidence of congenital blindness in calves in India. He could draw the attention of contemporary workers which resulted in the compilation of a chart by Col. G. Mellor, the then Director of Farms, Simla. Mellor (1933) reported that from 1—4—32 to 23—7—32, forty six calves were born blind at the Military Dairy Farm, Quetta. Out of these, 18 were blind at birth, the percentage being 39.1 per cent.

Datta (1933) discussed in detail the probable causes of this malady quoting the statements of Dr. Darling, Crew and Smith and the Chief Officer, Imperial Bureau of Animal Genetics. Aetiologically no definite conclusion could be arrived at but the probability was attributed to multifarious causes including nutritional, climatic, hormonal and genetic predisposition.

(g) *Congenital contracted tendons.*

Foot Knuckled at the fetlock.

Murthy (1946) and Sabharwal (1955) reported cases of congenital contracted tendons of both the forelimbs in Ongole and Haryana bull

calves respectively. In both the cases the affected limbs presented knuckling at the fetlocks which interfered with the locomotion of the animal. Murthy (1946) could trace no hereditary predisposition to this condition.

Buffalo

Nair (1930) described the case of a monstrosity in buffalo in which two fetuses were found to be fused at the pelvis. It presented all the organs in duplicate except the abdominal cavity, hindlimb, anus and the vaginal opening. However, the abdominal cavity accommodated two sets of viscera. Venkataratnam (1951) and Sapre (1953) reported two cases in buffalo where the fetuses were fused at the sternal region and the thorax respectively. Jothi (1955) recorded a case similar to that of Sapre.

All the four cases mentioned above were instances of double monstrosities (Fleming, 1942). Two theories have cropped up towards the explanation of the formation of double monstrosities. One of them supports the idea of union of two fertilised ova in their passage and the subsequent development of the united structure. The other propounds the existence of only one ovum whose imperfect division results in the development of two individuals still attached to each other at some point of the body. Fleming (1952) concluded that the similarity of sex in the double monster and other experimental evidences favourably influence the validity of the latter theory.

Congenital ascitis and polycystic kidney.

Iyengar (1943) and Marathe (1951) recorded respectively the conditions of congenital ascitis and congenital polycystic kidney in buffaloes where both the calves died at some stages of foetal life. In both instances the calves had to be removed by manipulation. Gordon and Trasoff (1937) noted the hereditary aspect of the condition of polycystic kidney in human subject. Their study suggested a dominant gene to be aetiologically responsible for the malady.

Besides these few other cases with minor organic deviations such as a buffalo with two teats and a cow with 5 teats have been reported by Lall (1951).

The records cited above should in no case be considered exhaustive. This is a pretty hard job with so huge a cattle and buffalo population in the country. Obviously, many cases in the field remain unrecorded. Another difficulty is to trace the pedigree of affected animals except those maintained in well managed farm. But this is necessary for proper understanding of the operation of such harmful

genes and also for their detection and elimination from the livestock population.

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INCIDENCE OF BRUCELLOSIS IN KERALA

BY

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Since the isolation of *Brucella* organisms by Bang in 1897, in Denmark, extensive work has been done from time to time on different aspects of Brucellosis. Apart from its importance as an animal disease causing severe economic loss, Brucellosis is also of great interest from the Public Health point of view as the infection is transmissible to humans through contaminated milk.

Though the existence of this disease in India had long been recognised it was Polding (1950 A) who made an extensive survey of Brucellosis in the different parts of the country and established its prevalence in various Indian farms and in many villages in the form of low grade enzootic. He determined that one to five percent abortions occurred every year in the places he investigated, the abortion rate reaching 20% in areas with high humidity and heavy rain fall. Recently Venkataraman (1958) recorded the occurrence of Brucellosis in a highly enzootic form in Coimbatore District, especially in hilly tracts.

In Kerala, where the present investigation was carried out, there is no previous record of the incidence of Brucellosis except a reference made in the I. C. A. R. annual reports (1954-'55) of Veterinary Disease Investigation scheme about the probable existence of the disease at the Livestock Farm, Trichur. While making detailed studies on a clinical case suspected for Brucellosis, it has now been possible to establish the prevalence of the disease in Kerala and the results of investigation so far made are presented in this paper.

A Sindhi-cross Cow (Case No. 2671) from a small herd at Pattikad in Trichur District was admitted to the Veterinary College Clinic on 28-7-1959 with a history that she had aborted two weeks back at the 7th month of pregnancy. On enquiry it was learnt that she had aborted almost at the same period in the previous gestation too. The animal was showing a straw coloured slimy discharge from its genitalia. With the aid of a speculum, cervical exudate was collected under aseptic conditions. Microscopical examination of stained smears of the exudate revealed the presence of organisms referable to *Brucella*.

Blood samples were collected from the Jugular vein of the animal on 3-8-'59 and they were subjected to agglutination tests making use of a *Brucella* antigen of the Indian Veterinary Research Institute, Mukteswar. The test gave a complete agglutination at as high a titre as 1 in 640, thus clearly indicating a strong positive reaction for *Brucella* infection, the species concerned being either *Brucella abortus* or *Brucella abortus-melitensis* as shown by Polding

(1950 B). Cultural examinations of the organisms could not be carried out owing to lack of facilities.

The animal was treated for metritis and discharged cured after ten days.

Attempts were made to detect the existence of the disease among other animals in the herd. The herd was visited on 10-8-59 and blood samples were collected from the rest of the animals for serum agglutination test. It is a small herd in a private farm situated on the border of Trichur and Palghat Districts. As in other parts of the state the rainfall is heavy in this area. The movement of cattle from the neighbouring districts of the Madras State is not restricted and there is usually a flow of cattle from those districts to this place. Most of the animals in the herd were purchased with previous history unknown. However there has not been any recent addition to the herd. In addition to the cow which proved positive for Brucellosis, the herd consisted of four heifers, a cow and a Sindhi bull. The females were country-bred, having a mixture of Sindhi and Kangayam blood. The animals were kept in a fairly good condition. The herd bull was purchased and was in use for about one and a half years. Its right testicle, was found to be thicker and harder than normal showing induration. There were no symptoms of acute orchitis or hygroma. The cow was about six months pregnant with a history of two previous abortions both at about seven to eight months of gestation.

The Bull being a suspicious case is kept under observation and instructions have been given to disallow further breeding.

The results of serum agglutination tests carried out in respect of these animals are given below:—

Results of Agglutination tests.

Sl. No.	Date	Particulars of the Animal	Result	Remarks
1	3-8-59	Cow, Brown, Sindhi-cross, 6 yrs. Aborted at 7 months of gestation. Uterine discharge revealed Brucella like organisms	Complete Agglutination in 1 in 640.	Positive
2	10-8-59	Cow, grey, 6 months pregnant. Aborted in previous gestation	Complete Aggln. in 1 in 20 and partial in 1 in 40	* Positive as the animal is pregnant
3	10-8-59	Heifer grey	Agglutination complete in 1 in 20 and partial in 1 in 40	Suspicious
4	10-8-59	Heifer-light brown	No agglutination	Negative
5	10-8-59	Heifer-Brown (Paru)	Complete Aggltn. in 1 in 160	Positive
6	10-8-59	Heifer-Brown	No agglutination	Negative
7	12-8-59	Bull, free from external symptoms of Brucellosis, but has hard indurated right testicle.	Complete Aggltn. in 1 in 20 and partial in 1 in 40	Suspicious

* Dandha and Rajagopalan (1949)

The results obtained are extremely suggestive of the existence of Brucellosis in the herd under investigation as revealed by the diagnostic titres. The present findings thus confirm the prevalence of the disease in Kerala State. Since there occurs a heavy rainfall in Kerala, and as there is regular movement of cattle from Coimbatore District of Madras State where the disease is reported to be widely prevalent, occurrence of Brucellosis in other parts of Kerala State cannot be overlooked. Statewide survey to ascertain the occurrence and the extent of incidence of Brucellosis in Kerala is indicated.

Summary

Prevalence of Brucellosis in a privately managed farm in Trichur District in Kerala is reported.

In a herd of seven animals, a cow which had aborted twice was strongly suspected for Brucellosis and serum agglutination tests confirmed the clinical diagnosis.

Blood samples from all other animals in the herd which included a pregnant cow, four heifers and a breeding bull were subjected to agglutination tests, of which two gave strongly positive reaction. The titres from the herd Bull and a heifer were suspicious.

The present investigation constitutes the first confirmatory record of the occurrence of Brucellosis in Kerala.

Acknowledgment

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A STUDY OF GESTATION PERIOD IN MURRAH BUFFALOES IN U. P.

By

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Information regarding gestation period in Indian breeds of buffaloes is rather sparse in comparison to that in cattle, although the knowledge of length of gestation and the factors influencing it is equally important in buffaloes if not more than in cows from point of view of dairy management.

Ledine (1920) was probably the first to report the gestation period of water buffaloes to be 312 days while Jennison (1927) estimated gestation period for Indian buffaloes to be 300 days which is lower than 311 and 317 days reported for Egyptian buffaloes (Maymone, 1942); Badreldin, 1948), 316.1 days for European buffaloes (Kaleff, 1932 and 315 for Malayan buffaloes (Kanagarathnam, 1935). The findings of Maymone (1942) and Badreldin (1948) were substantiated by the study of 410 parturitions of Egyptian buffaloes made by Ragab and Asker (1951). They found that the mean gestation period was 317.5 and 315.8 days for male and female calves respectively and the difference of 1.7 days was statistically significant at 5% level of probability. Sequence of calving was reported to have no effect on the gestation period. 96% of the buffaloes were found to calve between August and March. The month of calving was found to have a significant effect on the length of gestation period, both in buffaloes and cattle which were also included in the study, but, whereas in cattle the length of gestation period tended to increase with the month of calving gradually from August to February the buffaloes did not show the same trend. Influence of sires of calf and the correlation (0.201 ± 0.064 corrected for differences due to sex) between length of gestation and birth weight of calf were found to be highly significant.

Contrary to this, Arunachalam *et al* (1952) reported a mean gestation period of 305.3 days based on 225 gestations of 59 farm-bred Murrah she-buffaloes and 302.4 days for purchased animals based on 10 gestations and found the sire of calf, sex of calf, sequence of calving and month of calving to have no significant effect on gestation period. An insignificant correlation coefficient of 0.030 between length of gestation and birth weight of calf was also observed.

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Material and Methods

Records of Murrah she-buffaloes maintained at two of the livestock farms in U. P. were collected and analysed with a view to study the effects of various factors influencing the gestation period in buffaloes. In all, data on 697 parturitions was available. A mean gestation period of 314.8 days and a standard deviation of 21.6 days were observed. All gestations, numbering 31, which differed from the average by more than twice the standard deviation were suspected of being "abnormal" and omitted (Lush, 1949). In 74 cases out of the remaining 616 the stage of calving was not definitely known and hence they were excluded while studying the effect of sequence of calving on gestation period. No normal calving was excluded on account of subsequent death of the calf. Accurate records of the sire of calf were not available and therefore the effect of sire could not be studied. The data were classified according to sex of calf, sequence of calving and month of calving.

As there were disproportionate numbers in the sex and calving sequence or month of calving the method of expected sub-class numbers (Senedecor, 1948) was used to analyse the data for the effects of sex of calf, month of calving and sequence of calving on gestation period.

Results

1. Length of gestation period:

337 male and 329 female calvings were grouped in 5 day class-intervals of gestation period (Table I).

The largest number of male and female calves, i.e. 55.78 and 61.70% of the total male and female calvings respectively, were born between 301 and 320 days after conception. As much as 89% of total combined calvings had gestation period varying between 286 and 335 days. The longest gestation period of 431 days was observed in the case of a male calf and the minimum of 210 days for a female calf but these cases have not been taken into account for purposes of calculations as mentioned earlier in this note. The mean gestation period for male and female calves was found to be 312.73 ± 1.61 and 313.67 ± 1.56 days respectively and an overall average of 313.20 ± 1.11 days for combined calvings.

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TABLE I

Distribution of Calves according to sex of Calf and Gestation period.

Gestation Period (in days)	Male Calves		Female Calves		Combined	
	Number	%	Number	%	Number	%
271-275	3	0.89	1	0.30	4	0.60
276-280	3	0.89	1	0.30	4	0.60
281-285	9	2.67	4	1.21	13	1.95
286-290	12	3.56	14	4.25	26	3.90
291-295	13	3.86	9	2.74	22	3.30
296-300	17	5.05	16	4.86	33	4.96
301-305	39	11.57	39	11.85	78	11.71
306-310	48	14.24	56	17.02	104	15.62
311-315	58	17.21	65	19.76	123	18.47
316-320	43	12.76	43	13.07	86	12.91
321-325	31	9.20	17	5.17	48	7.21
326-330	22	6.53	22	6.69	44	6.61
331-335	14	4.15	17	5.17	31	4.66
336-340	6	1.78	9	2.74	15	2.25
341-345	12	3.56	4	1.22	16	2.40
346-350	7	2.08	9	2.74	16	2.40
351-355	—	—	1	0.30	1	0.15
356-360	—	—	2	0.61	2	0.30
Total ...	337	100.00	329	100.00	666	100.00

2. Effects of sex of calf and season of calving on gestation period:—

The table below (Table 2) gives the number and percentage to total calvings and mean gestation period against each month for male, female and combined calvings separately.

Percentage distribution of calvings according to months (Fig. 1) shows the relative occurrence of calving in each month for male, female and combined calvings separately as in Table 2. Mean gestation periods have been plotted against month of calving (Fig. 2) and 95% confidence limits for the mean gestation periods (combined calvings) drawn to give an idea of change in the reliability of sample means as estimates of true mean in the population at large.

Analysis of variance (Table 3) revealed that mean squares for month of calving, sex of calf and month of calving-sex of calf and interaction were insignificant.

As interaction turned to be negligible the Method of Fitting Constants (Senecor, 1948) was used to obtain unbiased estimates of mean gestation periods for each subclass. The constants to be fitted by regression methods were an overall mean, $\bar{x}$ deviations in each of the columns, a , and in each of the rows, b and these were used to get the regression values, $\hat{X} = a + b + \bar{x}$ shown in the table below (Table 4).

TABLE II
Distribution of calvings according to sex of calf and month of calving and mean gestation period.

Month of Calving	Male Calvings			Female Calvings			Combined		
	No.	%	Mean Gestation Period (in days)	No.	%	Mean Gestation Period (in days)	No.	%	Mean Gestation Period (in days)
January	22	6.53	315.36 ± 7.02	21	6.38	313.33 ± 4.11	43	6.46	314.37 ± 8.90
February	6	1.78	319.00 ± 12.79	7	2.13	318.29 ± 16.87	13	1.95	318.62 ± 8.90
March	5	1.48	308.80 ± 21.85	5	1.52	314.00 ± 29.92	10	1.50	311.40 ± 4.51
April	2	0.59	304.50 ± 23.50	5	1.52	308.40 ± 25.87	7	1.05	307.22 ± 18.59
May	2	0.59	311.50 ± 23.50	6	1.82	321.50 ± 17.13	8	1.20	319.00 ± 14.71
June	12	3.56	308.00 ± 8.52	7	2.13	307.43 ± 15.82	19	2.85	307.79 ± 6.94
July	33	9.79	314.21 ± 4.92	40	12.16	310.90 ± 4.17	73	10.96	312.40 ± 3.12
August	64	18.99	311.44 ± 3.75	59	17.98	311.83 ± 8.69	123	18.47	311.68 ± 2.59
September	57	16.92	310.68 ± 4.65	75	22.80	315.01 ± 8.52	132	19.82	313.10 ± 2.81
October	65	19.29	312.48 ± 3.22	47	14.28	311.72 ± 4.40	112	16.82	312.16 ± 2.59
November	47	13.95	314.04 ± 3.84	25	7.60	315.92 ± 3.86	72	10.81	314.69 ± 2.81
December	22	6.53	317.77 ± 8.23	32	9.73	318.38 ± 5.05	64	8.11	318.13 ± 4.33
All ...	337	100.00	313.78 ± 1.61	329	100.00	313.67 ± 1.56	666	100.00	313.20 ± 1.11

FIG1: PERCENTAGE DISTRIBUTION OF CALVINGS
ACCORDING TO MONTH OF CALVING.

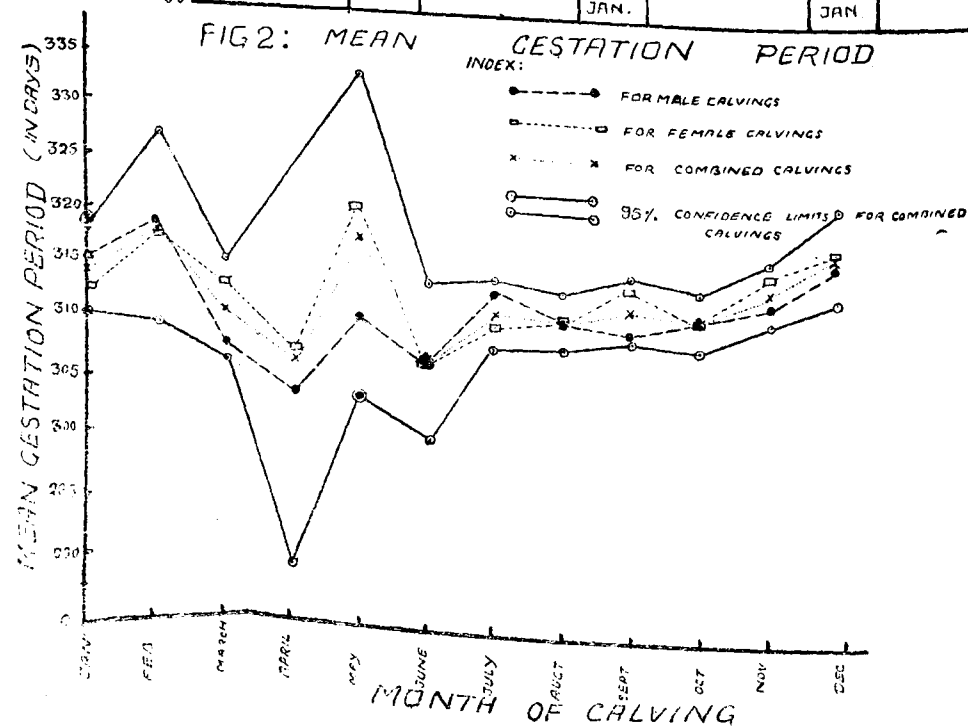
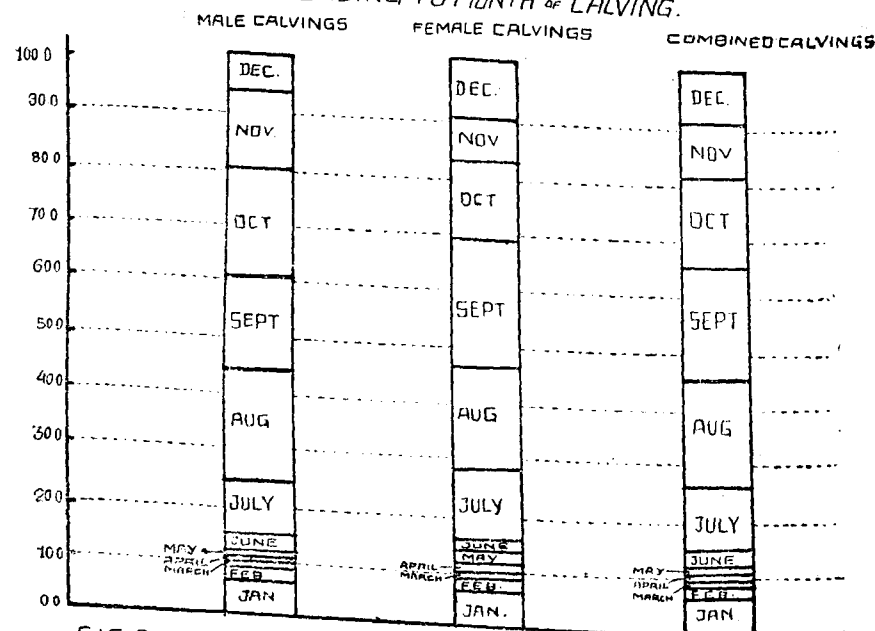


TABLE III

Analysis of variance of gestation periods for month of calving and sex of calf.

Source of Variation	Degrees of Freedom	Sum of squares	Mean square
Month of calvin	11	3482.37	312.03
Sex of calf	1	89.99	89.99
Month of calving— Sex of calf Interaction	11	1114.42	101.31
Individuals (Within subclasses)	642	138602.19	215.89

TABLE IV

Regression Estimates : $\hat{X} = a + b + \bar{x}$

(Reg. values from fitted constants ; interaction assumed negligible).

Month of calving	Constants b	Male calvings a ₁	Female calvings a ₂	Mean
January	1.0196	314.01	314.75	314.38
February	5.2256	318.21	318.96	318.59
March	-1.9612	311.03	311.77	311.40
April	-6.2355	306.75	307.50	307.13
May	5.4522	318.44	319.19	318.81
June	-5.4735	307.51	308.26	307.89
July	-0.9997	311.98	312.73	312.36
August	-1.7200	311.27	312.01	311.64
September	-0.8136	312.67	313.42	313.05
October	-1.1405	311.85	312.59	312.22
November	1.4472	314.44	315.18	314.81
December	4.6993	317.69	318.48	318.06
Mean	—	312.99	313.73	—

3. Effect of sequence of calving on gestation period :—

The 592 parturitions, for which records of the calving sequence were available, were distributed according to sequence of calving for male, female and combined calvings separately and mean gestation periods calculated for each sub-class. The table below (Table 5) gives the number of calvings and the mean gestation period with its 95% confidence interval against each sequence of calving for male, female and combined calvings separately.

TABLE V
Distribution of calvings according to sex of calf and sequence of calving and mean gestation period.

Calving Sequence	MALE CALVINGS		FEMALE CALVINGS		COMBINED	
	No. of Calvings	Mean Gestation Period (in Days)	No. of Calving	Mean Gestation Period (in Days)	No. of Calvings	Mean Gestation Period (in Days)
I	51	312.27 ± 4.03	46	309.61 ± 3.42	97	311.01 ± 2.63
II	46	307.52 ± 4.55	46	314.80 ± 5.09	92	311.16 ± 3.44
III	47	311.68 ± 4.28	58	311.86 ± 3.96	105	311.78 ± 2.83
IV	74	313.57 ± 3.38	64	316.03 ± 3.65	138	314.71 ± 2.45
V	37	312.11 ± 8.99	48	315.23 ± 3.87	85	313.87 ± 2.77
VI	22	319.36 ± 9.97	15	316.87 ± 5.63	37	318.35 ± 6.12
VII	9	317.89 ± 9.64	14	316.39 ± 2.43	23	316.91 ± 3.68
VIII	11	312.55 ± 7.52	4	305.50 ± 5.28	15	310.67 ± 5.60
ALL	297	312.45 ± 1.71	295	313.80 ± 1.59	592	313.12 ± 1.17

Analysis of variance of the gestation periods for sequence of calving and sex of the calf (Table 6) did not provide any evidence to suspect the null hypothesis that sequence of calving and sex of calf have no effect on the length of gestation.

TABLE VI
Analysis of variance of gestation periods for sequence of calving and sex of calf.

Source of variation	Degrees of Freedom	Sum of squares	Mean square
Sequence of calving ...	7	2818.83	402.69
Sex of calf ...	1	285.17	285.17
Sequence of calving—Sex of calf Interaction ...	7	1734.51	247.79
Individuals ...	576	119177.40	206.91

Interaction mean square, being insignificant, was assumed negligible and regression estimates calculated as given in the table below (Table 7).

TABLE VII
Regression Estimates : $\hat{X} = a + b + \bar{x}$
(Regression values from fitted constants : interaction assumed negligible).

Sequence of Calving	Constants b	Male Calvings a_1	Female Calvings a_2	Mean
I ...	— 2.5405	310.34	311.75	311.05
II ...	— 2.4242	310.46	311.87	311.16
III ...	— 1.8802	311.00	312.41	311.71
IV ...	1.1740	314.06	315.47	314.76
V ...	0.1920	313.07	314.49	313.78
VI ...	4.8978	317.78	319.19	318.49
VII ...	3.1728	316.05	317.47	316.76
VIII ...	— 2.5910	310.29	311.70	311.00
Mean ...	—	312.88	314.29	—

Discussion

The results showed that Murrah calves were gestated for an average period of 313.2 days which is in close agreement with those of 315.0 days reported by Kanagaratnam (1935) for Malayan buffaloes and not far below that of 317.5 and 315.8 days for male and female calves respectively reported by Ragab and Asker (1951) for Egyptian buffaloes

and those of 316.1 days reported by Kaleff (1932) for European buffaloes. The estimated average of 300 days given by Jennison (1927) and those of 305.3 days reported by Arunachalam *et al* (1952) for Murrah breed of buffalo are, however, considerably lower than the overall mean of 313.2 days obtained in this study. This difference of about 8 days between the averages for individuals of the same breed may be attributed to several causes, both pathological and environmental. In this connection Dr. Lush (1949) has observed that 'A common cause of variation is disease, such as abortion. Environmental conditions not usually classified as disease may sometimes bring about a shortening or lengthening of the gestation period. The season of the year in which pregnancy begins has a slight effect on the length of the gestation period in some cases. There is some evidence to indicate that nutritional conditions, even when not severe enough to be actually pathological, may effect the length of gestation.'

Both the season of freshening and sex of calf were found to have significant effect on gestation period which goes contrary to the findings of Ragab and Asker (1951) for Egyptian buffaloes but it is similar to the results obtained by Arunachalam *et al* (1952) for Murrah buffaloes.

Advance in age, as determined by the sequence of calving, seems to have no effect on the duration of pregnancy and this confirms the findings of Ragab and Asker (1951) and Arunachalam *et al* (1952).

Summary

1. The average length of gestation in Murrah buffaloes was 313.20 ± 1.11 days
2. 91.5% of calves were born between June to January. Calving was most frequent during July - November, which contributed to 76.9% of the total calvings.
3. Month of calving, sex of calf and sequence of calving were found to have no significant effect on gestation period.

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STUDIES ON THE INCLUSION OF A HIGH LEVEL OF GROUNDNUT CAKE IN GROWING POULTRY RATION

BY

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The groundnut cake is rich in protein and is readily available in abundance in India. The relative prices of cereals and groundnut cake, therefore, favour the increased use of groundnut cake for formulation of economic poultry rations. Previous investigation from this Division (Bose, Sen Gupta, Krantikumar and Iyer 1957) showed that a ration containing 40 per cent groundnut cake and 5 per cent fish meal was inferior to the ration containing 9.4 per cent groundnut cake supplemented with 150 parts of liquid separated milk for 100 parts of the ration, the average body weights of the chickens being 307 g. and 388 g. respectively at eight weeks age. As milk is a rich source of riboflavin whose requirement increases with increase in intake of protein, it was considered desirable to study the effect of the inclusion of high level of groundnut cake in growing poultry ration containing both separated milk and fish meal in combination, so that the ration remained adequate in both high quality proteins and vitamins.

The experiment consisted of 354 one week old chicks of white Leghorn breed divided into two comparable groups of 177 each, in brooder houses managed under semiintensive system. Table I gives the formulae of the control and experimental ration of 18 and 29 percent protein respectively.

The chickens in both the groups received chopped succulent greens and limestone grits in adequate amounts. The average weights of the male and female chickens in each group are recorded in Table II. The results show that the experimental ration containing 57 per cent groundnut cake supplemented with both separated milk and fish meal proved highly satisfactory in the growth of chickens, leading to considerable economy in the use of cereals for the production of stock.

TABLE I
Composition of the Rations.

Ingredients	Control	Experimental
Ground yellow maize	42.0 parts	15.0 parts
Wheat bran	20.0 parts	10.0 parts
Ground barley	10.0 parts	10.0 parts
Groundnut cake	20.0 parts	57.0 parts
Fish meal	2.0 parts	2.0 parts
Separated milk (expressed as dried)	5.0 parts	5.0 parts
Common salt	0.5 parts	0.5 parts
Shark liver oil (D ₈)	0.5 parts	0.5 parts
Terramycin (TM-5)	50 g. per 100 lbs.	50 g. per 100 lbs.

TABLE II

Inclusion of high level of groundnut cake Average body weights of
White Leghorn chickens in g.

Age in weeks	Control		Experimental	
	Male	Female	Male	Female
1	44	42	48	43
4	150	135	170	141
8	468	440	499	454

The combined average body weights of the male and female chickens in the control and experimental ration, at the end of eight weeks, were 454 g. and 476.5 g. respectively. It appears that the addition of separated milk has proved beneficial to the ration containing high proportion of groundnut cake by making available important vitamins, especially riboflavin. The percentages of mortality in the control and experimental groups were 15 and 20 respectively and the average food consumption per chicken from one to eight weeks was 3.1 lbs. only.

Summary

The present investigation was designed to study the effect of the inclusion of high level of groundnut cake in growing poultry ration containing both separated milk and fish meal in combination, so that the ration remained adequate in both high quality proteins and vitamins. The results show that the experimental ration containing 57 per cent groundnut cake supplemented with both separated milk and fish meal proved highly satisfactory in the growth of chickens, leading to considerable economy in the use of cereals for the production of

stock. The average body weights of the chickens in the control and experimental ration, at the end of eight weeks, were 454 g. and 456.5 g. respectively. It appears that the addition of separated milk has proved beneficial to the ration containing high proportion of groundnut cake by making available important vitamins, especially riboflavin.

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* STUDIES ON THE PATHOLOGY OF JOHNE'S DISEASE IN SHEEP

1. Haematological observations

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The importance of blood examination, as an aid, in Clinical Pathology and also in diagnosing the various diseases of chronic wasting nature, is well known. However, the blood picture in John's disease is not much known. A review of the available literature would also indicate that work on the haematological aspect of this disease has not been much attempted, except by Hallman (1945) in sheep, Miller (1932-33), Stewart *et al* (1945) and Rankin (1955) in cattle. Hence, the blood examination of sheep suffering from John's disease was conducted along with the other Pathological investigations.

Materials and Methods.

The investigations were carried out on 19 naturally infected Bikaneri sheep of age ranging between 3-5 years. These animals were declared positive for allergic tests in the year 1955-56, using Johnin and Avain tuberculin intradermally. In an attempt to find out the relation between the extent of macroscopic and microscopic lesions, and the physical condition of the animal, the whole lot was divided into three groups on the basis of the clinical symptoms and bodily condition.

Group I Extremely emaciated animals.

Group II - Body condition weak but not emaciated.

*This and the subsequent papers have formed part of thesis in partial fulfilment of the requirements of M.V.Sc. degree in Pathology of Agra University awarded to B. S. Rajya.

Group III—Apparently healthy animals.

Blood was collected in dried oxalated tubes and was used for determining the sedimentation rate of erythrocytes (E. S. R.) haemoglobin estimation, total red and white cell count. Blood smears for differential count were made from the fresh blood.

The analysis of the blood was done for E. S. R., Haemoglobin, total red and white cell count and differential count.

Results

The average haematological picture of the three groups of sheep is given in Table I and that of the three sheep in terminal stages belonging to group I is in Table II.

Discussion

On comparing the results of haemoglobin, total R. B. C. and W. B. C. with normal haematological constituents of sheep as obtained by Murty (1957), it would be seen that there is not much appreciable difference from the normal values. The percentage of different leucocytes is also not showing any marked difference when compared with the data given by Davies (1955) and Runnells (1954).

Although the haematological studies in the present work exhibit some differences among the three groups, the variations do not seem to be so appreciable as to be utilised for the purposes of diagnosing or distinguishing any stage of the disease, because the lower averages of erythrocytes, leucocytes, haemoglobin and high values of E. S. R. have been affected in group I by the extreme low and high averages of cases 187, 233 and 273 (Table II) where the blood was drawn a few hours before death.

The results of investigations of blood picture in Johne's disease by Miller (1932-33) in cattle and Halman (1915) in sheep also support the inappreciable alterations in the blood constituents. The findings of Miller (1932-33) of low, haemoglobin and total erythrocytes in the terminal stages are in close agreement with the present observations of three cases of group I sheep, which were extremely emaciated and died subsequently. The conclusions for the values of E. S. R. although high in cases of group I of advanced stages cannot be definitely drawn. It may be stated here that Rankin (1955) has pointed out citing Holman (1955) that there was no tendency to form rouleaux in cattle and as such the establishment of normal E.S.R. in this animal is misleading. At the same time, there appears to be a dearth of literature on the E.S.R. values of sheep and therefore the matter needs further investigations.

TABLE I
Average Haematological figures for the groups of Sheep.

Groups	E. S. R. in millimeters.					Haemoglobin gms. per 100 c.c. of blood	Total R.B.C. per c.m.m. (in million)	Total W.B.C. per c.m.m.	Differential Leucocytic count				
	I hr.	II hrs.	III hrs.	IV hrs.	V hrs.	XXIV hrs.			Neutrophils	Lymphocytes	Monocytes	Eosinophiles	Basophiles
I	5.5	11.14	14.74	18.61	23.59	35.6	7.259	10441.2	56.43	36.75	5.34	1.23	.05
II	1.1	1.91	2.8	3.69	4.85	13.35	9.490	11906.0	49.27	41.68	4.83	4.18	.12
III	1.03	1.93	2.29	3.7	4.87	11.3	9.638	15109.0	46.613	44.32	5.82	3.59	.017

(E.S.R. = Erythrocyte sedimentation rate)

TABLE II
Averages Haematological figures for the Sheep in Terminal stages of Group I

Sheep No.	E. S. R. in millimeters						Haemoglobin gms. per 100 c.c. of blood	Total R.B.C. per c.m.m. (in million)	Total W.B.C. per c.m.m.	Differential leucocytic count				
	I hr.	II hrs.	III hrs.	IV hrs.	V hrs.	XXIV hrs.				Neutro- philes	Lympho- cytes	Meno- cytes	Eosino- philes	Baso- philes
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
187.	18	36.5	46.2	55.8	59.2	87.1	7.81	6.47	13685.7	72.3	24.43	4.43	2.35	0
233.	1	1.75	2.75	3.5	5.75	13	8.4	7.51	9550.0	37.2	57.5	5	0.5	0
273.	0	1.94	2.77	3.55	5.17	20.3	6.3	7.04	7894.4	62.35	27.5	6.06	0.6	0

Summary

The haematological studies for erythrocyte sedimentation rate, haemoglobin estimation, total red and white blood cell count and differential count were conducted on allergic positive sheep to Johnin and Avian tuberculin and no appreciable difference was found from those of the normal values reported in the literature.

Acknowledgment

The authors are thankful to Shri C. V. G. Choudary, B.Sc., M.R.C.V.S., Principal, U. P. College of Veterinary Science & Animal Husbandry, Mathura for providing all facilities in conducting this work.

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* STUDIES ON THE PATHOLOGY OF JOHNE'S DISEASE IN SHEEP

II. Histopathological Observations on the presence of Acid-fast organisms resembling *Mycobacterium paratuberculosis* in the heart of sheep

BY

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Since the recognition of *Myco. paratuberculosis* infective lesions in sheep by Vukovic of Bosnia in 1907, a good amount of literature on this disease has accumulated. Various authors have reported the presence of *Myco. paratuberculosis* with or without lesions, in the organs of cattle and goats other than the intestinal tract and associated lymph nodes of these animals, in John's disease. The observations of some of the authors on this aspect are worth mentioning. For instance, Alexei-Jeff (1935) described the course of John's disease in cows as bacteraemia, because the bacteriological examination of blood from heart and peripheral blood vessels, lymphatic gland, heart muscles,

lungs, liver spleen, supra-renals, kidney, gall bladder, urinary bladder and mucous membranes of intestines, showed the antiformin resistant and acid fast cultures of the bacilli. Hardings (1957) quoting Alexei-Jeff Goloff (1929), Houthis (1932), Dunkin, Glover and Minnet (1941), and Taylor (1949, 1951 and 1953) observed that the organisms could be isolated from many of the organs of the body despite the absence of obvious lesions in cases of John's disease. In addition he has described the macroscopic and microscopic lesions in liver, lung and pancreas of goats, experimentally infected with *Myco. paratuberculosis* through various routes.

In the present investigations, six sheep of Group I, which were positive for allergic tests of John's disease were considered in advanced stage of the disease, due to the clinical symptoms and extremely emaciated body conditions. These animals on autopsy, showed characteristic gross lesions of intestines and contiguous lymph nodes. The smears from intestinal scrapings and mesenteric lymph nodes exhibited teeming acid fast organisms. Besides the histopathological changes with acid fast organisms of the tissues from the intestines and lymph nodes, the tissue sections of cardiac muscles in two of the sheep of this group, showed the presence of acid fast organisms morphologically resembling *Myco. paratuberculosis*. These organisms were located both intra and extracellularly near the epicardium. The organisms were associated with a mild inflammatory reaction characterised by infiltration of lymphocytes in the epicardium, presence of some macrophages along with a few giant cells in the stage of formation and the congestion of serosal capillaries.

Myco. paratuberculosis, although, had been isolated from various organs of cattle and goats there appears to be no record, so far, of the demonstration of acid fast organisms morphologically resembling *Myco. paratuberculosis* associated with histopathological lesions in the tissue sections of the heart of sheep under natural infection of John's disease.

Keeping in view this observation of unusual dissemination of *Myco. paratuberculosis* in the heart of sheep, it can be presumed that the organisms might have reached the heart through haematogenous route. This is supported by the formation of thrombus in the branch of mesenteric vein in one of the cases of this group of sheep, which had a number of acid fast organisms both intra and extracellularly (Rajya and Singh 1959). This presumption is in conformity with the observations of Hardings (1957), as the distribution of the organisms in liver lobules have been described by him through portal circulation. However, the probabilities of the organisms to reach the heart through lymphogenous route cannot be ignored since the organisms through

lymph nodes might also reach the thoracic duct and get mixed in circulation in the right atrium. This is supported by the presence of acid fast organisms and thrombus formation in the lymphatic vessels, as seen in some of the cases of this group of sheep and also with the observations of previous workers for instance McEwen (1939) and Stamp and Watt (1954).

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The authors are indebted to Sri C. V. G. Choudary, Principal U. P. College of Veterinary Science and Animal Husbandry, Mathura for the facilities provided to conduct the work.

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GLYCOPROTEIN CONTENT OF SERUM IN BULLOCKS

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Introduction

It has been recognized since long that serum contains high molecular weight carbohydrate components. It was also shown that much of this carbohydrate was bound to protein; these complex compounds are generally known as "glycoproteins". More recently the nature of the carbohydrate components of the serum glycoproteins has been established. Presence of glucosamine, equal quantities of galactose, mannose and hexosamine, together with significant amounts of fucose and sialic acid has been demonstrated by using chromatographic, spectrophotometric and isolation methods, (1).

A great number of studies, particularly during the past few years, have indicated that the concentration of the serum glycoprotein may be markedly increased in patients or in experimental animals suffering from a wide variety of pathological conditions. Most of the work in this field has involved determination of the total glycoprotein from the content of protein-bound hexose or hexosamine. Significant increases in the glycoprotein content of serum (as hexose or hexosamine) has been

shown to be associated with neoplastic disease, clinical tuberculosis, pneumonia, pregnancy, neoplastic, obstructive, or infectious liver disease, as well as with various miscellaneous infections and in inflammatory reactions. There is a gradual increase in serum glycoprotein levels with age, (2).

In spite of certain shortcomings in the use of their measurement for diagnostic purposes, such measurements, however, have been shown to be of value for (a) excluding malignant disease, (b) the differential diagnosis of jaundice, and (c) for following the activity of chronic infectious hepatic and rheumatic disease, (3).

In this communication is reported the concentration of some of the glycoprotein components present in the serum of normal bullocks.

Methods and materials

Twenty four adult Haryana bullocks were selected from the animals maintained at the District Dairy Demonstration Farm, Mathura. The animals were maintained under optimum conditions and were in good health.

Blood was drawn from the jugular vein early in the morning. Serum was separated and the three glycoprotein components, (a) Protein-bound hexose, (b) Hexosamine, and (c) Seromucoids were estimated.

Estimation of the glycoprotein components mentioned above was done as described by Glick, (3).

Results

The estimated average concentration of the various glycoprotein components expressed as milligram per 100 ml of serum is, Protein-bound hexose 148.5 ± 14.8 , Hexosamine 152.1 ± 4.2 and Seromucoids 9.3 ± 0.40 . The range varies from 112.5 to 200.0, 90.0 to 190.0 and 6.3 to 12.1 respectively. The three glycoprotein components of the individual animals are shown in Table I.

Discussion

The protein-linked sugar in the blood plasma of horse has been determined; it constitutes about two thirds of the total sugar and amounts to about 2 g. per litre of plasma, (4). The different glycoproteins in normal bovine synovial fluid and serum estimated electrophoretically have been reported; the average relative distribution of hexosamine in the electrophoretically separated zones were 59.6% and 56.7% in the α peaks, 21.3% and 16.7% in the β peaks and 19.1% and 26.6% in the γ peaks of synovial fluid and serum respectively, (5). The Protein-bound carbohydrate content of serum of healthy Swedish Friesian cows three hours after the first feed of the day, was found to be 159.8 ± 25.4 mg/100 ml serum, (6).

TABLE I

Protein-bound Hexose, Hexosamine & Seromucoid components in mg 100 ml. serum.

S. No.	Bull No.	Glycoprotein components.		
		Protein bound hexose.	Hexosamine.	Seromucoids.
1.	47/44	120.0	160.0	7.5
2.	19/24	137.5	190.0	7.5
3.	53/15	122.5	170.0	7.5
4.	765/P8	135.0	160.0	8.2
5.	700/P8	145.0	160.0	8.2
6.	704/P8	137.5	150.0	9.7
7.	689/47	145.0	170.0	10.5
8.	882/11	127.0	170.0	7.5
9.	730/28	120.0	160.0	6.3
10.	350/P9	112.5	170.0	7.1
11.	710/P8	116.8	150.0	7.1
12.	757/P8	132.5	170.0	6.3
13.	29	147.5	150.0	11.3
14.	677/17	200.0	111.0	12.1
15.	184/47	195.0	130.0	12.1
16.	99/45	170.0	150.0	11.3
17.	33	167.5	150.0	11.3
18.	24	145.0	130.0	11.3
19.	35	127.0	90.0	10.5
20.	32	140.0	140.0	19.5
21.	883/11	140.0	150.0	10.5
22.	114/16	157.5	160.0	6.3
23.	184/47	170.0	160.0	11.8
24.	690/47	135.0	150.0	11.3
Mean value :		143.5 + 14.8	152.1 + 4.2	9.3 + 0.40

In India, bullocks are largely used for agricultural operations; the incidence of cancer of the horn is found mostly in bullocks, (7). Since glycoprotein of the blood are markedly affected in neoplastic diseases (8), the normal values of various glycoproteins reported in this communication might be of value in the diagnosis of this malady.

Summary

The three glycoprotein components (a) Protein-bound hexose, (b) Hexosamine, and (c) Seromucoids were estimated in the serum of healthy bullocks. The respective figures, expressed in mg/100 serum, are 143.5 ± 14.8 , 152.1 ± 4.2 and 9.3 ± 0.40 .

Acknowledgment

Our grateful thanks are due to Dr. A. Roy, Professor of Physiology for his guidance and interest; and to Sri C. V. G. Choudary, Principal, for providing facilities.

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Clinical Article

A CASE OF FULL-TERM EXTRA-UTERINE (ABDOMINAL) PREGNANCY IN A SHE-GOAT

By

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Introduction

The fecundation in domestic animals probably takes place in the uterine horn, the fallopian tube (Fleming) or the funnel of the oviduct (Dukes) and from here the fertilized ovum travels to the uterus (1,2). In most cases this journey is successfully accomplished; on occasion, however it is unsuccessful and results in abnormal condition in which the ovum develops outside the uterus (1,3). This fascinating condition is termed Extra-uterine or Ectopic pregnancy (4).

Review of Literature

In Human subject, the first case was recorded by Albucassis, Abu'l Qasin uz Zahwari, who writes to have witnessed the parts of the foetal body from the abdomen of a woman by formation of pus (4). H. Hudnell Ware, jr., and William O. Winston of Medical College, Virginia, have reported 222 cases from 1945 to 1952 (5). Schumann

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has estimated the incidence to be one in 300 pregnancies (6). An extra-uterine twin has also been recorded in an African woman (7).

In domestic animals, this condition is very rare, even more than in woman (1). Some recent recorded cases in foreign countries are by Szaflark, J. (in Poland—1955) and Schmidt, A. (in Germany—1957) in sows; Collect, P., Colenson, R. and Petit (in France—1952/53) and Krusac, Z. (in Yugoslavia—1955) in cows; and Collect, P. and Bonnet (in France—1952/53) in rabbit (8, 9, 10, 12, 13). A case in a Fox-Terrier bitch of a mummified extrauterine foetus in the abdominal cavity as a sequel to a tear in the uterus has been described by Hofmeyr (in South Africa—Sept. 1958) (14). A through search of the available veterinary literature has revealed that with the exception of two cases in she-goats reported by Ayyer, T. S. V. in 1944, and Kaduskas, S. P. in 1956, no other record of this condition is available in the domestic animals in India (11, 4). The present case, therefore, appears to be the first of its kind in which a fully developed foetus was removed from the abdomen by performing laparotomy.

The Case

At 9 A. M. on 2nd December, 1957, the owner brought his pregnant goat to our College clinic (patient No. 360/146) with the complaint that she was uneasy, restless and straining since last night. On enquiry about the breeding date, it was known that the animal was carrying a full-term foetus and due to approaching parturition was evincing labour-pains. There was a history of difficult parturition at the previous delivery in the same goat. The examination of vulva showed that it was not enlarged and the flow of mucus as observed in the preliminary stages of ordinary parturition was absent. Vaginal examination revealed closed os-uteri. Palpation of abdomen confirmed the presence of a nearly fully developed foetus, the heart beats of which were later heard clearly on auscultation. The animal was kept under observation in the hope that normal parturition would ensue but even after 24 hours no sign of parturition was noticeable. Straining and labour pains had increased but no trace of foetal membrane was visible near the lips of the vulva. The patient's abdomen was again palpated to find out the possible existence of any abnormality in presentation etc. but nothing could be ascertained. On auscultation the foetal heart sounds were not audible, indicating the probable death of the foetus. Some mysterious dystokia was suspected and an immediate caesarian section was decided upon.

The hairs of a central area of the left para lumbar fossa were removed, and the site was scrubbed thrice with 5% Cetavlon lotion and dried with sterile swabs. The operation was performed

under paravertebral lumbar block effected by 2% procaine hydrochloride solution. With the animal in the standing position, a vertical cutaneous incision 5" long commencing an inch below the lumbar tranverse process was made. Abdominal muscles underneath were divided to the same extent. Minor haemorrhage was attended to. Finally, peritoneum was incised at the lower end and its wound was enlarged by fingers to the same extent as that in other tissues. The hand was then put into the abdominal opening for holding the uterus for its incision but a few adhesions were found between the abdominal wall, bowel mesentery and omentum just at the lower end of the opening. These adhesions were freed with the fingers and to our extreme surprise was exposed the dead foetus enclosed in membranes. Membranes were ruptured and foetus was taken out. Its placental attachment was not determined due to haste. Rupture of uterus was suspected and exploration of abdomen was made. The uterus was found lying in its normal position, in a perfectly contracted, non gravid state without any open wound in it. It was replaced in its position and after dusting some sterile sulphanilamide powder on the wound, the peritoneum and muscles of the opening were sutured with 20 chromic catgut. Skin was sutured separately in lockstitch pattern with S. S. wire and the line of sutures was painted with weak tincture of Iodine. The foetus on examination was found to be fully developed.

The animal was purchased by the College and kept on usual diet. The recovery was uneventful. The next gestation was perfectly normal and the animal has only recently delivered a healthy kid with no difficulty at parturition.

Discussion

Extrauterine pregnancy is a rare condition and can be tubal, ovarian or abdominal, according to the place of development of the foetus (1). Abdominal pregnancy may be *primary*, when the ovum after escaping from the ovary, grafts itself directly in the cavity of abdomen; or *secondary*, when the embryo falls into the abdomen after the rupture of the pouch, such as ovary, fallopian tube or uterus, where it had developed primarily (1). In secondary abdominal pregnancy the placenta maintains its primary attachment (6). Primary abdominal pregnancy is a doubtful entity although several authentic cases are on record in human subject (6, 16).

As the placental attachment in the present case was not determined, authors cannot say about the nature and origin of this gestation.

The aetiological factors concerned in the causation of extra-uterine pregnancy are very imperfectly understood but the most logic explanation seems to be some interference with the downward progress of fertilized ovum resulting more or less from mild salpingitis, tumours,

malformations, adhesions of mucous folds forming pockets and persisting embryonal twists (3, 17).

Conclusion

By virtue of knowledge and experience gained by this case and those recorded earlier by Ayyar (1944) and Kudaskar (1956) authors conclude that:—

The diagnosis of this condition is difficult.

It is perhaps possible to save the foetus if diagnosis is established in time and operative measures adopted before its death. This they say, because of the fact that foetus in the present case was alive till a few hours before the commencement of operation.

Summary

A rare case of extra-uterine pregnancy is recorded in which the fully developed foetus was taken out of the abdomen of a she-goat by performing laparotomy.

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Abstracts and Extracts

Parasitic bronchitis in cats in Ceylon:—By SENEVIRATNA, P. (1958). Cey. V.J, 6, 36-37.

Anafilavoides hostratus is the commonly occurring lung worm of cats in Ceylon as is *Vogeloides ramanujachari* in cats at Madras. The author has given a synopsis of his detailed studies on *Anafilavoides hostratus* regarding morphology, Zoological classification, life-history and pathogenesis of the parasite as well as clinical symptoms, diagnosis, treatment and prevention of the infection. The molluscan intermediate hosts in Ceylon are found to be *Achatina fulica*, *Helix aspersa*, *Maviella dussumieri* and *Laevicaulis alte*. In these hosts, the infective stage is reached in 30 days. Chicken and mice acquiring infection by eating the intermediate hosts act as transport hosts. The treatment suggested is five intramuscular injections of Antimosan at the rate of 0.2 c.c./kg. body weight every fourth day combined with the oral administration of Piperazine Hydrate at the rate of 50 mg./kg. body weight for 2-3 weeks.

V. S. ALWAR.

"Blotting Paper Disks - Aid Serum Testing".— Vet. Med. 54 (6); 284 (1959)

The veterinarians at the University of Wisconsin have developed a new technique which makes it easier and less expensive to transport and handle blood serum samples for virus testing.

Small disks of blotting paper have been used to absorb serum samples. After drying, such disks can be mailed to the testing locations where serum antibodies are dissolved from the blotting paper and subjected to the usual testing procedures.

No mechanical refrigeration is needed for the blotting paper disks. They have also observed that the blotting paper method gets rid of some "non-specific" antibodies which may cause confusion in the interpretation of the tests.

The testing procedure will be specially helpful in surveys aimed at eradication of virus diseases over a large area.

So far, the technique has been used successfully with Vesicular stomatitis, Newcastle disease and Equine encephalitis. The researchers on the project merely dipped the blotting paper disks into the animal, blood, then dried them and mailed them in large lots for testing.

(What's New in Farm Science; Bull. 526)

B. PANDA.

Physiological management of diarrhoea:—DR. W. J. FOSTER and DR. K. M. GODDARD. *Vet. Med.* (54), 214 (1959).

A simple physiological approach to correct gastro-intestinal disorders of the dogs has been presented. It recognises the existence of four distinct clinical entities such as nutritional disturbances, hypermotility of the gastro-intestinal tract, inflammation and infection.

Hypermotility of the inflamed gastro-intestinal tract, usually indicated by emesis or diarrhoea, initially serves as a means of quickly removing noxious materials from the tract and as a meaningful symptom of upset physiology. Excessive or prolonged diarrhoea causes upset in fluid balance, rapid dehydration, incomplete digestion and absorption of nutrients, promotes toxæmia and lowers resistance to infection.

The immediate and effective control of diarrhoea has been achieved by using a recently introduced compound (Diathal-Schering) which contains diphemanil methyl sulphate; an anticholinergic drug, which selectively suppresses parasympathetic motor and secretory activity of the gastro-intestinal tract. At relatively low dosage levels (0.25 to 0.5 c.c. intramuscularly, once daily to dogs weighing up to ten pounds; 0.5 to 1 c.c. to dogs, between 10 to 30 pounds and larger dogs 1 to 2 c.c.) this drug will suppress spastic contractions which contribute to rapid peristaltic propulsion of ingesta through the tract. Slowing the rate of propulsion of ingesta sharply cuts frequency, number and volume of evacuations.

Lower rate of propulsion permits colonic reabsorption of water, which halts progressive water loss and aids in re-establishing digestion and absorption of the nutrients. Renal clearance of accumulated toxic metabolites is facilitated by reabsorption of fluid balance in the dehydrated animal. Thus the use of this anticholinergic is an effective physiological addition to any system of antidiarrhoeal treatment, which should be accompanied by the indicated primary therapy if and when required—(i.e. when diarrhoea is secondary to systemic infectious diseases—like distemper, hepatitis or parasitism).

B. PANDA.

Neoplasms of Animals in India:—By GANTI A. SASTRY (1959) *Vet. Med.* Vol. 54 (8): 428-430.

Scrutiny of the incidence of neoplasms collected at the Madras Veterinary College during a 12 year period revealed a high percentage (60%) of veneral tumour in dogs while in other animals (sheep, horses, goats and cats) epithelial tumours were encountered more frequently.

M. S. J.

General anaesthesia in dogs by Pentobarbital sodium:—By Nicholas Aspiotis *et al* (1959). *Cornell Vet.* Vol. XLX (2): 220-232.

Authors' conclusions after the trial of Pentobarbital sodium as general anaesthetic in more than 300 dogs are as follow:—

1. Optimum dose is 35 mg. per kg.
2. A dilution of 3.5% in alcohol is preferable to that in water due to better keeping qualities. 1 c.c. of this solution is required to be injected intravenously per kg. of body weight. Doses above 40 mg. per kg. are to be avoided.
3. Average duration of anaesthesia is 2 hours and 28 minutes $\pm$ 49.3 minutes. (Experiment on 10 dogs.)
4. Since duration of deep surgical anaesthesia and period of recovery are long, the drug is best used for long veterinary and experimental operations.
5. Minimum lethal dose (MLD₅₀) was found to be 62 ± 14.1 mg. per kg. (Experiment on 10 dogs).

M. S. J.

Salmonella dublin infection in calves—A preliminary report—By ROKEY N. W. and ERLING H. G. (1959) *J.A.V.M.A.* 135 (2): 117-120.

The authors record the isolation of *Salm. dublin* from mesenteric lymph nodes of a calf which died of uncontrollable foetid diarrhoea. In the dairy herd of the dead calf there had been a previous history of similar sickness and high mortality among calves and out of 20 calves in the pen of the present case, there was a morbidity of 85% and mortality of 33½%.

The authors point to world wide distribution of the pathogen and the public health importance of the possibility of infection being conveyed to man through contaminated milk and meat.

M. S. J.

News and Views

Dr. O. S. Reddi:—News is to hand that Dr. O. Sundarama Reddi, Lecturer in Animal Genetics at the University College of Veterinary Science, Osmania University, has been awarded the Nuffield Foundation Dominion Travelling Fellowship enabling him to study Cross-breeding and inheritance of milk production at the Institute of Animal Genetics, Edinburgh, for one year from January 1960.

Dr. Reddi is a B.V.Sc., of the Madras Veterinary College and took his Ph.D., degree of the Madras University from the same institution. The award was made in open competition and on the basis of his work at the Madras Veterinary College. It is a double distinction of which the Madras Veterinary College can well be proud. One of its *alumni* is the first to secure this covetable distinction amongst Veterinarians in India and it has established beyond doubt the high level of Post-graduate Veterinary education imparted at this college. We congratulate both Dr. Reddi and the Madras Veterinary College.

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.]

CHEAP HOUSING OF POULTRY

BY

S. RAJAN, G.M.V.C., B.V.Sc.,

*Instructor in Animal Husbandry, Rural Extension Training Centre,
Bhavanisagar—Madras State.*

Poultry keeping has come to be accepted as a profitable subsidiary industry, which augments the income of the villagers, provided it is done on scientific lines. It is only to provide the necessary incentive and encouragement lots of money are spent on the poultry development schemes in our Five Year plans. One of the handicaps for rapid expansion of this industry by the villagers, is the problem of proper and economic housing of poultry under rural conditions. The present day houses with asbestos roofing cost nearly Rs. 350-450 per house and are therefore beyond the reach of a poor ryot.

With a view to find a simple solution for this, studies and experiments were undertaken at the Rural Extension Training Centre, Bhavanisagar, and based on the success of those experiments, in evolving a simple and cheap design of a poultry house, it was decided to publish this article.

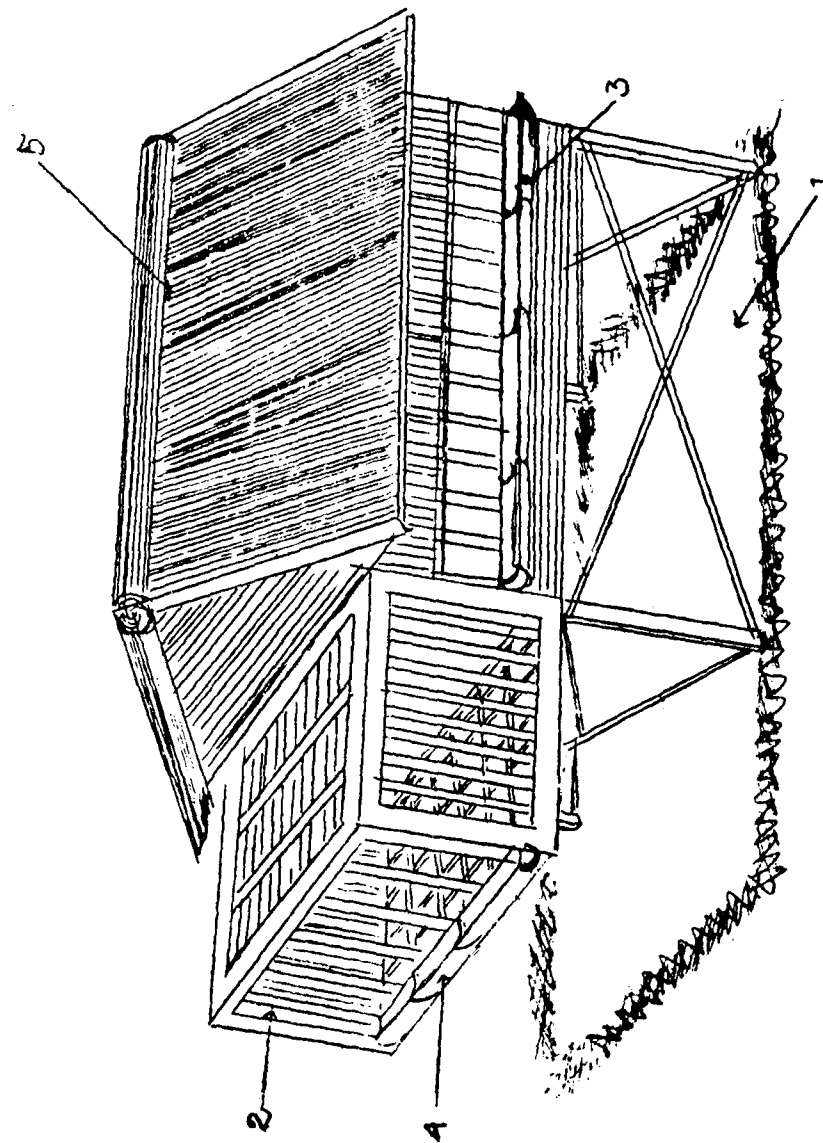
The materials used for constructing the poultry house, were only ordinary bamboos. Bamboos are easily available in villages and the making of the house does not require any technical skill. One carpenter can finish this construction within 1½ days. Split bamboos are preferred to whole bamboos because of their cheapness and reduced labour.

Roofing:—Ordinary Jumbu or Korai grass available in the villages can be used as roofing material and in our experience it has been found that this type of roofing can withstand heavy rain and sun without any discomfort to the birds lodged inside. (Sketch No. 1).

ADVANTAGES OF THIS BAMBOO HOUSE

1. Cheapness of construction.
2. It is within the easy reach of a poor ryot.
3. A smaller floor space is found adequate for rearing many birds and this obviates the need for finding more area especially in congested houses where enough open space and free runs are difficult to find.
4. It has been proved that birds reared in these houses are free from worms.
5. By dint of provisions in this house for giving feed and water in abundance, the ryot need not spend much of his valuable time in feeding and watering birds. The birds will take care of themselves. All that a ryot has got to do is to spend only 5 minutes in the morning and 5 mts. in the evening for feeding and watering the birds and another 5 to 10 mts. in the course of the day to collect the eggs.
6. Even children in the family not engaged in otherwise can take up to poultry farming easily.
7. Separate egg boxes can be provided in the houses to make the hen adopt its normal practice of laying eggs in a dark, cool place, quite undisturbed. (Sketch No. 2).
8. The birds can also get enough sunshine in the sun porch provided in the house, so that they get their ample natural supplies of Vitamin A and D. (Sketch No. 1)

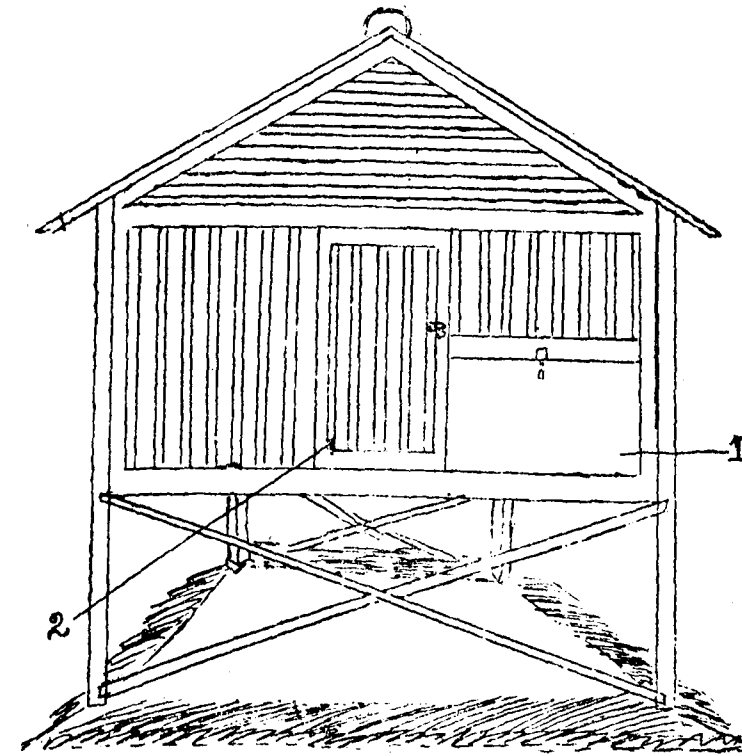
Portable Poultry House — Bamboo Make
(Side view)



SKETCH No. 1

1. Pit to conserve poultry manure.
2. Sun Porch.
3. Split bamboo for holding dry mash.
4. Split bamboo for holding water.
5. Roofing with Jumbu Straw or Korai.

Front view of the Bamboo Poultry House



SKETCH No. 2

1. Egg box with locking arrangements.
2. Door with locking arrangements.

9. The added advantage under this method is that the ryot will be able to conserve all the droppings of the birds as manure, in a pit dug underneath the house. Otherwise much of the manure gets wasted in a scattered and wider area. This pit can have a depth of about 3 feet. As soon as the pit is filled, the house can be transferred to another place and the pit already filled up may be covered with dry earth and kept for about a month or two so that it will rot well and become good manure. Since poultry manure contains not only the faeces but also the excretion of the kidneys, it is much richer in nitrogen than that of other domestic animals. To prevent the bad odour emanating from such a pit, hydrated lime can be used as a deodorizer since it can reduce nitrogen losses and also improve the handling qualities of the products.

The poultry manure obtained from such pits in the unit of this centre, is utilized with advantage in the Agriculture Farm attached to this training institution for Gramasevaks.

10. The owner of this type of house can easily dismantle them on shifting to another town or village and can easily reassemble them.
11. It has been proved beyond doubt that the laying capacity of the hens is not affected by using this house.

Disadvantage

There appears to be one disadvantage in this viz., Walking practice. This is due to the necessity of keeping birds always within the house. Birds reared in this type of houses, when let out, feel a sort of shyness while walking in the ground and this can be overcome, by allowing them in a separate pen freely for a couple of days.

Economics of a house of this type

(1) Cost of bamboo	Rs. 9-00
(2) Cost of reapers, if used as supports	" 2-00
(3) Cost of nails	" 1-50
(4) Wages for the carpenter for 2 days at Rs. 2-50 per day	" 5-00
(5) Other sundry charges	" 2-50
Total	20-00

So it is evident that to have houses with dimensions 7' x 5½' including the sun porch, costs only Rs. 20/- per house and this can lodge about 20-25 birds and this can be used with advantage in villages where free space is not available and where there is likely to be trespass into the neighbouring fields. This will be specially suitable for semi-urban and urban areas with congestion in living space.

The cost of one chick house using bamboos and with dimensions 3' x 2' comes to about Rs. 4/- and this can lodge about 10-15 chicks upto 1½ months of age.

Acknowledgment

My grateful thanks are due to Sri J. H. S. Ponnayya, former Principal of this centre for the suggestions and guidance given in evolving this house. I am also indebted to Dr. D. Pattabiraman, Director of Animal Husbandry and Dr. T. Ananthapadmanaban, Deputy Director of Animal Husbandry, (Livestock) and Rao Sahib T. Vinayaka Mudaliar, retired Livestock Development Officer, Madras, who visited this centre on 26-8-59 for giving me the incentive to publish this article.

My grateful thanks are also due to Sri R. Alagiamanavalan, Principal of this centre for the guidance given and facilities provided for publishing this article.

The help of my colleagues and the Gramasevak trainees in this training centre is also gratefully acknowledged.

Association News

The All-India Veterinary Association

THE RESERVE FUND

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

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

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

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

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

Jai Hind!

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

THE WEST BENGAL VETERINARY ASSOCIATION

The 14th All-India Veterinary Conference, Calcutta.

Postponed to February 1960.

In order to get some V.I.Ps and Professional Experts at the Conference, the Steering Committee has postponed it to February 1960. The exact dates will be announced later.

D. R. MARWAHA,
Organising Secretary.

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We are glad to announce that the next issue of our Journal, "The Indian Veterinarian," is being published from Pb. College of Veterinary Science & Animal Husbandry, Hissar. A limited number of copies have been reserved for the teachers and field doctors working in the Veterinary profession. Those who desire to get the copies may book their orders with the undersigned at the earliest. Each copy costs Rs. 3/- (Postage extra). Copies ordered more than six will be sent postage free.

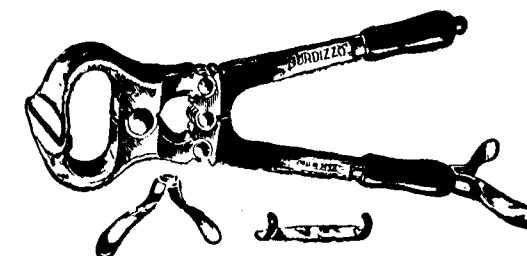
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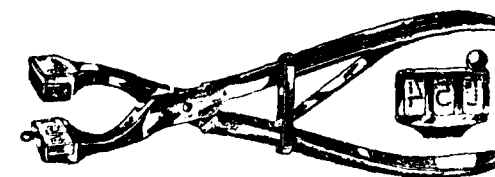
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