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PUBLISHED BI-MONTHLY

(THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION)

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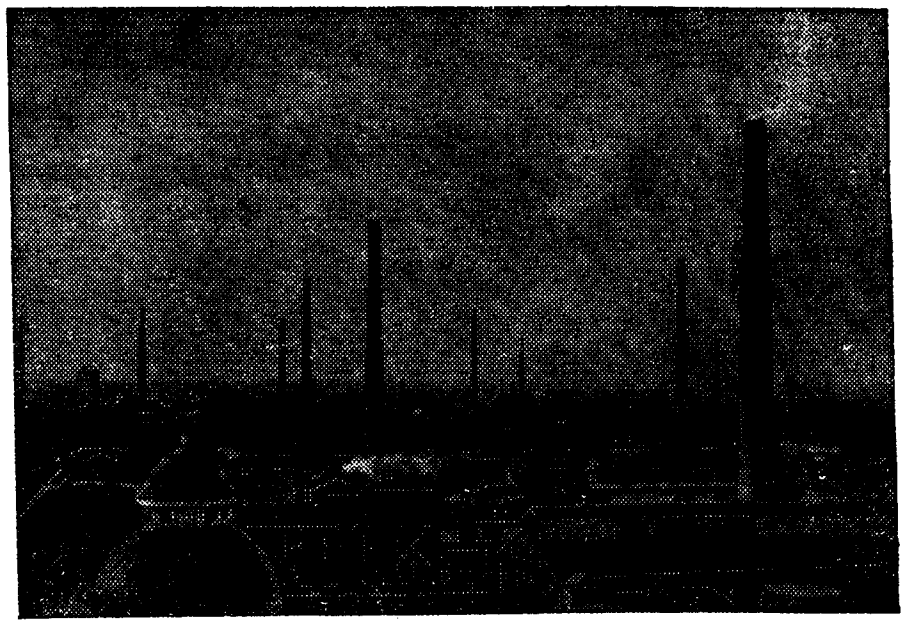

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(The Journal of the All-India Veterinary Association)

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General Articles

POLLED CATTLE*

BY

DR. JOHN HAMMOND C.B.E., M.A., D.SC., F.R.S.

So far as is known from fossil remains, all primitive breeds and species of cattle were horned, although this is doubted by Arenander, who cites *Leptobos frazeri* and some other hornless types of the Pleistocene period in India, which have been described by Rutmeyer. It is generally believed that polled breeds arose as mutations or sports from horned varieties. Characters such as horns are inherited by means of chemical substances called genes, arranged in pairs on the chromosomes of the nucleus of the animal cell. Genes determine the formation of the character in the new individual. When, by chance, the chemical nature of a gene is changed (as it can be sometimes by X-rays and other means) it gives rise to a mutation or sport. Most of these mutations are recessive in inheritance, that is, the character in question disappears in the first generation of a cross with the normal primitive variety, and then reappears in the next generation in the proportion of 1 in 4. The polled character in cattle is an exception in this respect, however, for although it is a mutation from the primitive form it behaves as a dominant, that is, one which appears in the first generation of a cross with the primitive type and which, in the second generation, appears in the ratio of 3 to 1; two, of these three will not breed true to polled, although the other one does (vide figure).

Historical

In general the history of cattle follows the history of man. Wherever either primitive or modern man has migrated, he has tended to bring with him his own breeds of cattle. An account of the literature

*Reproduced by the kind permission of the Editor, Endeavour, London, from Endeavour, April 1950. (Figures of polled catte illustrating the article have been omitted Ed, I.V.J.)

on the origin of hornless cattle has been given by Dechambre (1922). In this he states that the earliest records of polled cattle in civilized countries occur in Egypt about the year 2150 B.C. Polled cattle were also described by Herodotus (*History*, Book IV) in southern Russia (Scythia). Whether these had the same origin and were transferred from Egypt is not known for certain. There exist in Africa today some native polled breeds of cattle kept by tribes in French West Africa, which no doubt have arisen from the Egyptian polled cattle, for, as Curson and Thornton (1936) have shown, there was probably a migration of tribes from the north to south of Africa along definite routes.

The next earliest account of polled cattle occurs in Scandinavia where, in Sweden, polled cattle of a small red breed (*Rod Kullig*) and also a white breed (*Fjäll*) existed, as they do to this day. It is possible that these were derived from southern Russia, for similar breeds also exist around Archangel in Russia, and it is known that tribes from southern Russia migrated to Finland. There is the possibility, however, in the lack of absolute proof of the transport of southern Russian polled cattle to Scandinavia, that the Scandinavian polled cattle arose from a local mutation, for it is a well-known fact that the same mutation may arise at different times and places. There is indeed recent evidence (see below) that the polled mutation has occurred independently during recent times among pedigree horned cattle in the U.S.A. and in Britain.

It is highly probable that the majority of such polled mutations in horned breeds would not survive under primitive conditions, for the polled character would be a distinct disadvantage in combat with other bulls of the breed, when they fought for their herds or in defence against predatory animals. Moreover, polled breeds would not be favoured and retained by peoples who use cattle for draught purpopses, since in many lands the horns are frequently used to catch the cattle or to yoke them to the plough or cart. Conversely, the places where the polled mutation would be likely to be retained were those in which there was little cultivation, and cattle were required for meat and milk purposes only. Thus it was that polled cattle obtained a strong footing in Scandinavia, while few records of the development of polled breeds exist in central and southern Europe, Asia, and most of Africa.

The primitive cattle of Great Britain and Ireland were all horned, and Wilson (1910) has described how the various polled breeds of British cattle were derived mainly from red stock brought over from Scandinavia by the Vikings. In Ireland, the Maol, a polled breed almost extinct today, was produced. In Scotland, the imported polled cattle breeding with the primitive black horned cattle of the Celts gave rise to the polled black Aberdeen Angus and Galloway, while Viking settlements in East Anglia

developed the Red Poll possibly from pure Scandinavian stock and later by crosses of this with red horned breeds. Here also, by crossing with the white horned cattle introduced into Britain by the Romans, they gave rise to the polled Park Cattle which exist today in a few places. When men from Britain began to colonize North America, Australia, New Zealand, and South Africa they took many animals of these polled breeds with them, so that now polled cattle are distributed over both the south and the north temperate zones of the world.

In addition, however, to the polled breeds which were derived directly from Britain, polled strains of horned British breeds have arisen by muitations in North America, and have been developed there and elsewhere as separate breeds. Such polled mutations in normally horned breeds have arisen from time to time in Great Britain also, but hitherto they have not been preserved since tradition and breed-society rules did not allow of the admittance of such animals to the herdbooks. Duerst (1931) gives references to cases of the polled mutation occurring in many different breeds of horned cattle. Within the last three years, polled mutations in pedigree Guernsey cattle (one in England and one in U.S.A.), and at least one in Jersey cattle (in England), have been recorded. It has been stated that the chances of this occuring are about once in 50,000 births (Clover, 1948). In the home of a long-established horned breed such mutations stood little chance of survival. It was otherwise, however, in new countries where the survival depended on the value of the new mutations to the stockbreeder rather than on the traditions of the breed. It was for this reason that when polled mutations occurred in the Hereford and Beef Shorthorn breeds in the U.S.A. in comparatively recent times they were retained and bred from. Nine polled sports were listed by Spillman (1907); two of these Hereford bulls came from horned parents and were used by Boyd in establishing a pure race of polled Herefords.

In 1901, W. Gammon of Des Moines, Iowa, circulurized members of the American Hereford Cattle Breeders' Association, asking for hornless sports. 14 were found, and Gammon bought 7 cows and 4 bulls. The polled bulls mated with horned Hereford cows gave 50 to 75 per cent. hornless calves. A national breed organization for these polled Herefords was started about 1907 with a membership of 5, and by 1948 the new registrations of polled Herefords reached about 30,000 a year.

Owing to the demand for a polled beef animal which was a good grazer, these polled Herefords were introduced into Australia and are now spreading rapidly there. In the U.S.A., the polled Beef Shorthorn has also been developed. It is said to have originated in the State of Ohio about 1870 from pure-bred Shorthorn stock, and also in Minneapolis in about 1882, when a pedigree roan cow with scurs (small loose horns)

produced three hornless calves. An American polled Shorthorn herdbook society was formed in Chicago in 1889, and the first herdbook was published in 1898. The polled Shorthorn is finding a ready demand in beef-producing areas, and has spread to the Argentine, Australia, and South Africa.

Artificial Dehorning

In beef breeds kept under range conditions, polled cattle are favoured, except where predatory animals exist, since animals suffering from injuries due to their horning one another are difficult to treat. Moreover, the presence of horns is a frequent cause of bruises and spoilage in the carcass when the animals are rounded up to be put on rail to the abattoir, and more polled than horned cattle can be loaded in each rail wagon for transport. In most large beef-producing areas of the world (Argentine, Australia, New Zealand) the steers are therefore mostly polled or dehorned. This operation is best done by rubbing the horn core in the newly born calf with a stick of caustic potash. In extensive range areas, however, it requires a lot of labour to round up calves for this purpose, and under such conditions the young growing horns are often debudded with shears or sawn off, a rather cruel and bloody, operation, at a later stage of life. No wonder, then, that polled breeds and strains are now extending in these areas. For intensive beef production under yard feeding conditions too, such as in Scotland and eastern England, polled cattle are favoured, for, by polling, trough space requirements are reduced and more cattle can be put in each yard; thus Irish store cattle sent to be fattened in eastern England are now all dehorned, for they fetch about £1 per head more there than do horned cattle.

As to dairy cattle, the modern system in most countries of using run-through milking sheds has necessitated the dehorning of the dairy cows. Before milking, the herd is usually run in to a confined space, and here, as well as in the rush to the milking bale to get milked, horns may cause injuries not only to the skin of the cow but also to the udder. Moreover, a dig in the ribs from another cow when going to be milked is not conducive to that placid state of mind which is necessary for the easy discharge of milk to the machine or milker. In dairy cattle there has not been the same urge to produce polled breeds, however, as there has been with beef cattle, because the process of dehorning is much easier where the calves are confined and reared by hand. For this purpose the caustic potash method, and an electric dehorner which burns round the periphery of the horn bud in the newly born calf, are mostly used. This is carried out in most dairying areas of the world where milking machines are in common use, such as in the U.S.A., Canada, New Zealand, and Australia, and the 'new look' is not now discriminated against in many shows in the U.S.A., the champion cow in the 1947 Dairy Congress Show being without horns.

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FIGURE 1

Diagram showing the character inheritance in cattle. The Aberdeen Angus has the black and polled characters which are dominant over the red and horned characters of the Hereford. The latter, on the other hand, has the white face pattern which is dominant over plain face. The three dominants appear in their progeny, but when these are interbred eight different types are possible, and the chances of each type appearing is indicated by the numbers beneath the animals.

Producing Polled Breeds

Since dehorning involves much time and trouble, and employs labour which could better be devoted to other purposes, there is much to be said for producing new polled types of the horned breeds of cattle. To be set against this are the abolition of the primitive beauty of gracefully spreading or upturned horns, and loss to the cowboy of a means of casting or lassoing his steers, and, in some cases, of a means of rapid indentification of cattle where numbers are branded on the horns. However, if new polled breeds were produced the stockman could always have the option of which strains—polled or horned—would suit his purpose best.

If it were desired, there are two ways in which a polled strain of a horned breed could be produced. The first is that of preserving the polled mutations which appear from time to time among animals of the pure horned breed—the way in which the polled Hereford has been produced. This could be encouraged by opening a polled section of the herdbook concerned, in which these animals and their progeny (with due precautions —see below) were entered.

The second method is that of crossing with a polled breed and the upgrading the resulting progeny to the pure breed concerned, as in the grading-up schemes which exist in all open herbbooks. This is the method which has been successful in producing the new sex-linked strains of different breeds of poultry in recent years. The polled suffolk sheep, too, has been produced from crosses between the polled Southdown and horned Norfolk breeds, and now breeds, true to the polled character. Some of the present Red poll breed of cattle, which now breeds true for the polled character, were horned.

Both these methods are being used to develop polled types. Using the first method, that of collecting mutations which occur from time to time in the pure breed, the various breed societies fall into a graded series reflecting the attitude of the majority of their members. At the one extreme, even artificially dehorned animals are debarred form being registered as pure (Shorthorn and Hereford Societies of Great Britain); in other societies artificial dehorning is permissible although naturally-polled animals are not permitted (Friesian Society of Great Britain); while in several other societies (U.S.A. Holstein-Friesian, Guernsey and Jersey Societies) naturally-polled animals are admitted to the herdbook without any special note being made of the fact, or a special mark is made against the names of polled entries (U.S.A. Shorthorn and Ayrshire Societies). At the other extreme, the polled animals are registered in a separate herdbook by a separate breed society which is concerned with breeding them true to this character (Polled Hereford Society of the U.S.A.).

Within some of those breed societies which at present prohibit the registration of polled mutations, a few members have broken away. They are attempting to produce polled types by cross-breeding with a suitable (similar commercial qualities and colour) polled breed and then grading-up back to the original breed; for, while the polled and horned characteristics are inherited as units without blending, the commercial qualities are inherited in a quantitative blending fashion. Thus, while in first crosses between the polled Red Poll and the horned Ayrshire all the offspring are polled, in general build and commercial qualities the first cross is intermediate between the two breeds. When these first-cross animals are back-crossed to the pure Ayrshire, the offspring have 75 per cent. of the build and commercial qualities of the Ayrshire, while 50 per cent. of them are horned and 50 per cent. are polled. If these polled animals are now mated back to the pure Ayrshire again, the offspring have 83½ per cent. of the build and commercial qualities of the Ayrshire type, and 50 per cent. of them are polled, and so on for each successive generation of grading-up (see table).

Generation	Per cent Polled	Per cent. Commercial Qualities and Build of Ayrshire
1. First cross ...	100	50
2. Polled offspring mated to Ayrshire	50	75
3. Ditto	50	87½
4. Ditto	50	93¾
5. Ditto	50	97⅞

Since all our dairy breeds of cattle now have an open herdbook and allow grading-up, all that would be necessary to obtain polled types of breeds would be to admit polled animals as foundation cows—the rest would then follow automatically with the grading-up.

When a high percentage of the pure breed characters is present in the grades (when the animals would be admitted as pure-bred) the next problem arises, namely that of getting them to breed true for the polled character. This is done by mating bulls and cows of the polled grades together, when 1 in 3 of the polled offspring will breed true to this character. To obtain true breeding it is quickest and most economical to concentrate on the bull, and pick out the 1 in 3 of the polled bulls which will breed true. Some indication of whether they are likely to breed true or not can be found (in the bulls, but not in the cow) by the absence of

scurs or knobs (lumps of bone on the skull in the position of the horns), as bulls which are heterozygous for horned (or not breeding true for polled) will have these. After selection of the bulls has been made on this basis, it is advisable to make quite certain by doing a progeny test on the bulls before they are used for pure breeding. The young bull is mated with some 5 to 10 horned cows, and if without exception all the offspring are polled then the bull will breed true, but if even only one horned calf is found among the offspring then the bull should be rejected for further pure breeding. By grading-up the polled cows with such progeny-tested bulls the chances of horned offspring appearing in the breed will be reduced to zero, and they will become true breeding for polled in the course of time.

The chances of any of the polled cows in the herd ever breeding any horned offspring (even when mated with a horned bull) is reduced in each generation bred in this way from a succession of proven bulls thus only 1 out of 3 cows will throw horned offspring to a horned bull in the first generation, 1 out of 6 in the second generation, and 1 out of 12 in the third generation, and so on. Using our knowledge of the Mendelian laws of inheritance it sohuld be possible to produce pure polled strains of any breed of cattle without losing the characteristics of the breed in question, if it is so wished.

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Circumcising the Brahman Bull.—Most Veterinarians practicing in areas where Brahman bulls are used for service are familiar with the condition known as "prolapse of the prepuce". Breeders of Brahman cattle have not been successful in producing an animal that does not have an enormous amount of pendant skin in this region. The preputial opening is very low, and the prepuce is very easily traumatized by coming in contact with tall grass, weeds, or bush. Considerable thickening and edema occur, and an enlargement of varying size develops. The bull is unable to retract the prepuce or protrude the penis. Many valuable bulls with this condition have been sent to market, as they are valueless as breeding animals. Removal of the enlargement by surgery offers the only hope of returning these bulls to service.—A. A. Lenert, D.V.M *Southwestern Veterinarian*, May 1950. *N.A.V.*, August 1950.

B. C. G. VACCINATION

Contributions by The Veterinary Profession

By

K. P. CHANDRASEKHARAN, B.V.Sc.

Department of Pathology, Madras Veterinary College, Madras.

At a time when vaccination of human beings by B. C. G. (Bacillus Calmette-Guerin) is being done all the world over including India, it is but opportune to review the many contributions made by the Veterinary profession towards making this greatly possible. The fact that one of the authors of the vaccine, namely, Guerin, is a veterinarian, is seldom mentioned, if not lost sight of by the promoters of this method of vaccination. It was Guerin who collaborated with Calmette in evolving the strain of B. C. G., and who later supported his chief all through the controversy that raged around the use of this vaccine.

The early experiments on the attenuation of a virulent bovine strain of Mycobacterium tuberculosis, handed over to Calmette and Guerin by Nocard, also a Veterinarian of great repute, began in 1906. This strain at that time was found to kill calves under six months of age in four to six weeks' time, in 3 mgms. doses. The authors began growing this at 38° C on 5% glycerine bile potato medium; after 30 passages at 25 days interval, it was found avirulent for calves, later for monkeys and after five years for laboratory animals. The experiments to prove the innocuousness of the 70th passage of the bacillus and also its protective ability for cattle began in 1913 by the authors. Unfortunately these were brought to a sudden close in 1915, when German army overran France upto Maurie. However, they obtained sufficient data to conclude that the strain could safely be relied upon for vaccinating cattle against tuberculosis and recommended observations on a large number of animals for a longer period of time. They stated that this method of vaccination could be applied to human beings also since the bacillus played the role of harmless saprophyte in lymph nodes, producing the usual allergic immunity, well known in tuberculosis.

At the cessation of world war I, Calmette and Guerin (1924) were able to demonstrate conclusively that the original virulent strain that was now passaged through 230 sub-cultures in the course of 13 years, was no longer capable of producing any progressive tuberculosis and cattle that were given this alterated culture, now styled by them as B. C. G. (Bacillus Calmette-Guerin), could withstand an intravenous injection of virulent bovine culture. When calves received two doses, of 25 mgms. each, of this

vaccine, at a month's interval, and one month later, 3 mgms of virulent culture intravenously, no symptoms appeared, though the organisms were resident in a latent state in lymph glands. The authors believed, in view of the encouraging results they got, that the strain in question had now reached a stage when there is no return to its original virulence and that it was a 'Virus-fixe'. In the wake of this finding, large scale experiments were begun in immunizing cattle against tuberculosis by B. C. G. Guerin (1924) devoting himself to this aspect of the problem. The results obtained were so successful, that Weile-Halle (1925) commenced vaccination of infants by B. C. G., on a limited scale.

Announcement of this new method of vaccination against tuberculosis lead investigators, both Veterinary and Medical, all the world over, to initiate experiments to test the validity of the proclaimed claims. It will not be a denial of the popularity now gained by the B. C. G., for vaccination in human beings through the sustained work of a few Scandinavian Scientists, to state that the trials over the past two decades did not satisfactorily settle the question as to its efficacy, although the innocuity of the vaccine is now never questioned. On many of these controversial points, the Veterinarians have lead the medical men, at times showing them the necessity for caution in rushing with the vaccination, at other times, the limited efficacy of the vaccine, but always providing the scientific world with data on several aspects of the problem. The value of these works for the medical man interested in this type of vaccination against tuberculosis is at once obvious. Here is presented only a brief cross-section of the contributions of the profession in this field.

Almost along with the announcement by the celebrated medical bacteriologist Petroff (1927.8) of the dissociation of the B. C. G. into virulent colonies and avirulent R-colonies on plating on gention violet egg, Waltson et el (1928) of the Department of Agriculture, Canada, showed by laboratory experiments on guinea pigs that under certain conditions, B. C. G. was able to set up progressive tuberculosis. Schraeder and Crawford (1927) conducted vaccination experiments with B. C. G. and found that 9 out of 11 vaccinated animals and 9 out of 10 controls developed tuberculosis. They found that in the group where exposure to infection was made by feeding virulent tubercle bacilli, the vaccinated group showed more extensive lesion as a whole, than the unvaccinated. Cotton and Crawford (1932) found that 8 calves vaccinated at birth by B. C. G. by subcutanious route, reinoculated every year and exposed to natural infection for 2½ to 3 years, were as much affected with tuberculosis as unvaccinated controls. Watson (1930) described the results of an enquiry extending over five years, before the 11th International Veterinary Conference. In this experiment, which was carefully controlled, he allowed the vaccinated animals to cohabit with tuberculosis animals under natural

condition. In each, the vaccine was injected in doses varying from 75-100 mgms. subcutaneously, the number of injections varying from to five, three, at intervals of 12-15 months. On postmortem, he found a higher incidence of tuberculosis in the vaccinated than in control animals. With regard to the extent of lesions in vaccinated animals, he was of opinion that B. C. G. vaccination may retard development of infection in immunity trials of short duration, but this however was found transient. In a later article (Watson, 1934) wherein he has summarised the full work on B. C. G., done for a period extending over 10 years, during which time more than 100 cattle were used in a comparative study of susceptibility and resistence of vaccinated and unvaccinated animals, equally exposed to natural modes of infection, Watson had stated that age plays an important part in the development of tuberculosis in vaccinated animals. Vaccinated animals killed after 1½ years of exposure showed complete or nearly complete protection, whereas, the vaccinated animals killed after 4½ years exposure to natural infection, the percentage of tuberculosis was much more than in the unprotected controls. He says "the composite picture of the B. C. G. group may be distinguished from that of unvaccinated control group by the following features:—(1) the greater degree of relative resistance at the age of puberty, (2) the failure and disappearance of that resistance at early breeding age and subsequently; (3) an accelerated activity of the disease and the preponderance of lesions of pathologically progressive type."

Although in general the American workers lead by watson were very critical about the efficacy or innocuity of the vaccine, the result obtained by the continental workers were more promising. The vaccination according to Calmette and Guerin (1928) should be injected soon after birth and at no time later than 15 days. The vaccinated animals should be protected from all contact with infection for at least one month. Guerin, Richard and Boissiere (1927) did not find positive cases of tuberculosis after vaccinating 110 calves from a herd consisting of 41.7% tuberculin reactors. Ascoli et el (1927) and Maya (1927) reported very favourably on B.C.G. Vaccination in animals. Gerlach (1931, 1932) in Ausstria reported excellent results in field trials comprising more than 3,000 animals. Although the vaccine did not afford absolute protection, none of the cases that developed tuberculosis in the vaccinated group, showed progressive type of tuberculosis. Guerin (1933) after testing over 40,000 calves found the vaccine very effective. Earlier, Guerin (1930) in a paper presented to the IIth International Veterinary Conference, stressed the importance of rigid isolation of inoculated calves for at least one month from the date of inoculation, and also the need for repetition of vaccination evey year. Jundell and Magnusson (1933) in Scandinavia conducted experiments in a herd of 200 animals to determine the value of B.C.G. under field conditions. Half the calves were used for inoculation experiments and the other half left out as controls. Four years

after the commencement of the experiments, the herd had to be slaughtered owing to an outbreak of foot and mouth disease, which afforded an excellent opportunity to conduct post-mortem examination both in the vaccinated and non-vaccinated group. Of the 36 animals vaccinated, 31 were found free from tuberculosis, 4 showed slightly healed lesions and one with progressive type of lesions. Of the 39 non-vaccinated controls, 21 were free from tuberculosis, 11 showed healed lesions and in 7, extensive disease was present. Thus the percentage of infection in vaccinated group was very much lower than in the non.vaccinated animals. Researches conducted in Italy at the Institute Vaccino Geno Anti-tubercuolare under the direction of Ascoli (1947) showed the efficacy of the method of B.C.G. Vaccination in protecting all types of livestock. The success obtained attracted a large number of farmers and Veterinarians and this eventually resulted in the formation of a country-wide national organization to fight against tuberculosis in human beings. Ascoli (1934) presented the results of the experiments before the IIth International Veterinary Conference, wherein he pointed out the innocuity of the subcutaneous method of vaccination based on vaccination trials in nearly 6000 animals. He also reported that B.C.G. could protect calves against tuberculosis, provided large doses of vaccine were give per os in the first few days after birth.

More recently British workers namely Buxton and Glover (1934-39) working at the Institute of Animal Pathology, Cambridge, reported in a series of papers, the value of B. C. G. as a prophylactic against tuberculosis. The experiments, started in 1927, were taken up in stages commencing with an enquiry into the most satisfactory route of administration of B.C.G., the effect of re-enforcing the original dose of vaccine, and finaly the value of repeated doses of B. C. G. vaccine at regular intervals with immediate or delayed exposure to infection, under conditions that might be uncountered on naturally infected farms in England. They came to the conclusion that B. C. G. given intravenously at six month's intervals, in doses of 50-100 mgms, were well tolerated by cattle and the resistance induced by repeated inoculation of B. C. G. vaccine over a period of three years was overcome by continuous exposure to infection immediately after the first dose or after a lapse of 18 months. They also found that in a proportion of vaccinated animals which showed no visible lesions at post-mortem, virulent organisms were obtained from various lymph glands by guinea-pig inoculation. However, it may be mentioned, as pointed out by the writers, themselves, in most of these experiments, they did not adhere to the conditions specified by Calmette and Guerin, namely rigid isolation of inoculated ones, obviously to simulate natural conditions.

This short review show how the Veterinary profession has been associated with the vaccine from its very inception. Because of these ties,

it is but natural for the profession to claim a large share in the manufacture of the vaccine and in the world councils that decide the policy of B. C. G. vaccination, whether in human beings or animals.

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INCIDENCE OF TUBERCULOSIS IN GOATS

By

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Introduction.—Since very early days the common belief of the people in India and elsewhere has been that goats are free from tuberculosis. Many Unani and Ayurvedic physicians used to prescribe goats' milk as a remedy for tuberculosis in the human subject. It was Iyer (1932) who for the first time in this country detected the presence of tuberculosis infection in goats. Later Nanda and Gopal Singh (1943) published an account of this disease in five goats at the Government Livestock Farm, Hissar.

A review of the literature on the subject shows that the disease in goats has been known in other countries since 1884, having been first recorded by Koch. The disease was later recorded in many countries by different workers such as Edgar (1892), Thompson (1904) and Griffith (1917) in Great Britain, Golden (1921) in America, Giescu (1924) in France, Fourie (1928) in South Africa and Bagley (1938) in Ireland.

Material and Methods.—With a view to find out the incidence of tuberculosis in goats the author of this note conducted two series of examinations in the year 1946-47 viz. examination of carcases of goats slaughtered for food purposes at the Lahore Mutton Slaughter House and examination of milk of goats of a number of flocks in Lahore.

Daily visits were paid to the Mutton Slaughter House at Lahore and the carcases of goats slaughtered for food purposes examined. In all 1602 carcases were examined in 31 days. Out of these 14 carcases showed lesions that simulated tuberculosis lesions or otherwise aroused suspicion of the disease. Material—pieces of lungs, lymph glands, spleen, liver, kidneys etc. from 14 carcases was taken to the laboratory where it was put to microscopical examination. Smears from seven cases were positive microscopically for acid fast organisms and in the rest such organisms could not be demonstrated. In such cases rabbits were inoculated subcutaneously with the material from the lesions. These rabbits when examined after three weeks were found to have developed typical tuberculosis lesions. Detail of the positive cases is as under :—

(1) *Female goat.*—Left lung showed Pneumonia ; extensive patches of consolidation ; numerous tubercles varying in size from a pin's head to that of an olive, covered with thick yellowish-white pus-like material, bronchial and mediastinal lymph glands enlarged, congested and showing caseating lesions with calcareous deposits. Smears from the lung tissue and glands showed numerous acid-fast organisms.

(2) *Male goat.*—Both the lungs studded with many caseating tubercles of different sizes; mediastinal lymph glands congested and enlarged, spleen and liver showed a few caseating tubercles. Smears from the lesions did not reveal the presence of any acid-fast organisms.

(3) *Female goat.*—Anterior lobe of the right lung showed caseating tubercles of fairly large size, the size of an olive; pharyngeal and bronchial glands enlarged, showing numerous tubercles of different sizes with calcareous deposits. Smears from the lesions showed acid-fast organisms.

(4) *Male goat.*—Right lung showed patches of consolidation with numerous tubercles from the size of a pin's head to that of a walnut covered with about $\frac{3}{4}$ inch thick yellowish-white pus-ike material; spleen enlarged and presented some small sized caseating tubercles. No acid-fast organisms could be seen on microscopical examination of the smears from the lesions.

(5) *Female goat.*—Portal lymph glands showed some tubercles; mediastinal glands enlarged with a few caseating centres; the intermediary lobe of the right lung was studded with several tubercles with calcareous deposits. Smears from the lesions did not show any acid-fast organisms.

(6) *Female goat.*—Anterior lobe of the left lung consolidated with a big caseating lesion of the size of a lemon. No other tuberculous lesion was observed. Smears from the lesions showed a few acid-fast organisms.

(7) Pharyngeal, bronchial and mediastinal glands enlarged, congested and showed many caseating centres with calcareous deposits; right lung consolidated and showed numerous centres of caseation of different sizes spleen enlarged and congested but showed no tubercles. Smears from the lesions showed numerous acid-fast organisms.

(8) *Male goat.*—Both the lungs showed patches of consolidation and numerous caseating centres with calcareous deposits; posterior mediastinal glands congested and enlarged and showed yellowish-white caseating tubercles; bronchial glands extensively caseated. Smears from the lesions showed a number of acid-fast organisms.

(9) *Female goat.*—Anterior and middle lobes of the right lung pneumonic showing only a few caseating tubercles covered with a thick layer of greyish-white, granular puslike material; bronchial glands enlarged, congested and showed a number of caseating centres; spleen somewhat enlarged and presented a few caseating tubercles of the size of a gram. Smears from the lesions were negative for acid-fast organisms.

(10) *Female goat.*—Mediastinal glands enlarged and congested; mesenteric glands showed a number of caseating tubercles of different sizes varying from that of a pin's head to a pea; right anterior lobe showed

extensive patches of consolidation with caseating tubercles. Spleen enlarged but showed no tubercles. Smears from the lesions were negative for acid-fast organisms.

(11) *Female goat.*—The left lung completely consolidated and presented numerous caseating lesions with calcareous deposits, one of the tubercles was as big as a tennis ball; pharyngeal and bronchial glands enlarged and caseated; posterior mediastinal glands enlarged. No other pathological lesions found. Smears from the lung and the glands showed many acid-fast organisms.

(12) *Female goat.*—Bronchial and mediastinal glands enlarged, congested and showed caseating lesions with calcareous deposits; caseating tubercles from the size of a millet seed to that of a gram seed seen in both the lungs which were pneumonic; liver enlarged and showed some caseated lesions. Smears from the lesions showed no acid-fast organisms.

(13) *Female goat.*—Anterior mediastinal and bronchial glands congested, enlarged and showed many caseated tubercles of varying sizes; the main lobe of the right lung showed pneumonic changes with caseation and calcareous deposits. Smears from the lesions showed acid fast organisms.

(14) *Female goat.*—Both the lungs showed patches of consolidation with a few caseated tubercles; bronchial glands enlarged and showed a few caseous lesions. Smears were negative for acid-fast organisms.

Cultural Examination.—Material from the lesions in rabbits was inoculated after treatment with Antiformin on Glycerine broth, serum agar and glycerine potato. On glycerine broth the growth obtained was scanty and formed a fine, delicate net like membrane with slight thickenings. On serum agar, four week's old cultures showed a little greyish white, dry and dull growth. There was no growth on glycerine potato.

In the second investigation milk of goats of a number of flocks in Lahore was subjected to individual bacteriological examination. The usual Antiformin method was adopted for this purpose. 5 c.c. of milk from each teat was taken and mixed with 5 c.c. of absolute alcohol, 5 c.c. of ether, 10 c.c. of 25% solution of Antiformin and 25 c.c. of normal saline solution. The mixture was kept in an incubator for half an hour and thereafter centrifuged. Slides were prepared from the sediment and stained with usual Ziehl Neelson method. On the whole milk from 332 goats was subjected to the above test. Out of these milk from two goats was positive for Tubercle bacilli. This was also put to cultural examination on glycerin broth, serum agar and glycerin potato and findings similar to those recorded in the first examination were obtained. Tables 1 and 2 give the results of the above examinations.

TABLE 1

Number of carcases examined and their results.

Days of examination.	No. of carcases examined.	No. of carcases showing tuberculous lesions	Sex.	Remarks.
1	50	1	Female	
2	50	–	—	
3	53	–	—	
4	55	1	Male	
5	50	–	—	
6	60	–	—	
7	52	–	—	
8	57	1	Female	
9	50	–	—	
10	54	–	—	
11	50	–	—	
12	56	2	One Male & one Female	
13	51	–	—	
14	53	–	—	
15	50	–	—	
16	52	1	Female	
17	48	1	Female	
18	50	–	—	
19	56	1	Male	
20	50	–	—	
21	53	–	—	
22	50	1	Female	
23	50	–	—	
24	56	1	Female	
25	50	2	Female	
26	52	–	—	
27	50	–	—	
28	46	–	—	
29	50	1	Female	
30	48	–	—	
31	50	1	Female	
Total	1602	14	11 Female & 3 Male.	

Results.—In the first examination, out of 1602 carcases examined 14 proved positive for Mycobacterium tuberculosis infection. This shows that the incidence of tuberculosis in goats brought to Lahore Mutton Slaughter House was 0.87%. Out of the 14 positive cases 11 were females and 3 male. This confirmed the incidence of tuberculosis in male goats as well.

In the second examination only two goats out of 332 examined (0.6%) were found to have infected udders. Milk from such goats is likely to be dangerous for human consumption. This is especially so as raw goat's milk is commonly given to children during the summer months. The common belief that the goat is absolutely immune to tuberculosis is wrong and misleading.

TABLE 2

The number of goats examined for Tubercle bacilli in the milk and their result.

Serial number of flock examined.	No. of goats in the flock.	No. of positive cases.
1	15	—
2	23	—
3	18	1
4	21	—
5	13	—
6	10	—
7	17	—
8	15	—
9	18	—
10	10	—
11	16	—
12	20	—
13	13	—
14	17	—
15	17	—
16	19	1
17	21	—
18	12	—
19	15	—
20	22	—
Total	332	2

Although detailed work could not be done to find out the strain of Tubercle bacilli, still the findings of the cultural examination have a bearing that it showed characters of bovine type. It was for this reason that rabbits were used for animal inoculation test and they all showed typical tuberculosis lesions on post-mortem examination.

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BRUCELLOSIS IN INDIA*

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In India, as in other countries, brucellosis usually exists within a herd in the form of a continuous infection punctuated by sporadic abortions occurring singly or in groups. Such low-grade enzootics are seen in nearly all Indian farms and many villages of the peninsula and usually produce an unending trickle of abortions of 1 to 5 per cent in the year. From time to time, however, these infections exacerbate to 5 to 15 per cent within a few months. In special circumstances major enzootics occur where the annual incidence of abortion may amount to 20 per cent during several years, whilst, when newly introduced to a susceptible herd, the disease can be severe enough on occasion to produce abortion rates of 20 to 40 per cent of pregnant cattle within a few months. Thus, brucellosis in India, while not dissimilar to the disease in other countries, probably shows greater extremes than elsewhere and attempts are made in this and the following paper to illustrate the way in which environment dominates these contrasts.

INCIDENCE AND DISTRIBUTION

A conspectus of the disease in India appears in the map(Fig. 1), while Table I attempts to summarize its regional distribution in relation to climate.

Farms. Most of the organized farms in India have been visited and their stock blood-tested, while specimens from most of the other have been examined. It has been found as a result that, irrespective of situation, nearly all farms are more or less infected. Further, as most of the strains isolated from farms are of the non- indigenous species (*Br. abortus*), the origin of the infection is attributed to cattle imported from the occident. The distribution of farm brucellosis, therefore, is of samll significance, being on the whole fortuitous and depending on the situations of farms and the character of their foundaton stock. The rate of infection in farms, however, varies and appears to some extent to depend on climate. Thus in military establishments in areas of low rainfall, the normal annual abortion rate is 2 or 3 per cent in cows and about 1 per cent in buffaloes, but the rates in farms situated near the rain belts are sometimes higher (Table II). Again rates in the indigenous stock of Government farms are about 1 per cent or less in the said north-west and north and in the upper Gangetic basin, but in the wetter east they rise to 2·5 to 5 per cent or more.

* The data given in this paper were collected during a survey of brucellosis in India conducted under the auspices of the Indian Council of Agricultural Research, New Delhi.

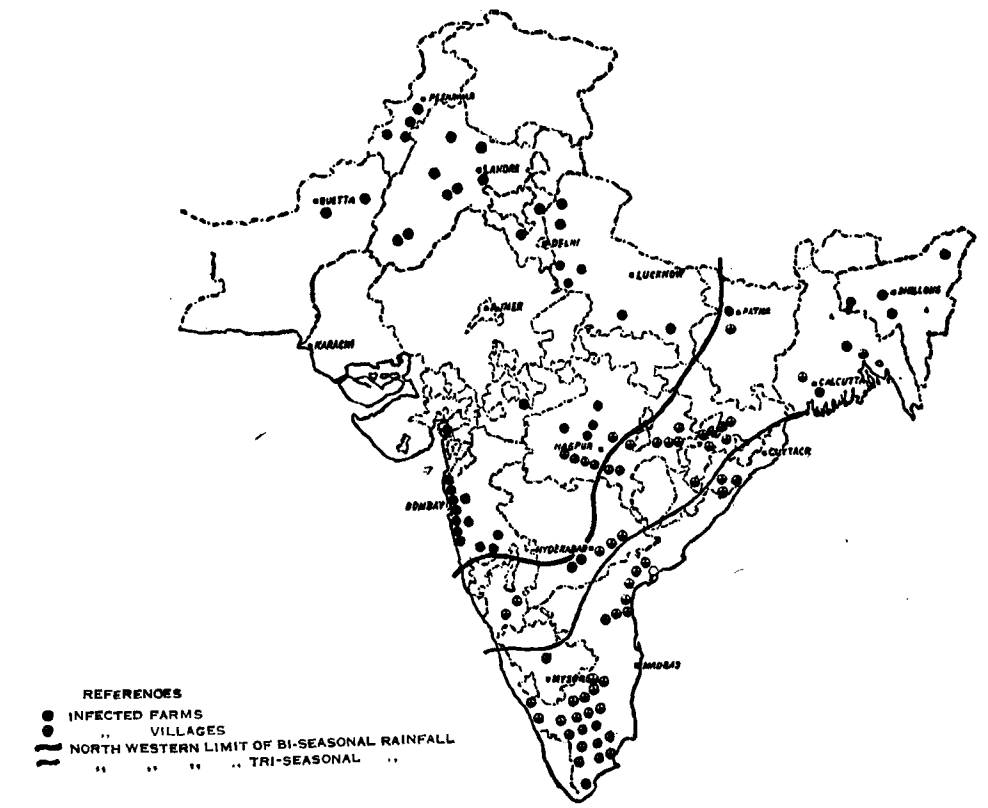

FIG. 1. Distribution of Brucellosis in India

Excepting one abnormal rate of 10 per cent in both cows and buffaloes in northern Central Provinces, rare in the few farms of torrid central India are 1 per cent or less. Government farms are rare in the south and west and they seem to be but slightly affected, being mostly well situated climatically.

A fair number of *quasi* commercial private farms lie in and around Calcutta and in the coastal belt of Bombay. The humidity and rainfall here is high and abortion rates in cows and buffaloes alike may reach 20 per cent per annum, while such outbreaks seem to be getting commoner. On the other hand, private farms and *gowshalas* in the drier hinterland at present appear to be negligibly affected.

Village infection. The effect of climate is better illustrated by the distribution of the disease in villages. Obviously, in a country of the size of India, it has only been possible to examine a few representative rural areas; nonetheless, discoveries here have been of far greater interest than in farms. If it is to be believed, for instance, that villages have become infected from farms, it would be reasonable to assume that most village infection would lie adjacent thereto,

A glance at the map (Fig. 1) shows that such is not the case, and indeed, village infection is commonest where farms are least numerous and *vice versa*. Moreover, as shown elsewhere [Polding, in press] all *Brucella* strains so far isolated from these villages, differ in their typing characteristics from the *Br. abortus* strains found on farms. It seems, therefore, that village infection, occurring as it does almost exclusively on the Indian peninsula, has not been

TABLE I

Regional distribution of brucellosis in India, with reference to climate

Region	Character of region	Annual rainfall	Brucellosis in	
			Farms	Villages
Baluchistan, N.W.F. Province, Rajputana	Desert and arid hills	Uni-seasonal 5-20 in (humidity always low)	Minor enzootics, or absent farms in-frequent)	Negligible
Punjab, United Provinces, Bihar	Cultivated plains	Uni-seasonal, 15-40 in. (humidity tri-seasonally low)	Moderate enzootics (farms abundant)	Do.
Bengal, Assam	Deltaic cultivation and forested hills	Bi-seasonal, 50-100 in. (humidity generally high)	Moderate enzootics (farms infrequent)	Not known
Western Hyderabad, Berar and Western Central Provinces	Cultivated plateau and forested hills	Uni-seasonal 25-50 in. (humidity tri-seasonally low)	Minor enzootics (farms infrequent)	Negligible
Eastern Central Provinces, eastern Hyderabad, Orissa, Madras, Mysore, southern Bombay	Richly - cultivated coastal belts, with hilly interior	Tri-seasonal, 25-50 in (humidity always high)	Minor enzootics, or absent (farms in-frequent and well situated)	Abundant
Central and northern Bombay	Cultivated coastal belt with hilly interior	Uni-seasonal, 25-100 in, (humidity always high)	Major or minor enzootics. Major epizootics farms abundant)	Negligible

imported from Europe *viz.* the farms, but is an indigenous Indian infection whose distribution may prove to be of epidemiological significance. Indeed, inspection of Table I and the map (Fig. 1) reveals a curious position. Infection as far as it has been discovered, lies mainly in the tri-seasonal rainfall area of the peninsula south-east of the thick line on the map. It has, however, advanced as far as, and follows with considerable accuracy the limits of the bi-seasonal rainfall area south-east of the thin line. Conversely, the minimum village infection seems to be in the arid north-west. It must be admitted, however, that owing to the difficulties of obtaining sufficient truly representative blood samples, for testing the final precise position in north-western villages is not yet fixed, but, so far as tests have been made, the reactor incidence is negligible.

TABLE II

Above average abortion rates occurring in the wetter Military Farms

—	Year	Head strength	Abortions	
			Actual	Per cent
Farm A				
Cows	1940	129	13	10·0
	1941	134	16	11·9
	1942	118	7	5·9 *Mean*=9,3
	1940	178	3	1·7
Buffaloes	1941	232	9	3·9
	1942	397	12	3·0 *Mean*=2.9
Farm B				
Cows	1940	137	17	12·4
	1941	124	6	4·8
	1942	96	19	19·8 *Mean*=12
	1940	225	6	2·7
Buffaloes	1941	327	10	3·1
	1942	432	52	12·0 *Mean*=5.
Farm C				
Cows	1939	26	3	11·5
	1940	30	3	10·0
	1941	32	2	6·3
	1942	36	4	11·1 *Mean*=9·7

In the south, the position is more exactly known and the incidence of agglutinin-positive village cattle runs between 10 and 50 per cent in village where abortions occur, but is negligible where abortions are not remarked. In Table III some relevant clinical conditions are correlated wih the reactor incidence in village animals of the south.

TABLE III

Relation between Bruccella *reactors and disease in south-Indian village cattle*

Serum reaction	Abortion	Synovial enlargements	Retention of the placenta	Sterility	Healthy	Totals
Positive	113 (66 per cent)	38 (49 per cent)	1 (10 per cent)	18 (16 per cent)	32 (10 per cent)	202
Doubtful	14	7	4	8	32	65
Negative	59	39	9	92	274	473
Totals	186	84	14	118	338	740

SUSCEPTIBILITY

Inextricably entangled as it is with many little-understood features of disease transmission, susceptibility *per se* is an imponderable attribute. Further,

the only available data on the subject often concern as in this case, statistically unsuitable populations. Hence it becomes necessary to make the best of the available information.

TABLE IV

Mean incidence of abortion among various classes of stock.

Class	No. of herds observed	Population observed	No. of aborters* observed	Incidence per cent
European zebu	15	1,337	273	20.4
Indian zebu, cohabiting with crosses.	13	164	12	7.3
Buffaloes	15	1,880	110	5.0
Indian zebu, not cohabiting with crosses	11	4,495	167	3.7

*Aborters=animals with history of abortion at the time of a single random observation,

TABLE V

Recurrence of abortion among various classes of stock

Class	Population observed	Abortion				Mean expectation of calf loss	
		Once	Twice	Thrice	Four times	Per aborting cows*	Per life time of 100 random stock†
European (European records)	...	68-76 per cent	...	...	...	...	...
European zebu-crosses	309	71-2 per cent	25-2 per cent	3.2 per cent	0.4 per cent	1.3	26.5
Indian zebu, cohabiting with crosses	8	75-0 per cent	12 per cent	1.2 per cent	0	1.33	9.5
Buffaloes	205	92·0 per cent	8 per cent	0 per cent	0	1.08	5.4
Indian zebu, cohabiting with crosses	134	94-0 per cent	5 per cent	1 per cent	0	1.07	3.9

*Calculated from actual recurrence of abortions in the populations observed

†Figures obtained in* multiplied by the average incidence of abortion per cent

TABLE VI

Pregnancy at which abortions occur in various classes of stock

Class	1	2	3	4	5	6	7	8	9	10	11	12	Population observed
European zebu, crosses ...	34	27	12	9	8	2	<1	<1	<1	...	...	...	228
Non-cohabiting zebu ...	46	26	13	9	3	2	<1	<1	<1	...	...	...	180
Buffaloes ...	16	39	17	10	6	6	2	<1	<1	...	...	...	130

Figures=abortion per cent occurring at the pregnancy shown

TABLE VII

Age at which foetuses are aborted

Class	Population observed	Age of foetus in months						
		3	4	5	6	7	8	9*
European (European records)	95	5	6	14	15	24	31	
European zebu, crosses ...	102	4	8	13	22	26	29	
Buffaloes ...	103	3	3	8	14	22	26	27

Figures=percentage abortions occurring at the months shown

*Buffalo's mean period of gestation=10½ months

TABLE VIII

Abortion rate in various grades of cross-breds

Class of animals	Population	Number of aborters	Abortions per cent
Friesian (Indian records)	18*	2*	11·1
⅞ grade	108*	8*	7·3
¾ ,, ...	329	21	6·4
⅝ ,, ...	152	9	5·8
½ ,, ...	464	14	3·0
¼ ,, ...	134	2	1·5
Indigenous	275	4	1·4

Mean annual abortion rate total population=3·3 per cent

*Mean of three years; the remaining figures mean of four years

(Figures by kind permission of the Director of Military Farms)

Tables IV to VIII give some abortion statistics of Indian bovines, which for purposes of comparison are grouped into: European zebu crosses, pure zebu cohabiting with European crosses, pure zebu, and buffaloes. An attempt has been made to abstract from these figures some concept of relative susceptibility; for this purpose the mean expectation of loss of calves due to abortion, during the working lifetime of 100 random animals, has been worked out. Thus a susceptibility figure has been obtained by multiplying the mean expectation of

loss of calves per aborting animal (Table V, column 7) by the mean expectation of unrepeated abortion during the lifetime of 100 random animals (Table IV). These figures are shown in Table V column 8, and, if the smallest is taken as unity, the relative susceptibility of zebu, buffaloes, cohabiting zebu, and crosses is 1·0 : 1·38 : 2·44 : 6·79, respectively. These results, together with the data of Table VIII, suggest that the greater the proportion of European blood in the animal, the greater is its susceptibility to brucellosis. At first sight, moreover, the buffalo appears to be more susceptible than the zebu. In point of fact, however, most of the buffaloes observed were cohabiting with crossbreds, so it is likely that there is little difference between the susceptibility of indigenous pure-breds.

Certain other records suggest either that the susceptibility of Indian cattle is decreasing, or that better animal management is limiting dissemination of the disease. For example, the reports of the military farms (northern circle) from 1932 to 1939 show a progressive annual decrease in the abortion rate; a decrease which runs parallel with improvements in housing and management. On the other hand, since 1939 there have been indications that, in the busier farms at least, the rate has increased, an increase which has coincided with overcrowding and the unavoidable lessened attention due to the wartime expansion. It seems probable, therefore, that good management, rather than reduced susceptibility, was the reason for the earlier decrease. Another example of decreasing incidence is to be found in the Punjab grantee farms. In 1923 the mean abortion rate, calculated from a single random observation of five of these farms was 3 per cent of 1264 animals, while in 1939 the figures had fallen to 1 per cent of 835 animals. Here again, good husbandry is probably the cause of the diminution.

It must be noted that all the animals considered in the foregoing sketch are kept in somewhat similar conditions and that their standards of life are good, many of the pure-bred zebu herds in particular living under semi-ranch conditions in a favourable climate. But severe epidemics of abortion can occur, even in non-cohabiting zebu situated in good climates. Tables IX and X

TABLE IX

Abortion rate during an exceptional Brucella *epidemic in indigenous cows*

Year	Total breeding stock (approximate)	Number of aborters	Abortions per cent
1941	50	16	32
1942	50	9	18
Not known, believed 1942	50	16	32

Breeding herd total at the time of observation (1943) = 52
Total aborters " " " = 40
" " per cent " " = 77

give data of one such outbreak. Ninety-five per cent of the aborted animals on this farm were *Brucella*-positive and if the annual abortion rate during the period of this epidemic be assessed at 25 per cent—a conservative estimate—the susceptibility figure of the herd works out at 11·1, *i.e.*, more than tenfold the average for this class of stock. A possible explanation of this anomaly is given in the next section.

TABLE X

Incidence of repeated abortions during an exceptional Brucella *epidemic in indigenous cows*

—	Numbers stated to have aborted			Mean expectation of calf loss	
	Once	Twice	Thrice	Per aborting cow	Per lifetime of 100 random animals
Actual ...	19	16	5	...	...
Per cent ...	49	40	12	1·65	41·25

As with cows, so with buffaloes there are exceptional rates of abortion. These abnormal rates occur in two forms, *viz.*, as severe epidemics, of which brucellosis is almost certainly the cause, and as exceptional epidemics, mostly in villages and about which little is known. The former, though perhaps getting more frequent, are not very common. The latter will be discussed in another paper.

In the absence of records, it is impossible to give figures illustrating the susceptibility of village stock, but it seems probable that they do not deviate much from the foregoing estimates for zebu cattle.

During five years of investigation not a single abortion in sheep has been attributable to brucellosis, nor can a significant incidence of reactors in these animals be recalled where sheep were aborting or where they were in contact with Brucella-infected cattle. It must be supposed, therefore, that the susceptibility of Indian sheep to brucellosis is slight.

The goat, on the other hand, seems to be rather more susceptible, for, although during this survey brucellosis has not been diagnosed in cases of clinical abortion among village goats, in two old-established goat farms, the disease has undeniably co-existed with abortions. Nevertheless, goat brucellosis in India is in no way comparable with that of the Mediterranean area.

During blood-testing work in slaughter houses, occasional isolated reactors have been encountered among goats and more rarely in sheep. It is noteworthy that these have occurred only in south India, where brucellosis is

common in village cattle. Thus, of 405 sheep and goats bled in 15 towns of south India, 11 (2·5 per cent) were positive : of 250 tested in 11 towns of north India, none was positive.

Dissemination

The channels by which *Brucella* leaves and re-enter their host are well known. The point to be noted is that, although these parasites are considered obligatory, in favourable circumstances they will survive outside the host and be available for dissemination. In this part of the paper an attempt is made to indicate the conditions governing this dissemination in a continent, where extreme cases give opportunities for comparison not often seen elsewhere. Throughout north-west India, there is daily scorching sunshine from April to October, natural shade is rare, and the total annual rainfall is one inch or less. In the south, conditions are the converse, temperatures vary little around blood heat, the atmosphere and land surface are moist, while natural shade is everywhere more common and for fairly long periods the sky is overcast. However, this survey has shown that brucellosis is enzootic in the south and rare in the north-west. The inference is that sunshine and dryness are inimical to *Brucella*, or conversely that equable temperatures, humidity and shade favour their survival. Certain less general observations support this premise. Earlier in this paper, the decrease of brucellosis on the Punjab grantee farms was noted. These farms lie in a semi-desert tract and for the most part their indigenous stock live and calve out-of-doors. It is possible that this is an example of self-elimination of brucellosis due to animals living in dry, sun-lit surroundings. By contrast, there are three farms in Assam, a region enduring a heavy and protracted monsoon and lying within the bi-seasonal rainbelt. The animals of these farms are similar in type and origin to those of the grantee herds, yet in 1941 the incidence of reactors amongst them was 20 per cent, whilst their abortion rate varied from 2 to 6 per cent per annum.

In another indigenous herd of the Punjab (farm I), the mean annual abortion rate during the climatically normal period 1930-1935 was 1·27 per cent of several thousand pregnancies, while during the entirely rainless period 1936-1939 the rate was only 0·66 per cent. Here, another important consideration arises, for during the rainless years the stock could not be grazed but had to be stallfed in congested corrals. The result of this over-crowding was a severe epidemic of tuberculosis. It appears, therefore, that conditions of congestion, sufficient to produce an air-borne respiratory infection due to a relatively resistant organism, resulted in a decrease of *Brucella* infection during a period of constant sunshine and extreme dryness. Thus congestion as a factor in the spread of brucellosis may be secondary to excess of sunlight.

In contradistinction to these, observations in the classical outbreak are noted in Tables IX and X (farm 2). Here again atmospheric humidity was negligible and sunlight was more or less continuous. Congestion also was extreme, the animals never being out of the farm compound. The contradictory results of farms 1 and 2 may perhaps be explained on the grounds of hygienic conditions. On farm 1, aborting animals were segregated and gross infective materials, such as the placenta, were quickly destroyed. On farm 2, no such precautions were taken and general cleanliness was lacking.

In cows, therefore, it appears that, provided gross sources of contagion are removed, the sterilizing effects of sunlight are sufficient to suppress the remaining minor sources, even when congestion is great; conversely, where animals are dispersed, hygiene becomes of less importance and the effects of sunlight are paramount. Village cattle on the whole graze over wide areas and dispersion thus counteracts the lack of hygiene, but here again sunlight probably plays a major part in suppressing the disease.

There are, however, other aspects of the effect of climate on the dissemination of *Brucella*, namely humidity and rainfall, but while the possible importance of moisture is well illustrated by the restriction of indigenous brucellosis to the humid tracts of India, it is even more sharply emphasised by some aspects of the epidemiology of brucellosis in buffaloes.

TABLE XI

Monthly incidence of abortion among buffaloes of farm 2

Month	Term of pregnancy in months, and the abortion liability ratio for each month					No. of absortions (5 years aggregate)	No. of susceptible animals	Ratio of column 7 to 8, per cent.
	9 (3·5)	8 (3·25)	7 (2·75)	6 (1·75)	5 (1 0)			
January ...	12	7	11	10	10	2	124	1·6
February ...	7	11	10	10	46	3	154	1·9
March ...	11	10	10	46	131	4	314	1·2
April ...	10	10	46	131	134	10	567	1·7
May ...	10	46	131	134	116	14	909	1·5
June ...	46	131	134	116	80	17	1,021	1·6
July ...	131	134	116	80	40	14	1,377	1·1
August ...	134	116	80	40	21	27	1,184	2·3
September..	116	80	40	21	12	36	861	4·2
October ...	80	40	21	12	7	21	517	4·1
November...	40	21	12	7	11	5	269	1·8
December...	21	12	7	11	10	1	162	0·6

Figures in columns 2 to 6 number of animals pregnant at the term shown Aggregate for five years.

Figures in column 8=sum of the figures in columns 2 to 6, after application of the abortion-liability ratio, plus the figure in column 7.

Only one major endemic of brucellosis has been encountered in buffaloes (farm 3). Here the annual abortion rate was 21 per cent of pregnancies over a period of six years ; this for India is certainly excessive, possibly unique. In an attempt to explain this unusual incidence, many environmental factors have

been considered but the only extraordinary influence discoverable was the exceptionally heavy monsoon, with 80 in. of rainfall during the period June to September. Table XI presents a statement of the monthly abortion rates among susceptible stock, calculated from an aggregate of the returns for five years. This shows that abortion-rate for the months November to July varied little about a mean of 1·4 and although the population of susceptible animals steadily increases from January to July, there is no corresponding increase in the abortion-rate. In August, however, whilst the number of susceptible animals commences to decrease, the abortion-rate suddenly doubles and in September and October it is thrice the mean for the normal months of the year. Thereafter, the rate returns to normal. Now as the period of transmission and incubation of the disease is likely to occupy a period of 1 to 2 months, the critical period of increased infection-rate causing the increased abortion-rate during August, September and October, commences in mid-June and lasts into August. But in this period the abortion-rate, and therefore presumably the bacterial excretion-rate, is constant, whilst the corrected number of susceptible animals does not vary greatly round a mean of 1200; further the absolute number of abortions in July is the same as in May. In other words donor and receptor influences do not vary sufficiently during this period to account for the large increase of abortions in August, September and October, and this increase must be explained by a change in environment which affects bacterial survival and transmission. But in mid-June the climate changes completely from diurnal sunlight to total sunlessness and continuous rainfall and this suggests that either the absence of sunlight or the presence of moisture, or both, favours the spread of brucellosis in buffaloes.

As before, however, the factor of congestion complicates the picture. During the monsoon, buffaloes cannot be grazed and consequently they stand in congested cowsheds, sometimes for weeks on end. The influence of congestion may perhaps be eliminated by comparing this result with the records of farm 2 above, which, besides carrying the herd of *Brucella*-infected cattle already discussed, keeps a herd of closely cohabiting buffaloes. It is remarkable that during the epidemic no abortions occurred in buffaloes, despite their exposure to excessive infection from cows. Now on each farm the factor of congestion is probably about equal, but on farm 2, as evidenced by the spread in cows, the abundant sunlight was unable to destroy the infection, and the two environments may be compared as in Table XII.

This comparison surely suggests that in buffaloes at least rainfall plays a considerable part in the dissemination of brucellosis.

This and many other similar records lead to the same conclusion and it is tempting to accept the simple explanation that at least among buffaloes a fluid vehicle is more satisfactory for dissemination than a dry one. In this respect the buffalo's habit of wallowing requires consideration. Observations on this habit have been recorded by Minett [1947]. In north India at least buffaloes

wallow voluntarily from April to October and there is a natural desire to do so when the air and water temperatures are above 85° and 77°F. respectively. The desire to wallow is intense during hot damp months, August and September in north India. During the hot dry period of April to June, water is short and the few available shrunken tanks and ponds are grossly congested, while during the rains, the animals are dispersed over a far wider expense of water.

TABLE XII

Comparison of environments in farms 2 and 3

Environment	Farm 2	Farm 3
Climate	Sunny and dry ...	Overcast and humid
Disposal of animals	Congested ...	Congested
Source of infection	Great ...	Ample
Result	No epizootic ...	Panzootic

If therefore it can be accepted that the sterilising effect of sunlight, which is admittedly great for *Brucella*, can suppress the contagion during the sunny months, then increased infection of buffaloes during the rains, despite wider dispersion, might be partially accounted for by wallowing, especially when this is done in tanks.

Many epidemiologists have associated moisture with the spread of diseases. Rogers [1926], for example, found that cholera spreads as the absolute humidity reaches 0·4 in. and it may be noted in passing that, in lower Bengal and on the Coramandal and Malabar coasts (*i.e.*, in the *Brucella*-endemic areas of India) the absolute humidity is never below 0·4 in. About *Brucella* little has been proffered, but Cameron [1932], who has tested fairly thoroughly the viability of *Brucella*, shows on the whole that drying is harmful to the organism.

SUMMARY

The results of a survey of brucellosis in India have been analysed in an effort to trace some of the factors which control the spread of the disease in that country.

The scatter of the disease amongst farms was uniform and thus uninformative. On the other hand, an indigenous enzootic among village cattle occurred throughout the bi-and tri-seasonal rainfall areas only.

The incidence of infection in farms was often high where total rainfall was high, and *vice versa*. The rate of village infection was negligible in semi-desert areas but considerable in humid coastal belts.

It is concluded that the sterilizing effect of continuous sunlight is paramount in checking dissemination of the disease, while humidity, rainfall and sunlessness are favourable to its spread. Nevertheless, unhygienic conditions and congestion of animals play an important part in transmission.

Abortion statistics are given for European zebu crossbreds, for pure zebus, and for buffaloes. The susceptibility of these animals and of sheep and goats is assessed.

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INDIAN SPECIES OF BRUCELLA*

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Not all *Brucella* can be exactly classified and in an examination of some 2,000 strains Huddleson [1939] refers to 13 that were not precisely *abortus*, *melitensis* or *suis*. Huddleson has recently intimated to me that a correspondent of his has encountered a certain atypical variant in Indonesia, which appears to be indigenous to that country. The characteristics therefore of strains isolated in India will be of interest and in this paper are described some 49 strains collected at random from this country.

Experimental

Methods

The criteria used for typing were, (1) CO_2 requirements at time of isolation, (2) H_2S secretion, (3) inhibitory action of dye media, and (4) antigenic structure. The techniques of items (1) to (3) were those of Huddleson [1939], that of (4) was based on the work of Wilson and Miles [1932]. Controls with type-specific strains were prepared throughout.

Strains were examined for dissociation as follows. Two-day-old agar cultures were suspended in 12 per cent. saline and adjusted to density 1 to 2 on Brown's scale. The suspensions were immersed in boiling water and readings for agglutination made after 5, 15, 30 and 60 minutes. The suspensions were then removed and left on the bench until the following morning when they were again examined for agglutination. A strain agglutinating in these circumstances was regarded as dissociated.

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Tests for antigenic sensitivity were made as follows. Standard antigens were prepared by suspending 48-hour-old slant cultures in 12 per cent. saline and their density very accurately adjusted to 1 on Brown's scale. Stableforth's [1936] standard dried serum was reconstructed according to his directions, but the concentration of his final dilution series was halved in saline. In a series of tubes, 0·5 c.c. of the antigen to be examined was added to 0·5 c.c. of each dilution of serum in the halved Stableforth series, thus forming a titration range of 1/640, 1/800, 1/960 and 1/1120 and 1/1280 and the ultimate reaction after 24 hours' incubation at 37°C. was noted. In this range, type-specific antigen prepared in a similar way had been previously found to react to about ++ at 1/1280, and this titre was accepted as the datum with which the end points of the titrations of the field strain were compared.

Strain typing

In the intemperate climate of India, the procuring of satisfactory specimens for bacteriological examination offers many peculiar difficulties. The main troubles are the early putrefaction of dead tissues, dust contamination,

TABLE I

Origin and classification of Indian Brucella *strains*

Origin	*Br. abortus*			*Br. melitensis*			Unclassified		
	Host			Host			Host		
	Farm cow	Farm buff	Horse	Farm cow	Goat	Mare	Farm cow	Farm buff	Village cow
Ahmednagar ...	1		1						
Ambala ...	2	7							1
Bombay ...	1	2							1
Cuttack ...									
Ghoom ...	1				1		3		
Hissar ...									1
Jarsugudda ...							1		
Jubbulpore ...		1							
Kirkee ...	3			1					
Lahore ...							1		
Lucknow ...		1							
Meerut ...	1	1					6	2	
Mukteswar ...	1								
Mysore ...							1		
Patna ...						1			
Poona ...									3
Rapur (Madras) ...	1	1							
Razmak ...		1							
Sialkot ...									
TOTALS ...	11	14	1	1	1	1	12	2	6

Total: *Br. abortus* = 26, *Br. melitensis* = 3, unclassified = 20, *Grand total* = 49 strains.

long periods of transportation in warm environment and above all difficulties of communication, for abortions usually occur without notice in remote localities, which cannot be reached in time by persons qualified and equipped to take samples fit for examination. The *Brucella* strains it has been possible to secure have thus been disappointingly few, but such as they are their origin and classification are given in Table I.

In this classification, all 26 *Br. abortus* strains fell precisely into class, with no discrepancies. It is also noteworthy that all came from organized farms, most of which have carried or are still carrying European cross-bred stock, and that they occurred equally in cows and buffaloes. As regards the *melitensis* strains, in all three there was little doubt as to their classification (Table II.)

TABLE II

Classification of Indian melitensis *strains*

Strain	CO_2 requirements at isolation	Excretion of H S on successive days	Growth on		Agglutination with	
			thionin	fuchsin	mono-A serum	mono-M serum
Abortus control ...	CO_2 ...	+++ +++ ++ + +	—	+++	+++1/320	+1/20
Suis control ...	air/CO_2 ...	+++ +++ +++ +++ +++ ++ ++ +	+++	+ —		
Melitensis control I ...	air/CO_2 ...	*nil*	+++	+++	+1/20	+++1/640
Indian-*melintensis* I ...	air/CO_2 ...	*nil*	+++	+++	strain rough, test not possible	
Do. II ...	air/CO_2 ...	*nil*	+++	+++	do.	
Do. III ...	air/CO_2 ...	*nil*	+	+++	++1/320	++1/160

It will be observed that first two strains were rough, so that their antigenic structure could not be examined, but in all probability they are normal *melitensis* types. They are alleged to have been isolated some years ago from a cow and a goat in the Punjab. The third strain was isolated recently from a naval rating in Poona hospital, and, whilst it was able to grow in air and failed to produce H_2S, it grew but weakly on thionin and its antigenic structure

appeared to be more *abortus* than *melitensis*. The reason for the appearance of these strains is obscure, but it is possible that the third at least was brought from overseas.

TABLE III

Unclassified Indian Brucella *strains*

Origin of strain	Atmospheric requirements at isolation	H_2S Secretion	Growth on		Agglutination with	
			thionin	fuchsin	mono-A serum	mono-M serum
Lucknow (farm) ...	CO_2 ...	+++ ++ ++ +	+++	+++	1/160	1/5120
Jubbulpore (farm) ...	CO_2 ...	+++ ++ + +	+++	+++	Negative	1/3560
Hissar (farm) ...	CO_2 ...	+++ ++ + +	+++	+++	1/1280	1/80
Mukteswar (farm) ...	CO^2 ...	+++ ++ + +	+++	+++	1/640	1/80
Do. ...	CO_2/air ...	+++ ++ ++ —	+++	+++	1/320	1/80
Kanara District, Bombay (village).	CO_2 ...	+++ ++ + +	+++	+++	1/160	Negative
Orissa (village) ...	CO_2 ...	++ +++ +++ +	+++	+++	1/320	1/80
Madras (village) ...	CO_2 ...	+++ +++ ++ +	+++	+++	1/320	1/80
Bihar (farm) ...	CO_2/air ...	+++ +++ ++ ++ +	++	++	1/320	1/40

The + signs are purely comparative estimations of degrees of reaction. In the H_2S column the reaction was registered over five successive days.

The twenty strains termed 'unclassified' all differed from true *Br. abortus* types in one main characteristic, *i.e.* they grew both on thionin and fuchsin. Also the majority, although undeniably *abortus* antigenically, showed a slight tendency not to differentiate so sharply as pure *abortus* types on serological tests against monospecific sera, whilst two were distinctly *Melitensis* in this respect. One strain isolated from Patna and one from Mukteswar, whilst conforming to the above grouping, also grew in air at isolation.

Table III illustrate the typing results of some of these unclassified strains; those not shown in the Table were unexceptional in their behaviour and are typified by the Madras or Orissa village strains of the Table. Such strains will be referred to as "*abortus melitensis*", or A/M for short.

On first examination of these strains, it was thought that a technical error had crept in, but, when the work was repeated keeping careful controls, it was found that if the above dye concentration was low enough to permit the growth of *melitensis* controls on both media, and if ordinary, European *abortus* and undoubted Indian *abortus* strains were inhibited on thionin but grew on fuchsin the results with these aberrant strains were always the same. Moreover, field strains were always typed in lots of 10 or 12 at the same time, and it is significant that out of the 49 strains no less than 20 inescapably gave this ambiguous result. It is concluded therefore that this *abortus melitensis* type is a common indian *Brucella* variant, its constant characteristic being ability to grow on both thionin and fuchsin. Variably, it will grow in air on first isolation (two cases out of 20); its antigenic constitution is unstable, two strains out of 20 being *melitensis* antigenically and the rest conforming more or less to the structure of *abortus*.

Agglutination absorption tests have been made on these *abortus melitensis* strains to observe whether they contain any additional, hitherto undescribed antigen, but this does not appear to be the case.

As to the origin of these aberrant types, it is significant that all the six strains isolated from villages of the Indian peninsula were of this nature. It is suggested, therefore, that this is a South Indian indigenous variant and that the true *Br. abortus* type, as yet exclusively found on organized farms, is an imported European strain.

Further, a consideration of the part played by climate in the dissemination of *Brucella* (Polding, in press) suggests that, if there was a spread of infection from the villages of this peninsula it would be likely to occur along the relatively humid Himalayan foot-hills and perhaps descend into the Gangetic plain. It is of interest, therefore, that the *abortus/melitensis* strains, so far isolated from organized farms, have been found at Jubbulpore—not very distant from the endemic are of Nagpur and Raipur—, and at Bihar, Lucknow, Mukteswar and Hissar, whither infection may well have spread *via*. the Himalaya.

Dissociation

Rough forms of *Brucella* can sometimes be recovered from the animal host, while they may also arise during prolonged artificial culture, especially if grown in fluid media. The species *melitensis* dissociates very much more readily than the other members of the genus, and among the present Indian strains two out of three *melitensis* types were rough when examined after many subcultures. Of 26 *abortus* strains, one only was partially rough in the primary culture. However, when 18 of these strains were re-tested after some 15 or 20 transfers on liver agar, six had become partially rough and two wholly rough. None of the *abortus/melitensis* strains was rough at isolation, but of 13 retested after some 15 or 20 transfers four had become partially rough and one wholly rough.

Antigenic sensitivity

Most of the present collection of Indian strains have been tested for differences in antigenic sensitivity but within the limits of ordinary error no differentiation has been observed,—even the *abortus/melitensis* forms being unexceptional in this respect. Some of the results of this work are shown in Table IV.

TABLE IV

Antigenic sensitivity of Indian Brucella *strains*

Strain	Type	Titre
F39	A/M	+1/1120
F40	A/M	++1/1280
F41A	A/M	+1/1280
F41B	A/M	+1/1120
F42	A/M	+1/1280
F43	A.	+1/1120
F44	A/M	++1/1120
F45	A.	++1/1120
F46	A/M	+++1/1120
F47	A/M	++1/1120
F48	A/M	++1/1280
Control (European)	A.	++1/1280

A=*Br. abortus* A/M=*Br. abortus/melitensis*

Virulence

As white mice are required in large numbers in assays of virulence, and as these animals are not easy to obtain in such numbers in India, only a few Indian *Brucella* strains could be examined for this property. The test is described by Priestley and McEwen [1938] and the results of some of the

present estimations are shown in Table V. For comparison, tests on three foreign vaccine strains are included in this Table. Again, for control purposes it was necessary to compare the virulence of Indian strains with that of type-specific strains from abroad, and in so doing few mice were left for testing the local strains; even then, the interest centring round the *abortus/militensis* type led to four of these and only one *abortus* and one *militensis* being examined.

TABLE V

Virulence of Indian field strains

Strain	Bacterial doses					
	16×10⁹	8×10⁹	4×10⁹	2×10⁹	1×10⁹	0.5×10⁹
F.46 Indian CO_2 A/M ...			4	3	2	3
F.45 Indian CO_2 A ...			4	2	0	1
F.41 Indian CO_2 A/M ...			5	5	2	2
F.40 Indian CO_2 A/M ...			5	3	0	1
F.36 Indian CO_2 A/M ...			5	4	4	1
F.34 Indian M ...			5	5	4	4
A.1 European A ...			3	1	0	1
M.1 Malta M ...			5	3	1	1
V.1 Cotton's 19 ...	5	4	1			
V.4 McEwen's 45(6) ...	2	1	1			
V.5 McEwen's 45(20) ...	2	5	2			

Numbers=dead mice out of 5.

A=*Br. abortus* M=*Br. melitensis* A/M=*Br. abortus/melitensis* CO_2=CO_2 sensitive

The Indian strains tested were recently isolated and, except the *melitensis* strain, were Co_2 sensitive. As might be expected, the order of virulence proved to be: *melitensis* most virulent *abortus-melitensis* of intermediate virulence, and *abortus* least virulent. As repeated sub-culturing is supposed to lead to loss of virulence, a comparison with the overseas type-specific strains must be made with caution. It is to be remembered that the Maltese strain was isolated six years previously and the English *abortus* strain must be many years old. After making due allowance for this, however, the experiment suggests little difference between India and overseas species. To check up this suggestion, in Table VI a comparison is shown between the Indian strains and an average result of four recently isolated English *Br. abortus* strains typed by Priestley and McEwen [1938]. If it can be believed that tests done by different persons are comparable, the foregoing conception of virulence seems to be substantiated.

DISCUSSION

The apparent rarity of ***melitensis*** strains in India is note-worthy, for while corroborating the belief of most contemporary observers, it accords ill with the early history of human infection, which for this reason merits a brief scrutiny. From the year of Wright and Smith's [1897] demonstration

of the agglutination test for brucellosis until the far-reaching revelations of the Mediterranean Fever commission [1905—07] an ever-growing number of reports were published of undulant fever in India. It is indeed remarkable that with the crude facilities and techniques of those times, investigators were apparently able to isolate what seemed to be the causal organism with ease and certainly, *e.g.* from 11 humans in Multan and Ferozepore [Lamb and Pai, 1906], and from goats also in Ferozepore [Froster, 1906]. Concurrently, numerous serum-positive cases of typical fever were described from all over India and a perusal of the contemporary journals forces the conclusion that undulant fever was enzootic in certain military cantonments, with the inference that the Punjab at least was widely infected. What is more, a scrutiny of the records cannot fail to convince the critical that a gram-negative, CO_2-insensitive, cocco-bacillus, agglutinable by *Brucella*-specific serum, was being isolated. This, together with the fact that CO_2 was not required at isolation, is an indication that the species concerned was ***melitensis***. On the other hand, agglutination reactions were generally weak, and demonstration of infection in animals was infrequent and confined to a few cantonment goats only.

TABLE VI

Comparison of Indian and European strains

Strains	Bacterial dose			
	4×10⁹	2×10⁹	1×10⁹	0.5×10⁹
Indian M	5	5	4	4
Indian CO_2 A/M*	5	4	2	1
Indian CO_2 A	4	2	0	1
McEwen's CO_2 A† ...	4	2	1	0

Numbers=dead mice out of 5

*Average of 3 Indian village A/M strains

†Average of 4 of McEwen's *abortus* strains (CO_2 sensitive and virulent), Priestley and McEwen [1938]

A=*Br. abortus* M=*Br. melitensis* A/M=Br. *abortus/melitensis* CO_2=CO_2—sensitive.

In 1907, the spate of case reports suddenly subsided and at the present day it is difficult to obtain more than very rare reports of single scattered cases of undulent fever. But this surprising state of affairs can only be explained by one of three propositions, (1) that the earlier reports were incorrect, (2) that in the period 1907-1939 human brucellosis in India had practically died out, or (3) that undulant fever still occurs frequently but is either not reported or not diagnosed.

The earlier work must either be disbelieved as a whole, thus discrediting the work of several specialists, or accepted as a whole. On the other hand, it is past belief that at the present time frequent cases of so obvious a disease as ***melitensis*** infection could be missed in modern army hospitals. In the face of this, an explanation must perhaps be sought in the admittedly rather improbable proposition 2.

Now it is odd, to say the least of it, that case reports in India subsided so soon after 1907, the very year succeeding that in which the infection rate in the British garrison at Malta was so greatly and dramatically diminished. But nearly all the cases of genuine Malta fever reported in India, occurred in cantonments, and in the words of Scott [1939], 'The disease was shown to be widespread in north-west India and ***especially in places where British troops were stationed***' (The italics are mine). Can it be accepted then, that infection in indian cantonments was brought by trooping movements from Malta, that dissemination was entirely localized, and, to round off the premise, that when fresh sources of infection from Malta failed, in the absence of a sufficient animal reservoir and possibly in the face of stricter boiling of milk, the local infection partially or wholly died out?

During the present investigation constant attempts have been made to stimulate medical interest in brucellosis; but it has been rightly contended that during the wartime emergency little effort could be spared for a disease of such ***apparent minor importance***. The securing of human strains has, therefore, been rendered almost impossible by the unavoidable circumstance of war.

Nevertheless, it is of deep interest why a disease, so prevalent in man on the goat-populated Mediterranean littoral, should be apparently so rare in man in India, where in certain parts at least sheep and goats are abundant. At one time the simple explanation of the almost universal Indian custom of the boiling of milk was stressed as the explanation, but in France Taylor, Lisbonne, Vidal and Hazemann [1938] have clearly shown that at least among breeders of goats and sheep, and possibly also amongst all who come in close contact with these animals—such as small-holders, house—wives and butchers—some 40-60 per cent of infection is transmitted to man by contact. For a considerable section of the Indian public, therefore, the 'boiled milk' explanation fails and, if it can be assumed that ***melitensis*** fever in man would be diagnosed and reported were it a sufficiently prevalent disease in this country,—an assumption which is probably valid—then it appears that the reason for its rareness in man must be its rareness in animals—and as will be shown elsewhere (Polding, unpublished), this appears to be the case as far as sheep and goats are concerned.

Br. melitensis is not, however, the sole ***Brucella*** species pathogenic to man, and it seems possible that a variable number of Indians must

become infected with ***Br. abortus*** from contact with animals, in which there is no room for doubt that ***Br. abortus*** infection occurs. Rare serum-positive patients, suffering from fever, are reported from time to time, notably in the North-West Frontier Province and Punjab, but until the responsible strains are isolated and typed, which has not yet been done, it will not be known whether these fevers are ***melitensis*** or ***abortus*** in type, although the latter seems more likely.

On the fact of it, therefore, it seems that, if ***melitensis*** infection has occurred at one time in India, it is not very prevalent today. The ***abortus*** type is known to occur in cattle and is likely to occur to some extent in man. Sheep and goats appear to be relatively free from either infection, whilst there is no reason to suppose that the ***suis*** species occur at all.

The existence of the aberrant ***abortus melitensis*** strain holds much interest. Huddleson's correspondent, cited earlier, observed similar characteristics in his aberrant Indonesian strains. In India, the only truly enzootic area, where the incidence of brucellosis in native village cattle is significant, is the south-eastern seaboard. This is also the area of constantly high atmospheric humidity, equable temperature, and a tri-seasonal rainfall. This portion of India is, therefore, not only nearest to Indonesia geographically but also climatologically. Consequently, it is tempting to suppose that this a middle-asiatic variant, which is adapted to survival in regions favourable to the cultivation of rice.

SUMMARY

Forty-nine Indian field strains of ***Brucella*** were typed and their dissociability, agglutinability and virulence assessed. They were unexceptional on all the last three counts. Of the 49, 26 were pure ***abortus***, 20 were intermediate between ***abortus*** and ***melitensis***, 3 were ***melitensis*** and there were no ***suis***. All six strains isolated from village cattle of the ***Brucella*** enzootic area of the peninsula were of the intermediate type and it is suggested that this is an indigenous Indo-Indonesian variant.

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BREEDS OF POULTRY SUITABLE FOR INDIAN CONDITIONS

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The fowl population of India may be roughly divided into two types, viz., *desi* and 'improved'. According to the Egg Marketing Report (1938), the total number of *desi* birds is 51. 47 million, whilst the number of improved stock i.e. imported birds and crosses between them and *desi* fowls, is only 0.73 million.

The *desi* fowls cannot be regarded as a true breed, as the term includes all types indigenous to India, but despite their lack of uniformity they have certain characters in common. They are normally small or medium-sized, the female weighing 2½-3 lb. and the male 3-4 lb. The body is compact, the breast bone low and well-covered, the feathers are of various colours and lie close to the body. Broodiness is very pronounced. They are active and hard and generally lay eggs weighing about an ounce. The estimated average egg production for the whole country is only 53 eggs per annum per bird, but under good environment much better results have been obtained.

The *Aseel* is of special interest, as it is the best-known and the oldest breed in India. At one time, it was popular for its fighting characteristics but less attention is now being paid to its cock-fighting qualities. The breed is an exceptionally poor layer and though the mature bird has ideal meat conformation, its low egg production and slow growth are handicaps.

Birds of the Aseel breed have a short, broad head and exceptionally strong beak. The comb is small and the wattle is small or absent. The neck is strong and scantily feathered. The body is short, the back wide, and the tail short and somewhat drooping. The chest is broad and the strong muscular legs are set wide apart. The plumage is short and tight. There are no standards of colour, nor any real standard weights, but the males may weigh 5-8 lb. and the females 4-6½ lb.

The White Leghorn is widely distributed and competes with the Rhode Island Red in popularity. It is predominantly an egg-producing breed, and when crossed with *desi* birds practically all the progeny are white except for occasional black or brown feathers. The Leghorn is more suited for dry districts, as it does not stand up well to severe rains or heavy,

wet soils. It is good for 'grading-up' ordinary country fowls, but its non-broody characteristic both as a pure breed and as a cross is normally regarded as a defect by the village poultry-man. The head of the bird should be comparatively fine, the eye prominent and rich-red in colour. The beak is stout, and the point should be clear of the comb. The comb is single and in the male should stand erect with five regular serrated points. In the female, the comb should hang neatly over the head. The comb and wattles in both sexes should be fine in texture. The body is wedge-shaped, being wide in front and tapering towards the tail. The tail in the male is prominent and carried at an angle of 40-50 degrees. The carriage is upright and sprightly. The plumage is white, the legs are yellow in colour and free of feathers. Adult males and females weigh 5½-6 lb. and 4 lb. respectively. Good layers should produce 200 or more two-ounce eggs during their pullet-laying year.

The Rhode Island Red is also well distributed throughout the country. It is an excellent dual-purpose breed, and, as it is hardy and stands up well to high rainfall, it is well suited to most parts of the country. The Rhode Island cross *desi* has good body size and, as it is relatively broody, it is well adapted for natural hatching and rearing. The head should be bold but not coarse. A long narrow beak is a sign of low stamina, and an excessively beefy head denotes low productivity. The comb is smooth, with 5 points and should not fall over the face. The back is long, broad and level, and the tail should be carried at an angle of about 40 degrees in the male and 35 degrees in the female. The breast should not fall away. The exhibition Rhode should be dark-chocolate in colour and free of white under feathers, but certain black feathers are permissible in the wings and tail. The egg is brown, and good layers should produce 200 two-ounce eggs in their first year. The standard weights of the male and female are 8 lb. and 6 lb. respectively.

The Black Minorca ranks next to the White Leghorn and Rhode Island Red in popularity. However, as the breed is much less hardy and as it is a poorer layer than the Leghorn and Rhode, it is not likely to be used extensively in rural improvement schemes.

Though small numbers of other breeds such as Australorps, Light Sussex and Rocks are occasionally seen at different centres, they are relatively unimportant. As it is difficult with the rarer breeds to obtain the necessary changes of blood to prevent inbreeding, it is unlikely that any of them will prove very satisfactory, at least in the near future.

ANATOMICAL DEVIATIONS

By

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The following anatomical deviations were noted in the 'dissection class' of this college and, as they are interesting, they are published for the benefit of the profession.

I. Additional femoral insertion of the Biceps Femoris. (Ox).

The Biceps Femoris or the combined Biceps Femoris and Superficial Gluteus in the Ox, has usually three insertions. This muscle appears to divide below into three parts anterior, middle and posterior. The anterior portion is inserted to the patella, the middle portion to the external patellar ligament and the tibial crest and the posterior portion to the fascia lata and through it to the Os Calcis.

In a subject dissected by group No. 1, on 14—4—50, this muscle was found to have an additional insertion to the femur. This additional insertion was in the form of a thick strong tendon, about an inch and a half long and was inserted to the inner lip of the supracondyloid fossa of the femur. This condition was noted in both the hind limbs of this subject.

II. Additional tendon of insertion of the Peroneua Longus (Ox).

The tendon of insertion of this muscle is long and has the following usual disposition :—

It first runs down between the Extensor Proprius Externus and the Complex muscles, passes then downwards and backwards over the external face of the tarsus, passes through the synovial theca of the Extensor Proprius Externus, crosses this tendon, comes out of the theca and diverges from the tendon of the Extensor Proprius Externus by passing outwards and backwards. It then passes in succession under the External lateral Calcaneo-metatarsal and tarso-metatarsal ligaments of the tarsus. The tendon is bound over by these ligaments, in this course, to the channel on the external face of the Scapho-cuboid. The tendon hereafter becomes interosseous or intra-articular, detaches a short branch which becomes inserted to the upper extremity of the large metatarsal, inclines then gently backwards, widens out and is finally inserted to the Cuneiform Parvum.

In a subject dissected on 13-1-50, each of the two groups (Nos. 13 & 1) working on the two hind limbs, observed an additional tendon of insertion of this muscle. The tendon of the Peroneus Longus had the

usual disposition till it came out of the synovial theca. It then divided into two branches, one thick short and a second slender long one. The thick branch had the usual course, description and insertion to the Cuneiform Parvum as described above. The long slender branch is the *additional tendon of insertion referred to* and it followed the tendon of the Extensor Proprius Externus to the lower third of the metatarsal region and was inserted to the deep metatarsal fascia.

III. Insertion of a tendon of the Extensor Proprius Internus to the Peroneus Tertius (Ox).

The usual description of the tendon of the Extensor Proprius Internus is as follows:—

This muscle is succeeded by its tendon of insertion at the upper part of the tarsus and this tendon passes down with that of the Extensor Communis Digitorum, lying on the anterior capsular ligament of the tarsus, to the lower third of the metatarsus. It here diverges from that of the Extensor Communis Digitorum, passes downwards and inwards on the antero-internal aspect of the internal metatarso-phalangeal articulation, widens out, receives two branches from the suspensory ligament about the middle of the first phalanx and is finally inserted to the second and third phalanges of the internal digit. It is thus seen that the tendon of insertion of this muscle is usually single throughout.

The tendon of this muscle in the right hind limb of a subject dissected by group No. 13 on 13-1-50, showed an interesting deviation from the usual disposition.

As soon as this tendon succeeded the muscular belly, it divided into two branches of unequal size. The thick long branch behaved as the uaual tendon of insertion of this muscle while the short slender one which was the additional and unusual feature was about three inches in length and was inserted to the deep face of the Peroneus Tertius about an inch and a half above the tarsus. Thus, the Extensor proprius Internus of the right hind limb had two tendons of insertion.

This muscle in the left hind limb of this subject did not exhibit the additional tendon.

VI. Variation in the origin of the Prehumeral and deep Humeral arteries (Ox).

Usually, these arteries arise as collateral branches of the Brachial artery. The slender prehumeral artery arises, usually, as the first of the collateral branches from the anterior face of the Brachial artery while the small, short, deep Humeral artery, usually, arises as the second important

collateral branch from the posterior face of the Brachial artery about the level of the middle of the humerus or about one to two inches below the level of the origin of the Prehumeral artery.

In a subject dissected by group No. 11 on 21-2-50, the following deviation was noted:—

Both the Prehumeral and Deep Humeral arteries were absent as collateral branches of the Brachial artery. A branch arising from the anterior face of the Axillary artery at its termination, took the place of the Prehumeral artery.

A common trunk arising from the Subscapular artery divided into two branches. One of these, became the Posterior Circumflex artery while the other one took the place of the Deep Humeral artery.

V. Digastric Sterno-Thyro-Hyoideus Muscle in the Ox.

Usually, the Sterno-Thyro-Hyoideus of the Ox does not show the digastric character like that of the Horse.

But, in a demonstration subject (Ox) dissected on 26-8-49, both the right and left Sterno-thyro-Hyoideus muscles presented a distinct digastric character about the middle of their length.

VI. The Sternum. (Ox).

Usually, the sternum of the Ox is made up of seven Sternabrae and each of the right and left lateral edges of the sternum presents eight depressions—the Costal Cavities—which articulate with the lower ends of the first eight costal cartilages. But the finding of the Sternum sometimes composed of only six Sternabrae in small ruminants, has been recorded.

While engaged in the preparation of bones, for demonstration purposes, I have, for the first time, noted that the Sternum in three adult subjects—one buffalo and two bullocks—was composed of only six Sternebrae. Of these, the sternum of one bullock and one buffalo showed only seven costal facets on each side and thus showed only seven sternal cartilages articulating with the sternum on each side. Though the Sternum in a third Subject—a bullock—showed only six sternebrae, its edge on each side articulated with eight sternal cartilages. The costal facet from the second to the seventh were found as usual at the intersternebral junctions. But, the facet for the eighth costal cartilage was found on the lateral border of the sixth sternebra, close behind the seventh costal facet.

In the sternum of a fourth subject—a bullock—two large foramina were noticed on its lateral edges. This peculiarity which has not been recorded by any, has been noted for the first time. The lateral borders of

the sternum, usually, present more or less deep notches for the passage of vessels. These notches on the lateral edges of the third sternebra are absent in this subject and have become converted into complete foramina. Of these, the right foramen was oval and larger while the left one was smaller, higher in level and elliptical in outline.

These four sternums, referred to above, have been kept as moist specimens in the Anatomy Department of this College.

The following students constituted the groups mentioned in the article.

Group No. 1. Shri B. S. THAKUR, ,, P. G. CHITNAVIS, ,, V. R. THATTE, ,, S. V. SHEMBEKAR

Group No. 13. Shri. G. M. DEORAS, ,, S. B. RAWAT, ,, V. J. IYER

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Editorial

EXPORT OF NUTRITION

A recent announcement by the Government of India gives the information that it has decided to lift partially the ban on exports and to allow the export of 8000 tons of groundnut up to the end of December 1950 to dollar countries and also to allocate the export of 20,000 tons for shipment to all permissible destinations during January-February 1951. This is a surprising and disquieting news. We are left guessing as to the reasons for this revision of policy. Groundnut is a very valuable nut containing 'a protein of a high biological value which ranks with the microbial protein of yeast and closely approximates animal protein as found in milk, eggs and mutton'. It is rich in phosphorus and contains a good percentage of vitamin B complex. After the expression of oil, the residual groundnut cake forms an excellent protein feed for our cattle. As is only too well known, our animals are grossly and seriously underfed. They are in different stages of malnutrition. Their maintenance in a state of good health and efficiency has been a great problem with us, because of the non-availability of nourishing food in adequate and sufficient quantities. According to experts, even if all the oil-cakes, cotton seed and bran in the country were available as cattle feed, no oil seeds being exported and no oil-cakes used as manure, still their production would be only one-fourth of our requirements. This non-availability of a good supplemental concentrate feed for our cattle has been a great check on cattle development and improvement in the country. An oft-

reiterated recommendation for closing up this gap has been 'that the agricultural plan should provide for an adequate increase in the production of concentrates, especially oil-cakes'. Consequently, our endeavour has been to conserve and utilise the available edible oil-cakes as economically as possible. Under these circumstances, the recent announcement of the Government permitting the export of even the little available groundnut only adds to our existing difficult problem of feeding our cattle. Is the income from this export more valuable than the Nutrition and Health of our livestock? Are not our livestock indispensable for the improvement of our agriculture? Is not our country a predominantly agricultural country and is it not necessary to build up a sound agriculture to make the people prosperous and happy? One of the greatest lessons of history, as President Truman has said, is that no nation can be stronger than its agriculture. This is a truism which is particularly applicable to our country where agriculture is impossble without cattle. These are factors which weigh heavily with us and prevent us from allowing the export of any quantity of cattle feed available in the country. If, however, export *is* to be allowed, will it not be more in accord with our own primary needs if it is restricted *only* to the oil expressed from the nut, leaving the residual cake for use here? We will then be able to feed not only our starving cattle but also our starving lands, because the dung of cake-fed cattle are of high manurial value owing to the retention of nearly nine-tenths of the nitrogenous and mineral constituents of the cake in the dung and urine of those animals. When, in the past, we allowed free and unrestricted export of oil seeds and oil-cakes, we really allowed the export of the Nutrition of the livestock and the Fertility of the soil. That resulted in the starvation of both our livestock and lands which, in turn, has landed the country in a food crisis for the people. This initial mistake of exporting valuable articles of food must first be rectified if the resulting devastating effects on the people are to be warded off. As our revered President Rajendra Prasad put it very aptly, 'no scheme aiming at an improvement in the milk yield or better bullocks, can be successful unless there is sufficient nutritious food available for our cattle.' Groundnut cake

is one of the important 'nutritious foods' available in our country for our cattle and therefore this must be retained and used for feeding the starving cattle within the country itself.

In this connection, we desire to invite the attention of the Government of India to the resolution passed at the All-India Veterinary Conference held at Bombay in April 1950 which requested the Government of India in the general interest of our livestock to ban completely the export of oil seeds and oil cakes which are used as cattle feed. We therefore earnestly wish that the Government acconsiders its decision and stops the export of this valuable nutritious food out of the country.

DISCRIMINATION BY TURF CLUBS TO GO.

We are very gratified to learn that the Government of India have addressed all the States Governments which issue licences to Turf Clubs in their jurisdiction to impress on these Clubs the desirability of removing the existing discrimination practised by them beween the Graduates of Indian Veterinary Colleges and Members of the Royal College of Veterinary Surgeons in England. This is the result of a representation made by the All-India Veterinary Association to the Government of India drawing attention to this discriminatory rule of the Turf Clubs of India, whereby certificates issued by the Graduates of the Indian Veterinary Colleges were not accepted by them and whereby also these Graduates were prevented from officiating as Veterinary Surgeons at Race Meetings. The Association also represented that it was a matter affecting the dignity and honour of the members of a scientific profession in a free country like India that the products of their own professional Colleges and Universities were not only not given their due status by organisations within the country but were treated as persons inferior to those possessing qualifications from outside the country. It was well known that as matters stood at present the entire professional work among the race horses was practically in the hands of the Graduates of the Indian Veterinary Colleges and that this practice was being carried on with credit and distinction and with entire satisfaction to the owners and trainers of horses. In

spite of all these when it came to a simple matter of signing an identification certificate or a death certificate the ban was put on and the signatures of Graduates of Indian Veterinary Colleges were not accepted. The Turf Clubs accepted only the certificates issued by the Members of the Royal College of Veterinary Surgeons. It was obvious that this was neither fair nor just to the Graduates of Indian Veterinary Colleges. The All-India Veterinary Association also represented to the Government of India that the Graduates of Indian Veterinary Colleges had proved their efficiency wherever they had been posted. They had acted as Directors of Veterinary Services, Principals of Veterinary Colleges, as Veterinary Investigation Officers, Livestock Development Officers, etc., with great credit and satisfaction. Moreover, they had been declared eligible for Commissioned Officers' posts in the Army Veterinary Corps which, till we attained freedom, was reserved only to Members of the Royal College of Veterinary Surgeons.

Under these circumstances, it was a matter for deep regret that the Turf Clubs of India which were financed entirely from subscriptions and collections from within the country were treating the Graduates of the Indian Colleges as persons inferior to those possessing foreign qualifications. This subject of discrimination by the Turf Clubs has been agitating the minds of the profession for a long time and we are therefore glad that the All India Veterinary Association took up this matter to the Government of India. We are thankful to the Central Government for their kind intervention in the matter. We do hope the State Governments will see to the removal of this discrimination when they issue licences to these Turf Clubs.

The administrative machine is an association that receives the greatest support among all associations by way of finance and respect and co-operation. Do not let it go slack. I consider all officers to be soldiers under the command of India's Prime Minister. Do as he expects you to do. Do not do anything dishonourable. Be proud of your standards of conduct and behaviour and treat anyone among you who is guilty of dishonesty or rudeness or laziness as a disgrace to your community. Meet often among yourselves and obtain encouragement from one another in your noble work. Those of you who are older, be kindly and helpful to the younger members and guide them.

C. RAJAGOPALACHARI.

THE INDIAN VETERINARY RESEARCH INSTITUTE
MUKTESWAR
POST GRADUATE REFRESHER COURSE, (1950).

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Standing 2nd Row.—Mr. H. S. Jodha (*Rajasthan*) Mr. M. Natarajan (*Madras*), Mr. R. L. Gulati (*Punjab*), Mr. B. S. Rao (*Hyderabad*), Mr. Jai Singh (*U.P.*).

Late Sri V. JANAKIRAMIER, G.M.V.C.

Retired Lecturer, Madras Veterinary College.

The late V. JANAKIRAMIER.

With a very heavy heart, and with poignant grief, we place on record the sudden demise of V. Janakiramier, one of our valued colleagues, and a retired District Veterinary Officer of the Animal Husbandry Department, Madras, on Sunday, the 8th October 1950 at his residence at Tiruvarur, Tanjore District. In his death, the profession has lost one of its beloved members; and one more link with the pioneers of the profession in Madras is severed.

The late Janakiramier came of a good and noble family in Tanjore District and was born on 15th December 1889. He had his early education in the mofussil and moved to Madras in 1910 to join the Madras Veterinary College. Passing out as a Graduate of that College in December 1912, he joined the Madras Civil Veterinary Department (as the present Animal Husbandry Department was then known) on 2nd January 1913. He served in various capacities with ability, credit and distinction in the several parts of the Presidency and, in spite of the hard up-hill work in the early days when the profession was quite unknown in rural parts, he easily earned a name as a popular officer and made the profession known to the people. He was on the staff of the Madras Veterinary College for nearly fifteen years and was well known as an able clinician. Late in his career, he was promoted as a District Veterinary Officer and retired as such in 1944 as a respected member of the profession. His experiences were utilised by the Government of Madras even after retirement for a short while as a Lecturer at the Madras Veterinary College.

Very upright and honest in his dealings, the late Janakiramier never hesitated to call a spade a spade, but, withal that, he made no enemies. He was intimately associated with the present Madras Veterinary Association in its formative years and, as one of its earliest Secretaries and Treasurers, contributed a good deal in stabilising that organisation and in building it up. Till the last, he continued to take a live interest in the Association and was regularly present at all its meetings. He was of great help to us in the conduct of this *Journal*. Above all, he will be remembered as a true and sincere friend who acted up to the dictum, a friend in need is a friend indeed. Small of stature but big of heart and mind, full of wit and humour, he was always a welcome figure and his death so soon after retirement will be mourned by one and all.

We extend our heartfelt sympathies to the members of the bereaved family whom we can confidently assure that their grief and sorrow is shared by a host of friends and admirers of the deceased.

May his soul rest in peace!

Clinical Articles

HYDRONEPHROSIS IN CANINES*

By

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Hydronephrosis is a cystic condition of the kidney characterised by an over-distention of the renal pelvis due to accumulation of urine, consequent on organic or functional obstruction in the urinary passages. It is referred to as 'Non-infected hydronephrosis' when the fluid in the pelvis is clear and colourless and as 'Infected hydronephrosis' when it is turbid due to inflammation.

Incidence:—Hutyra and Marek (1949) and several other authors have observed the frequent occurrence of hydronephrosis in cattle, pigs and sheep. Lucks found this condition in 0.67% of 6,425 pigs and Horn in 0.21% of 1,700 sheep slaughtered for food (Hutyra and Marek-1949). However, very few reports are available regarding its incidence in other animals. A few cases have been noticed in canines during routine autopsy at the Madras Veterinary College and they are described here.

Etiology:—Hydronephrosis may be either congenital or acquired.

A. *Congenital Hydronephrosis*:—This is due to atresia (i.e., absence of normal opening) of the ureter. This is reported to be frequent in pigs and less so in calves (Runnels-1946). Congenital aplasia of the ureter and congenital stenosis of the urethra or ureter are also responsible and the latter is a frequent cause in human beings (Bell-1947).

B. *Acquired Hydronephrosis*:—This is caused in a variety of ways and may be mainly classified as (1) Obstructive hydronephrosis and (2) Non-obstructive hydronephrosis.

(1) *Obstructive hydronephrosis*:— In this form of hydronephrosis the increase of back pressure is due to mechanical obstruction in the urinary passage which may be present anywhere between the pelvis of the kidney and the external urethral orifice.

(i) *Obstruction in the lumen of the organ*:—Calculi, inflammatory products, etc., may be present in the urinary passage and cause obstruction to the flow of urine. Horn says that 80% of the cases are due to kidney stones. (Hutyra and Marek-1949)

*Read at the Annual Conference of the Madras Veterinary Assistant Surgeon's Service Association held in October 1950.

(ii) *Obstruction in the wall of the organ*:—Stricture of the ureter or urethra due to inflammation and neoplasms in the pelvis of the kidney and in the bladder are occasionally noticed to cause obstruction.

(iii) *Obstruction due to pressure from outside the organ*:—Abdominal neoplasms, pregnant uterus, enlarged prostate, over filled rumen, etc., may cause displacement of the kidney and the ureter may be compressed or bent.

(2) *Non-obstructive or paralytic hydronephrosis*:—In this form of hydronephrosis, the increase of back pressure is due to neuro-muscular disturbances resulting in paralysis of the bladder or to functional disturbances in the ureter.

Hydronephrosis is a constant feature of diseases and injuries of spinal cord. Incoordination between ureteral peristalsis and relaxation of the uretero-vesical sphincter and paralysis of the uretero-vesical sphincter are the two widely offered explanations for the development of non-obstructive hydronephrosis. Evidence is in support of the latter view than to achalasia (i.e., failure of the sphincter to relax) (Bell, 1947).

Pathogenesis:—Hydronephrosis is due in all cases to some obstruction to the flow of urine. It is dependent on the continued secretion of urine along with the presence of some obstruction which is incomplete or intermittent and is periodically overcome. Sudden, complete occlusion of the urinary passage, whether unilateral or bilateral, is not followed by hydronephrosis as the pressure in the urinary passages rapidly increases and will result in the cessation of urine secretion. In pigs, the conformation of the urinary organs predisposes it to hydronephrosis. The bladder is large with a long neck and the ureters enter the bladder posteriorly and too low in the region of the neck. When the bladder is filled, it hangs down into the abdominal cavity, due to its loose attachment, and the long neck is pressed against the anterior border of the pubis and urination is interfered with.

When there is an impediment to the flow of urine, the urine which is steadily secreted is dammed up behind the obstruction. This results in the dilatation of the urinary passages anterior to the obstruction and finally the renal pelvis.

Hydronephrosis may be unilateral or bilateral depending upon the situation of the causal agent. Lucks found it to be unilateral in 29 animals and bilateral in 14, while Horn found it to be usually unilateral (Hutyra and Marex—1949). The condition will be unilateral if the obstruction to the flow of urine is proximal to the bladder and bilateral if it be in the bladder or distal to it.

Symptoms :—In unilateral affections, there may not be any particular disturbance to the excretion of urine because the other healthy kidney will undergo compensatory hypertrophy and attend to the excretion of urine. In advanced bilateral affections, there may be a permanent or intermittent diminution in the output of urine. The animal may be dull, anorectic, vomit occasionally, become weak and unable to stand. There may be some pain in the region of the loins. Very large hydronephrotic kidneys distend the abdomen. Urine may be high coloured. If the anuria persists for a long time, uraemic symptoms such as convulsions, vomition, dimness of vision, transient pulse and coma may be noticed.

The following five cases of hydronephrosis were detected in canines during P.M. examinations and their case reports are as follows :—

In two bitches aged about 5 years, (D.W.I.P. 2603/49-50-A. 188/49 and D.W.I.P. 4416/49-50-A. 53/50) the early stage of hydronephrosis was seen. There was no appreciable change in the size of the kidneys and in the length of the ureters. In both the cases the cause was unilateral calcular obstruction in the left ureter. In the first case, the obstruction was in the middle of the ureter and about 30 c.c. of clear urine was present in the distended pelvis. In the second case, there was a yellow pea-sized calculus about an inch from the pelvis and two similar ones, one behind the other, about half an inch from the uretero-vesical orifice. The ureter anterior to the seat of obstruction was dilated and the ureteral wall was very much thinned. The pelvis, distended with the retained urine, caused slight atrophy of the medulla surrounding the pelvis.

The intermediate stage in the development of hydronephrosis was seen in 2 cases. In one bitch, aged about 2 years (D.W.I.P. 4045/48-49-A.28/49), the right kidney was slightly larger than the left, its surface uneven and the capsule was thickened and adherent to the cortex. The cause was a slight twist in the right ureter, about an inch from the renal pelvis, and was probably congenital. Both the ureters were of the same length. The ureter anterior to the twist was distended and the wall thickened. The renal pelvis was highly distended and contained about 60 c.c. of clear urine. A very large portion of the medulla was destroyed. The cortex was much reduced and only a thin strip was left. The ducts of Bellini were much thickened and stood out prominently.

In the other bitch which was aged, (D. W. I. P. 297/50-51-A. 102/50), hydronephrosis was bilateral and was due to metastatic neoplasm. Both the kidneys were much enlarged. The left kidney showed marked distention of the pelvis with a large tumour filling the pelvis. A large part of the medullary portion was destroyed and the ducts of Bellini were thickened and prominent. In the right kidney the pelvis was only slightly distended and the neoplastic growths were present in the pelvis as well as in the parenchyma.

FIG. 1

Early stage of hydronephrosis.

FIG. 2

Intermediate stage of hydronephrosis.

FIG. 3

Advanced stage of hydronephrosis.

FIG. 4
Bilateral hydronephrosis.

FIG. 5
Section of cortex (X 100. Haematoxylin and eosin).

FIG. 6
Section of medulla (X 100. Haematoxylin and eosin).

The last case representing an advanced stage of hydronephrosis was observed in an experimental bitch, which was fairly aged and having a distended and pendulous abdomen. The left kidney was like a large sac of fluid and it filled the major portion of the abdominal cavity. It was nearly four times the size of a normal kidney. The hydronephrotic kidney weighed 1,060 gms. while the right kidney weighed 25 gms. The left ureter was 9" long, very much distended, thickened and tortuous. It ended in a cul de sac about $2\frac{1}{2}$" from the uretero-vesical orifice and was continued by a normal looking ureter commencing 1/8" antero-internal to the cul de sac. The right ureter was 7" long. The distended pelvis had completely destroyed the parenchyma of the kidney leaving only the fibrous capsule, which was much thickened. Strands of fibrous, cord-like structures were present inside the hydronephrotic kidney appearing as a sort of truss for the distended kidney. The kidney contained 900 c.c. of dark brown viscid fluid with a high sp. gr. of 1.052. The fluid on examination was found to be acid in reaction and contained albumin, traces of uric acid and urates. On microscopical examination large number of blood cells was noticed.

The cause in this case is believed to be a congenital stricture of the ureter at the level of the cul de sac, which had subsequently undergone fibrosis and finally resulted in its complete occlusion. There was no sign of any inflammatory lesion at the level of the occlusion.

Hydronephrosis due to similar etiology, though frequent in human beings, has rarely been observed in animals. A single case similar to the advanced case mentioned here is quoted by R. A. Runnels (1946) and was due to congenital atresia of the ureter.

Microscopical Appearance:—In the cortex several tubules were atrophied and lined by low epithelial cells, while in others varying degree of degenerative changes were noticed in the lining epithelium. In extreme cases, the cells showed intense eosin-staining with practically no evidence of nuclear staining. Hyaline casts were present in the lumen of some of the less severely affected tubules. Several glomeruli in the cortex showed partial hyalinization of the capillary tufts. There was diffuse cellular infiltration, chiefly of plasma cells and lymphocytes, and macrophages around the atrophied and necrotic tubules and in the interstitial tissue surrounding a few glomeruli.

In the intermediate zone, there was an increase in the amount of interstitial fibrous tissue and tubular atrophy was present. The walls of the blood vessels were much thickened and their lumen narrowed.

In the medulla also there was an increase in the intertubular connective tissue and tubular atrophy was more pronounced. The fibrous tissue presented a hyaline appearance. The renal vessels in this zone were much distended and engorged. Blood pigments were deposited diffusely in the lumen of the blood

vessels and the tubules and in the interstitial connective tissue. The medulla, adjacent to the distended pelvis, showed extensive fibrosis and cellular infiltration and was lined by a layer of atrophied, hyperchromatic cells.

In the hydronephrotic kidney of neoplastic origin (A-102/50) there was a large scale invasion of neoplastic cells in the parenchyma of the kidney, resulting in the destruction of glomeruli and tubules leaving only a few islets of atrophied glomeruli and tubules. The neoplasm was diagnosed as a lympho-sarcoma. The neoplastic cells were large and circular or oval. The cytoplasm was purple and abundant in a few cells. The nucleus was dark-blue and highly chromatic. The cells were arranged in alveolar fashion with an abundance of fibrous stroma separating the alveoli. The blood vessels were much thickened and contained emboli of neoplastic cells.

Sequelae :—Infection might take place resulting in pyo-nephrosis and death. In unilateral affections, the renal function is taken over by the other healthy kidney, while bilateral affections usually terminate in death due to ureaemia. Occasionally in advanced cases, the large sac-like kidney may rupture resulting in death due to peritonitis.

Diagnosis :—Rectal exploration in large animals and abdominal palpation in small animals will help in diagnosing the condition. One or both kidneys may be found enlarged and fluctuating but not painful. In advanced cases of hydronephrosis in dogs, there is considerable distention of the abdomen. Intravenous urography will aid in diagnosis.

Treatment :—Treatment depends upon the cause and its situation. Calcular obstruction in the course of the ureter and abdominal neoplasms, if operable, may be operated and removed. In the case of prostatic hypertrophy, prostectomy may be attempted with success. If the obstruction to the flow of urine cannot be removed, nephrectomy may be considered in unilateral cases, if the enlarged kidney affects the health of the animal by compressing the abdominal organs. This procedure will be successful only if the other kidney is still capable of functioning.

Discussion :—Hydronephrosis has rarely been noticed in animals other than those slaughtered for food. This may perhaps be due to fewer opportunities for necropsy in them than in the latter.

A varying degree of atrophy of the parenchyma and chronic inflammatory reaction of the interstitial tissue is seen depending upon the duration of the condition. The tubular atrophy is largely due to disuse since glomerular filtration is suppressed. The distended pelvis also causes pressure atrophy of the adjacent medulla, which becomes gradually thinner and thinner and, in the advanced stage, is merely covered by the fibrous capsule and a very thin layer of the cortex.

It might be observed that all the cases of hydronephrosis described here were noticed in bitches. All of them were aged about 5 years and over excepting one bitch which was about 2 years. Lucks found that the incidence of hydronephrosis was three times more in females than in males (Hytyra and Marek-1949). An interesting observation was made in human beings by Dr. E. T. Bell (1947) who found the incidence in males to be about 3.9% and in females 3·6% (but the number of autopsies in males was nearly double that of females). There was no great difference in its incidence in the sexes until 20 years of age. It was more frequent in females between 20-60 years, chiefly due to the occurrence of pregnancy and uterine carcinoma during this period. After the 60th year, there was a great preponderance in males chiefly due to hypertrophy and carcinoma of the prostate.

Summary :—Five cases of hydronephrosis were noticed in canines, four being unilateral and one bilateral. Amongst these, two cases were of congenital origin and three of obstructive origin with calcular obstruction in the ureter in two cases and neoplastic obstruction in the renal pelvis in one case. In unilateral hydronephrosis, the left kidney was affected in three cases and the right kidney in one case. The gross and microscopical appearance of the cases have been described in detail.

Acknowledgment

I wish to express my thanks to Dr. I. M. Azizuddin, Principal, Dr. K. P. Chandrasekharan, Lecturer in Pathology for help and encouragement in the preparation of this article, Dr. K. T. K. Nambiar for the urine analysis and Sri Jambulingam, Artist, for the photographs.

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I firmly hold the view that the happiness of our people depends on administration more than upon legislation or any other organ of Government, more than any policies or constitutional forms. Upon the character, industry and ability of the officers in our civil services depend the prosperity and happiness of the people.

C. RAJAGOPALACHARI.

RETENTION OF PLACENTA AND ITS TREATMENT BY HOMOEOPATHY*

By

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Retention of placenta is of frequent occurrence in stall-fed animals of the city probably due to lack of sufficient exercise, green fodder and minerals. As this condition, if left untreated in time, leads to severe after-effects such as sterility and even death, the veterinarian must be well acquainted with it.

According to Wooldridge, the blood supply is cut off as soon as the umbilical cord connecting the foetus with its membranes is ruptured and the placenta becomes detatched from the uterine wall. Soon the uterine contractions (after pains) recommence, the womb becomes progressively smaller and the after-birth is gradually pushed out.

Williams says, "the dehiscence of the foetal membranes is not due to the contraction of the uterus but, when the detatchment has occurred, the uterine contractions are the essential forces in their final expulsion. It is quite true that when the foetal membranes are retained, the uterus does not contract properly. The failure to contract is not a consequence of the retained placenta nor the cause of it". This, then, raises a very important question in the treatment of this condition. There is no use, then, in administering ecbolics if the foetal membranes have not become detatched. So the indiscriminate use of ergot and its preparations in all cases of retention of placenta is irrational.

In the normal course of events, the expulsion of the foetal membranes takes place soon after the birth—within a few minutes in the mare, sow and the bitch where the placenta is diffuse or zonular, to 2 or 3 hours in the cow owing to the intricate and very intimate connection between the maternal and foetal cotyledons.

But, due to various causes, these envelopes are frequently retained, especially in the cows, which require the intervention of the veterinarian. Though no untoward results were noticed by the retention of these even up to 10 or 12 days by Flemming, yet, under Indian conditions, one cannot leave them unremoved for more than 48 hours.

Causes of retention.—Abortion, premature birth, abnormal adhesions between the maternal and foetal placenta, protracted and laborious birth, uterine inertia, contraction of the cervix rapidly after delivery and mouldy herbage or forage have been cited as causes by Flemming. According to Wooldridge, anything which lowers the tone of the system acts as a contributory or predisposing cause, e.g. weakness, debility, confinement, old age, exposure to chills and travelling. Added to the above, lack of requisite amount of minerals esp. calcium in the food is another factor that one should particularly bear in

*Read at the 10th All-India Veterinary Conference held in April 1950.

mind. Absence or shortage of calcium produces flaccidity of the uterine musculature and hence may be one of the contributory causes of retention.

Treatment.—At present animals are brought to the hospitals if the placenta is not shed within 12 to 24 hours after calving and the usual routine treatment is to administer a cleansing draught containing mag. sulph, ergot etc. But, in over 90% of cases, nothing happens. The animals return next day for manual removal. This process is laborious and very tiring. After the removal, a boro-iodoform pessary is inserted into the uterus.

But, contrary to the treatment mentioned above, I have treated 11 cases of retention of placenta with Homoeopathic medicines and in no case was it necessary for me to resort to mechanical removal.

Secale Corn, Pulsatilla, Sabina, Sepia, Viscum Album, and Cantharis are the remedies recommended for this condition and I have used all of them and found them useful. The leading indications of these medicines are:

(1) *Secale Corn.*—Retained placenta with offensive discharge, uterine contractions very imperfect.

(2) *Pulsatilla.*—Retention of placenta due to want of uterine tone or spasmodic contraction.

(3) *Sabina.*—Retention of placenta after abortion due to atony of uterus, with blood and clots and intense after-pains.

(4) *Cantharis.*—Retained placenta with painful urination.

(5) *Sepia.*—Retained placenta after miscarriage, discharge offensive, and corrosive with reccurrent haemorrhage.

(6) *Viscum Album.*—Retention of placenta, general.

(Nos. 1 to 3 from Herring's cards; 4 & 5 from Kent's repertory; and 6 from Gazdar's specific remedies and Youngling's Emergency Manual)

Dr. Boenninghausen had used Secale Corn and Sabina in a number of cases and found them very useful while Isa Tweed recommends Pulsatilla and Secale Corn.

Administration of medicines and Potency

I used the 30th potency. 200 also may be used. A few pills (4 or 5) to be imbedded in jaggery and offered to the animal which readily accepts it.

Case reports

(1) *Cow—aged 6 years.*—Calved 24 hours previously—placenta snapped due to tying a heavy stone. Puls. and Sec. Corn. Morning and evening. Placenta shed next day.

(2) *Buffalo—aged 4 years.* Primipara—nearly full term—premature birth due to walking 40 miles. Secale Corn and Sabina alternately every 4 hours. Placenta shed 24 hours later.

(3) *Cow.*—Calved 5 days previously—not eating well—Os contracted. Puls. and Sec. Corn. 4 doses on alternate days. After the 2nd day placenta shed.

(4) *Cow.*—Calved 16 hours previously and restless—Canth. and Vis. Alb. morning and evening 2 doses each respectively—placenta shed after 24 hours.

(5) *Cow.*—Calved 24 hours previously—hot and blowing—Sec. Cor. every 2 hours—6 doses—placenta shed after 24 hours—Temp. high—Aconite 2 doses—finished off with Sulphur.

(6) *Buffalo*—Dystokia—Removed a dead calf—Arnica 1 dose—after 4 hours, Sec. Corn. every 2 hours. Straining noticed next day—Sepia every 2 hours. After 24 hours placenta loose. Removed. Metritis present with offensive discharge—cured with caulophyllum in 3 days.

Prevention

As a routine measure, immediately after calving one could administer a dose of Nux. Vom. and followed 2 hours later by a couple of doses of Sec. Corn and Pulsatilla each. No further intervention will be needed.

Conclusion

Homoeopathy which is found so very efficacious in human practice was tried by me in various disease of animals like Rinderpest (vide Homoeopathy in Rinderpest in I.V.J. Vol. XXVI, No. 4), Foot and Mouth disease, coccidiosis etc. In retention of placenta particularly, it is very useful as with its help, manual interference becomes unnecessary. Besides, it is easy to administer the medicines as against the voluminous draughts of allopathy and it is pleasing to the owners to see their animals getting well without any manual interference. So, it is my fervant appeal to all the veterinary practitioners in the field to use these medicines and record their findings.

Acknowledgments

I am greatful to Dr. Shanker Rao P. Koppikar, B.H.M.S. for his inducement to try these medicines on animals and for his technical advice and to Sri. S. V. Mudaliar, Principal, Madras Veterinary College for his encouragement.

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AVIAN COCCIDIOSIS

(A brief Review)

By

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29846

The historical reference to this disease goes as far back as 1877. Zuern (1878) found for the first time coccidia in the intestines of a calf. Zschokke (1892) was the first worker who established the etiological relation between coccidia and red dysentary in cattle. During the early part of the 20th century, this disease attracted the attention of many scientists who placed it under a seperate entity of protozoan infection.

The disease is reported from several places like Germany, England, Denmark, Hungary, U.S.A., South Africa, Abyssinia, Tunis, Columbia, Holland, etc. No locality appears to be completely free of this infection.

It is recorded in countries other than India in fowls, ducks, geese, guinea-fowls, turkeys, quails, pheasants and pigeons. The incidence of this disease will possibly be increased in proportion to the adoption of mass production of poultry to solve our food problem.

Essentially this is a disease of digestive tract which occurs in endemic form at places where chicks are raised frequently on one and the same premises. 50 to 70% mortality in 1 to 4 months old chicks due to caecal coccidiosis is common in our country. This has been reported to exist in Madras, Bengal, Bombay, U. P., Bihar, Orissa, C. P., Mysore and Hyderabad State. It is manifested in chicks by a predominant symptom of blood-tinged and mucoid faeces of semi-solid consistency but these symptoms are not uniformly present in infected flocks. It was observed by some workers that coccidia are discharged in droppings without manifestation of any clinical symptom. Stress has therefore been laid on microscopical examination of intestinal mucosa whenever there is a serious mortality in chicks. Autopsy studies will reveal often the characteristic enlargement of caeca. Microscopical examination of caecal contents in positive cases show a large number of oocysts of coccidia.

Ray (1945) has reported the following species of *Eimeria* in poultry :—

1. *E. tenella.*
2. *E. mitis.*
3. *E. maxima.*
4. *E. necatrix.*
5. *E. acervulina.*
6. *E. praecox.*

He also mentions that *E. hagani* and *E. brunneti* still remain to be detected. Zargar (1945), in addition to *E. tenella* and *E. mitis*, reports a

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new species in chicks as *E. wenyonella* from C. P. which is under study at the I.V.R.I., Mukteswar. Deshpande (1946) reported coccidiosis in pigeons from Bombay but he has not mentioned the name of the species involved. This was later reported by Dixit (1949) as *E. dyspersa*. He has also reported *E. meleagrimitis* in one month old poults.

A 50 to 70% mortality in 1 to 4 months old chicks, prevailing undetected for a long time at the Government Poultry Farm, Patencheru, was brought to light for the first time in an endemic form by the writer during 1943. *E. tenella*, *E. mitis* and *E. maxima* were recorded in fowls, guinea-fowls and pea-fowls in this State, of which *E. tenella* was the commonest species one countered in chicks with a grave rate of mortality.

It may be interesting to recapitulate briefly the like cycle of coccidia. Oocysts of coccidia when passed out in faeces require 24 to 48 hours to develop into an infective stage under favourable conditions such as humidity, temperature and oxygen. Temperature below 40. deg. F. and above 98. 5 deg. F. is detrimental for the development of oocysts. Oocysts cannot survive in low humidity and extreme heat. Degoix (1904) reports that oocysts can remain alive for three months even after the putrefaction of carcasses. It was reported in U.S.A. during 1949 that *E. tenella*, *E. acervulina* and *E. maxima* can survive in shade for 48, 86 and 41 weeks respectively.

Changes take place in oocysts outside the body of host under favourable conditions. They develop into four component parts called *Sporocysts* and each splits again into two parts called *Sporozoites*. The sporulated oocysts in the genus *Eimeria* are termed *Tetrasporocystid and Dizoic*. They are now in the infective stage when ingested with contaminated food and water. Zublin (1908) states that panreatic juice acts upon the ectoderm of sporocysts and liberates sporozoites into the lumen of the intestines. These sporozoites attack the epithilial cells of intestines and develop into schizonts. Each schizont multiplies into a number of merozoites which again attack the epithelial cells and develop into schizonts. The process of multiplication goes on in the same direction and it is called schizogony or an axesual reproduction. After some times this cycle stops and merozoites differentiate among themselves into *Macrogametes* (male element) and *Microgametes* (the female element). Conjugation takes place between the male and female gametes and an oocyst is formed which is passed out in faeces in a non-infective stage. Time required for the completion of life cycle of coccidia is 4 to 10 days and the course of the disease is 6 to 10 days.

Various stages of development in the oocysts of coccidia can be studied if the material is sowed in 2·5% solution of potassium bichromate, and kept under room temperature for 24 to 72 hours depending on the variable periodicity for any particular species,

The following sanitary and hygienic measures are considered necessary for the control of this infection :—

1. Avoidance of over-crowding.

2. Removal of faeces every 24 to 48 hours with a view to breaking up the life-cycle of coccidia.

3. Giving food and water free from contamination.

4. Fumigation of the buildings with Ammonia at 3 ozs per 10 cubic feet space and washing the floor with hot boiling water.

5. Treatment of the affected flock with specific medicines.

Specific medicines :—1. Kerr (1930) with Botham used iodine in conjunction with casein and claimed success in the treatment of coccidiosis in chicks at the Harper Adams' Agricultural College, Newport, England.

2. Blount (1931) carried out experiments on acid-forming germs in the treatment of coccidia. He, however, has investigated the sour-milk-treatment which proved valuable in this disease.

3. Levine (1945) reports that sulphur and sulphaguainidine were found to have definite coccidiostatic effects. Sulphur is effective only against *E.tenella* and *E.necatrix* in the proportion of 5% in ration whereas Sulphaguanidine was found effective against all the eight species of *Eimeria*. Neither sulphur nor sulphaguanidine have any curative value but these drugs prevent infection in birds. There is no medicine so far known which can be safely made a permanent part of ration in chicks.

4. Richardson (1948) recommends sulphaguanidine in 0·5 to 1% in ration or 0·2 to 0·5 gm in capsule. He advocates also the use of Sulphadiazine one per cent in ration or Sulphamezathine in 0·05 gm. as a single dose.

5. Mirza (1947) from C. P., has used sulphaguanidine in the proportion of 0·2 to 0·4 % in the feed and claimed to control this outbreak in chicks which were worth well over Rs. 5,000/-.

6. The writer used in 1949 Sulphamezathine (I. C. I.) in an affected flock of 24 chicks of 3-4 weeks old and found this to be a perfect and reliable remedy against the caecal coccidosis. 5 c.c. of 16% soultion of this drug was added to 500 c.c. of drinking water and given to chicks for five days. Mortality in this flock stopped from third day and 87% chicks escaped this fatal infection. This was later assessed by microscopical examinatian of rectal mucosa from 12 chicks for the evidence of oocysts of coccidia with negative results.

7. An anti-biotic (Cacitracin) has not proved of any value in the prevention of coccidiosis as reported from U.S.A.

Acknowledgment

Thanks are due to Mr. S. A. Jabbar, G.B.V.C., I.D.D., M.Sc., (Cornell, U.S.A.), Director, Civil Veterinary Department, Hyderabad State, for his keen interest in poultry work.

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SCHISTOSOMIASIS IN CATTLE

By

G. Narasimha Murty, B.V.Sc.,

Veterinary Assistant Surgeon, Gokavaram, Madras

During July 1947, three bovines were suspected to be suffering from worms and samples of their dung were found to contain, on microscopical examination, ova of *Schistosoma indicum.*

It was ascertained that these animals belonged to a village 3 miles from Dhone, Kurnool District. This village is situated on the side of a hill. The water supply for all the livestock of the village was from ponds at the foot of the hill throughout the year except when they got dried up during summer. Snails were found in these ponds and they were identified as *Indoplanorbis* and *Limnea leuteola* species. As many as 60 samples of dung from different animals (4 from sheep, 7 from goats and 65 from cattle) were then sent to the Principal, Madras Veterinary college, for microscopical examination, at frequent intervals, besides some more specimens examined by me personally after receiving a microscope from the District Veterinary Officer, Kurnool. Of these, only 9 samples from bovines were reported to contain ova of *Schistosoma indicum.* Some of the Indoplanorbis species only were reported to have discharged cercaria of Schistosoma group. Sheep and goats were found to be free from infection. About 60 livers of sheep and goats purchased from the same village and slaughtered at Dhone Slaughter house were inspected and they were found to be normal in condition.

Symptoms.—Out of the 9 animals suffering from *Schistosoma indicum* infection, 4 animals showed a mixed infection of Strongyle species and *Schistosoma indicum;* one animal with Eimeria and *Schistosoma indicum* infection ; and 4, pure *Schistosoma indicum* infection only.

Treatment.—Six animals suffering from Schistosoma infection were treated with Antimoni et. potasa tartaras 1½ to 3 grains intravenously once in three days. The specimens of the dung after injection showed no ova of the parasites.

Animals with mixed infection alone showed a certain amount of emaciation and debility while those with pure *Schistosoma indicum* infection were observed to be in good condition. The symptoms of pure infection were only an occasional cough, more pronounced during the night than by day. Temperature, rumination, defecation, micturition etc., were normal.

Animals with mixed infection of Strongyle species and *Schistosoma indicum* infection were run down in condition and when treated with Antimoni etc., Potasi Tartaras did not show ova of *Schistosoma indicum* and Strongyles in 3 cases.

The animal with combined infection of *Eimeria* and *S. indicum* was debilitated and anaemic. The animal was first treated with Cupri Sulph internally and Antimonii et Potasii Tartaras afterwards. The animal improved in condition and was reported to be free from *S. indicum* ova in its dung after treatment.

Summary:—Animals suffering from *Schistosoma indicum* infection are not generally poor in condition. Even though cattle are suffering from the infection, sheep and goats may be free from disease. The intermediate host is possibly Indoplanorbis species. Treatment with Ant. et. Potasii Tartaras is likely to be successful. It is likely to be useful and promising in treatment of Strongyle infection also in cattle.

Acknowledgment.—I am grateful to Sri P. Subbarayalugaru, District Veterinary Officer, Kurnool and the Principal, Madras Veterinary College, for their kind help and guidance during the course of investigation.

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Association News

THE MADRAS VETERINARY ASSISTANT SURGEONS' SERVICE ASSOCIATION

Proceedings of the Annual Conference held at the Madras Veterinary College on the 18th, 19th & 20th Oct, 1950.

First day, Wednesday, the 18th October, 1950.

The Conference commenced at 10 a.m. in the Swarajya Hall. The following members were present :—

1 Sri V. S. Alwar
2 ,, G. A. Sastry
3 ,, G. Balasubramanian
4 ,, N. Balasubramanian
5 ,, S. K. Balakrishnan
6 ,, S. Damodoran
7 ,, M. S. Ganapathy
8 ,, D. Jayaraman
9 ,, M. Muthugopal
10 ,, K. T. K. Nambiar
11 ,, E. R. Nagarajan
12 ,, P. L. Narayana Rao
13 ,, T. A. Natarajan
14 ,, G. Pandurang
15 ,, L. Ramaswamy
16 ,, E. V. Babu
17 ,, M. Ranganathan
18 ,, P. S. Rajulu
19 Sri V. Ratnasabapathy
20 ,, P. Srinivasan
21 ,, G. Venkataratnam
22 ,, R. Veeramani Iyer
23 ,, Dharmaraj A. Victor
24 ,, S. Subramanian
25 ,, W. Rama Rao
26 ,, E. I. Rajendram
27 ,, B. Bhaskaran
28 ,, S. Srinivasa Rao
29 ,, C. T. Das
30 ,, A. R. Vedanayakam
31 ,, V. Satchidanandam
32 ,, V. Anjaneyulu
33 ,, K. Purushotham
34 Mr. Frank D. Wilson
35 Sri K. Thiruvengadaswami Pillai
36 ,, K. Ramamohan Rao

Among the invitees were

1 Sri V. R. Rajagopalan
2 Dr. I. M. Azizuddin
3 Mrs. I. M. Azizuddin
4 Sri R. Swaminathan
5 ,, P. Srinivasa Rao
6 ,, R. Venkataraman
7 ,, C. V. Padmanabhan
8 ,, V. J. Balasundara Das
9 Mr. Bertie A. D'Souza
10 Sri R. Koteeswara Rao
11 ,, H. Narahari Rao
12 Rev. J. J. DeValois
13 Dr. Mrs. DeValois
14 Sri C. K. Velayudhan Nair
15 ,, K. P. Chandrasekharan
16 ,, K. Govinda Sastry
17 ,, M. C. Chellam
18 ,, C. Bharadwajan
19 Mr. T. John
20 Mr. Noble Thomas
21 Sri K. S. Krishnappa of Messrs. May & Baker (India) Ltd., Madras.
22 Sri I. Kuruvilla of I.C.I. Ltd.

and students of the Madras Veterinary College.

The Hon'ble Sri A. B. Shetty, Minister for Agriculture and Animal Husbandry, Government of Madras, on arrival, was received and introduced to the distinguished guests and then conducted to the diais. Sri R. Veeramani Iyer was proposed for the presidential chair. The chief guest and the President were garlanded amidst cheers.

The proceedings began with the singing of " Vande Matharam " by Sri S. Sumitra Paul, a student of the Madras Veterinary College.

Sri G. A. Sastry, Secretary of the Association, welcomed the gathering in the following speech :—

MR. PRESIDENT, THE HON'BLE MINISTER, DISTINGUISHED VISITORS AND COLLEAGUES,

On behalf of the Managing Committee of the Madras Veterinary Assistant Surgeons' Service Association, it is my proud privilege and pleasure to extend to you all a cordial and hearty welcome to this conference. Weare really most fortunate in having The Hon'ble Sri A. B. Shetty, Minister for Agriculture and Animal Husbandry in our midst to inaugurate this conference. He is not new to us veterinarians. He had always had an abiding interest in our science and welfare of our department long before he took charge as Minister for Agriculture. We are also fortunate in having as our Premier, one who was once Minister for Agriculture. Hence with these honourable gentlemen at the helm of affairs, it should not be difficult for considerable development of our profession and science. I welcome all the officers of our Animal Husbandry Department whose presence here is a sure indication of their keen interest in the activities and welfare of this association and it is really a source of immense encouragement for us. I welcome the distinguished guests who have honoured us with their presence here in spite of their multifarious duties.

We are extremely gratified to see such a large number of delegates and members from all over the province, which is an index of the strength of our association and the keen interest evinced by the members.

It is not out of place to inform the Hon'ble Minister that this association, recognised by the Government, has been functioning for the past 28 years and represents the entire cadre of the Veterinary Assistant Surgeons of the Animal Husbandry Department. Though modest in its transactions for the most part of its existence, yet, since 5 years, this Association has had new life and zeal infused into it. Branches in the districts, where there were no associations, were started 5 years ago and now we have branches in all the districts of the province which are functioning well. We take this oppurtunity of thanking all the District Veterinary Officers, who have been very cooperative and helpful in the proper functioning of the District Branches. Various problems confronting our profession are discussed in our periodical meetings which besides help to bringing the members of the service into closer contact and colloboration.

Professional matters are discussed and papers read on these are published periodically. We will be failing in our duty if we do not record here the sympathetic and favourable consideration that the Government as well as the Director of our department are bestowing on the various resolutions passed and the suggestions made by us from time to time and we are, of course, confident of receiving similar treatment in the future also.

On such an important occasion as this it is customary to review the problems facing us in our profession and department and to suggest some remedial measures. These have been thrashed out fully time and again by various people in the previous conference of this association and the conferences of the Madras Veterinary Association. As most of these still await solution, I will just touch upon them. As these pertain to the welfare of our livestock and hence the prosperity of our nation, no amount of repetitions will be too many.

Nutritional problems:—As an aftermath of World war II, the cattle feed—both concentrates and roughages—have become scarce and costly. Even in pre-war times, the *per capita* consumption of milk in our mother-land, where the cow is worshipped as a deity, was very low. It is still lower at the present times, as milk has become too costly for the poorer section of the public to buy. Though under the U.N.O. releif measures, a small amount of succour is rendered by the free distribution of milk to expectant and nursing mothers and new born children, still it is a drop in the ocean. If cattle feed were made available easily at cheaper rates, the milk problem could be solved to a certain extent. Many measures have been suggested to remedy the shortage of cattle feeds and the following are some of the important ones.

1. Making available and accessible all the grazing areas.
2. Throwing open the forest grazing areas to the use of public.
3. Controlling the prices of concentrates and distribution of the same through fair price shops, co-operative societies and Veterinary institutions.
4. Manufacture of concentrates in brick form and selling them through the channels afore said. The public evinced great interest in the bricks when exhibited in the recent khadi exhibition and expressed their opinion that such feeds, if made available to them, would considerably lessen their cattle feed problems.
5. Manufacture of bone meal by the Government and distribution through Government channels.

Veterinary education and research:—Though our college has been leading in the field of veterinary education in India so long, now many

colleges have sprung up and some of them seem to strive to attain that coveted leadership. Plans have been finalised for the introduction of M.V.Sc., course in the College of Veterinary Science and Animal Husbandry, Mathura. Though we have facilities in this college for post-graduate research degrees in a few subjects, facilities are lacking for research in other subjects, the main reason being the non-recognition of the lecturers as supervisors. This state of affairs could easily be remedied by deputing young promising persons for higher studies. We thank the Government for having passed a G. O. improving the status of the teaching staff of this college, in response to our resolution, but we regret to note that, for reasons unknown, the same has not been given effect to. Even in the most recently opened college at Jabalpur, there are Professors and Asst. Professors for each subject on the staff, and, if the above mentioned G. O. is not implemented, ours will be the only college in India wherein the heads of departments are designated as lecturers. Since our Hon'ble Minister has assumed charge, he has been trying to help this much and long neglected department and college. We see now new blocks of buildings springing up and I hope that before long new cadres and new posts will also spring up.

Though a begining has been made by naming the Serum Institute at Ranipet as "Veterinary and Biological Research Institute", so far not much progress has been made in equipping it either with men or material. There are many an unstudied problems which can profitably be probed into—provided the purse strings of the exchequer are not tightly drawn. A scheme for the enquiry into the incidence of Tuberculosis in the City of Madras has now recently been launched and similar schemes for Johnes' disease, Brucellosis, Mastitis and parasitic diseases, to name a few, may profitably be taken up, not only with reference to Madras but to the Province as a whole. Though such schemes may appear to progress rather slow, yet, in the long run, they give high dividends by way of prevention, thereby increasing the milk yield and animal power.

Post Graduate course:—We are thankful for the revival of Post-graduate course in response to our repeated requests, which will really be of immense help to the senior members of our cadre.

Veterinary institutions:—We are gratified to note that the systematic touring has been abolished in response to our resolutions and appeals. I may here, on behalf of the members of this association, assure you, Sir, that, because of this move, no outbreak of cattle disease will remain un-attended to. We only wanted that sting of compulsory touring removed. Now that every touring billet is in the process of being converted into a veterinary dispensary, each such institution may be equipped with at least a microscope and important journals. The microscope will help to keep the Veterinarian interested in his treatment and enliven his work. As against

the present arrangements, where journals are circulated among the staff in a district, each institution must be supplied with at least a few journals, which will form a nucleus for a small library. These will keep him posted with latest advances in Veterinary Science at home and abroad.

Service conditions :—The Hon'ble Minister on a previous occasion had remarked that the Veterinarians have no means of supplementing their pay unlike the medical men. We had requested the Government to raise our status on a par with those of the medical department. But I am sorry to say that the Government would not see their way to consider our request sympathetically. We wanted a *status* and *position* and these are denied to us. The licentiates, the former sub-assistant surgeons, are now not only Civil Asst. Surgeons Class II, but there is a move to amalgamate their cadre with those of the class I officers. Even the Health officers class II are now gazetted. One anamolous position I may be permitted to state. I.D.Ds. who get 2 years' training after S·S.L.C. are given a pay in the scale of Rs. 175-230 in the Cooperative department of this State, while Veterinarians, after 4 years of intensive study with Intermediate as minimum qulaification, are given a start of only Rs. 140. We request the Hon'ble Minister to translate his sympathies into practical form.

Though sufficient representation has already been made in suitable quarters, yet being a believer in the old adage, "*Adhikascha adhikam balam*" I too would like to join the chorus. I refer to the question of increasing the dearness allowance. I need hardly tell you, Sir, how difficult it is for us to make both the ends meet nowadays. I have not come to advise Government how best to run it, there are more competent people for that, but I only voice the difficulties of our members in obtaining the necessaries of life. I take this opportunity of requesting the Government to consider sympathtically our oft-repeated requests to increase the dearness allowance. Fearing to be misunderstood to be a pack of grumblers, I have purposely reserved this remark to the end.

I now request the Hon'ble Minister to inaugurate the conference.

The Hon'ble Sri A. B. Shetty then inaugurated the Conference with the following address:—

The invitation you have extended to me to inaugurate this Conference gives me a welcome opportunity to meet the Veterinary Assistant Surgeons who form the great bulk of the profession. It is very pleasing to know that your Association is 28 years old and that your Branches are actively working in every district. You have to be congratulated for organising yourselves in this way and seeking to discuss your problems, advance your knowledge and promote the interests of your profession by holding meetings and conferences. The importance of the

role played by livestock in the economy of this country is too well known to need any special mention at this place. The improvement of our draught and milch cattle is vitally necessary at this time of food shortage to raise the efficiency of our agricultural operations and add to our food resources. Our present food plan is a short term plan which is more or less concentrated on maximising cereal production for tiding us over the present food crisis. It has not given due recognition to the contribution which the increase of milk, meat and egg production can make to the improvement of our nutritional standards.

The cultivator's cow.—The Dairy Development Adviser to the Government of India has pointed out how the lot of the ordinary cultivator can be elevated through the improvement of his cow. It is possible to increase milk production and grow stronger bullocks, if the cultivator can possess and maintain a good milk cow. Dairying in India must depend upon the cultivator-milk-producer. "The development of the dairy industry in our country cannot be visualised without the improvement of the cultivator's cow". We can increase the overall production of milk in the country and also grow stronger bullocks for work purposes by raising the quality of the cultivator's cow. The plan for cattle development and increased milk production which the Dairy Development Advisor has put forward is well worth consideration.

Better Feeding.—The improvement of cattle depends, as we all know, upon the use of approved types of bulls and provision of adequate quantities of fodder and feeds. The village cattle are usually housed in insanitary conditions. They are grossly under-fed. The insufficiency of bulky fodders, both green and dry and the scarcity and high prices of concentrated feeding stuffs is a great problem for us. No green fodder is available for our cattle except during the monsoon season. Silage-making for use during the hot months is hardly known to our cultivators. Even the dry fodder that is available in the country is said to be barely sufficient to feed one-third the number of our cattle. It has been estimated that the present production of concentrates is only about 5 per cent of the nutritional requirements of the cattle in our country. The ordinary cultivator cares better for his plough cattle than for his milch animals. He neglects the dry cattle and the young stock. It is a common sight to see wretched starving cattle roaming about to find their own food on the village grazing ground or in the jungle or by raiding the neighbour's crop. In these circumstances the task of improving the quality of our cattle by better feeding seems a very difficult task indeed.

Selective Breeding.—There are very few bulls of the desired quality for stud purposes. We have not been able to issue more than 80 to 100 bulls in a year from our Government Farms. About 1,700 bulls and

buffalo bulls are maintained under the premium and other schemes in this state and nearly a hundred of this number are stationed at our veterinary institutions. This number is far short of our requirements which has been estimated at 50,000 bulls. The use of the bulls under the premium scheme is limited to small areas. The improvement effected through the present system of bull supply and distribution must, therefore, be more or less insignificant. Moreover, this upgrading work is to a great extent nullified by allowing scrub bulls to do promiscuous breeding in the same areas.

The key village scheme.—The Key Village Scheme that has been recommended by the Cattle Preservation and Development Committee has many commendable features about it. The essence of this scheme is to purchase selected young calves in the breeding tracts, rear them on Government farms till they are sufficiently mature and keep the required number of such bulls in a selected village or a group of contiguous villages containing about 500 cows. All the scrub bulls in the key villages are to be compulsorily castrated or removed from that area. This scheme involves no capital expenditure on acquisition of sites or construction of buildings. Every key village will, in course of time, develop into an economic cattle breeding centre. The I.C.A.R. proposes to start a small number of such centres. One of such centres will be in Madras, probably in the Ongole tract. A Village Livestock Improvement Scheme based on the Key Village Scheme idea has been sanctioned for introduction in 4 Firka Development Centres in Guntur, Bellary, Tanjore and Coimbatore districts.

Artificial Insemination.—The adoption of the method of artificial insemination can, to some extent, meet the difficulty caused by the shortage of good breeding stock. Artificial insemination work which has been done with success at the Veterinary College Hospital has recently been extended to the hospitals at Coimbatore and Guntur, and there are proposals to introduce it in other suitable centres. Mr. Kothawalla thinks that by resorting to the method of artificial insemination we can utilise the limited number of good bulls now available in the country to cover a much larger proportion of female stock, over wider areas, at lesser cost and in a comparatively shorter period. He suggests for this purpose the setting up of "Seed Bull" centres, at suitable places with insemination yards around them within a radius of about ten miles. This arrangement will enable one bull to be employed for the insemination of about a thousand milch cattle, in a year. If facilities can be provided for the storage and transport of semen under refrigerated conditions, large scale adoption of artificial insemination may become more possible for breeding work.

Unserviceable Cattle.—There are too many unserviceable cattle which reduce the limited food resources available in this country for feeding the more useful cattle. In western countries considerable headway is said to have been made in the development of good stock of cattle by slaughtering unproductive and unserviceable animals. Here, our agelong sentiment for Gorakshan prevents such disposal of uneconomic cattle. In view of the public demand for cow protection and preservation, the Union Government are asking the State Governments to take steps to prevent the slaughter of all useful cattle as a first step. They are also contemplating the enactment of a Central Legislation and the constitution of a statutory body called the Indian Council of Gorakshan with a Central Board and Boards for each State for organising Gosadans for segregation of useless cattle and Goshalas for cattle development.

Disease Control and Eradication.—The conditions regarding housing, feeding and management of cattle are far from what they should be. The veterinary facilities we provide for immunising cattle and treating them are limited. Outbreaks of epidemics are not discovered and reported early enough nor are control measures carried out properly and in time. Necessarily, therefore, there must be a high percentage of morbidity, and mortality among our cattle. We have no data regarding cattle mortality. The actual number of deaths due to contageous diseases must be much larger than what our published statistics show. Frequent outbreaks of epidemic diseases kill or incapacitate large numbers of cattle and cause great loss to the poor cultivator. In several western countries they have elaborate legislation for the control of contagious diseases. Veterinary inspection is done at the time of transport of animals. Infected or suspect animals are kept in quarantine and inoculated or they are slaughtered and compensation is awarded to the owners. The owner of an infected animal has to immediately notify about it to the police. We have no such elaborate measures to prevent epidemics. No steps are taken to prohibit the import of animals from cattle fairs to the healthy areas and the epidemic spreads. If we can stamp out at least rinderpest, our major killing disease, as has been done in the west, we shall be confering a great boon on our cattle owners. The Research Institute at Mukteswar is said to have submitted to the Union Government a plan for wiping out rinderpest from this country within 5 years. Veterinary science has placed in your hands certain sera and vaccines for prevention and treatment of the main animal diseases. Chemotherapy has come into use in the field of veterinary medicines also. Cheaper more effective and safer vaccines and medicines will no doubt be discovered and brought into use in future. Several problems relating to diseases of cattle, sheep, poultry etc., some of which are still undiagnosed, require further investigation. With a view to develop the Ranipet Institute into a first-class

research institute and enable it to manufacture all the biological products we require, certain improvements are being effected. Further steps will be taken to equip it with qualified staff and necessary material. In accordance with the suggestions made at Veterinary conference, Government have ordered touring Veterinary Assistant Surgeons to curtail their touring work when there is no cattle epidemic and to run minor dispensaries at their headquarters. 81 such dispensaries have already been set up and 86 more are expected to be opened shortly. We expect the local bodies and the public to help the expansion of this work by providing buildings and giving annual contributions. 40 Livestock Inspectors who have finished their training in last June have been appointed to relieve you of some of your routine duties by doing such work as castration and inoculation.

Future Outlook.—The revival of the refresher course has been sanctioned and arrangements are being made to start it in the Veterinary College. You should take early advantage of this training course and add to your professional knowledge and skill. You should also read at least two or three good veterinary journals to keep yourselves abreast of modern developments in the theory and practice of animal husbandry. It is high time for us to review the work done by the Department in the past and think of new and better methods of work for the future. Your Director is proposing to issue shortly a questionnaire to elicit information and get suggestions from you for this purpose. In these days of high prices and increased cost of living, there is naturally a demand for better pay and prospects in the Animal Husbandry Department as in other departments. With all the goodwill one may have for you, it is not an easy matter to give any assurances to you at a time when retrenchment and economy is the order of the day both at the Centre and in the States. The best that is possible in the present circumstances will be attempted to be done to expand the activities of the Department and enable you to serve the country in new and more efficient ways. I trust that under the new dispensation you will get recognition from the State and the public in increasing measure and you will have more chances for better remunerative employment in the future.

Sri R. Veeramani Iyer, President, addressed the meeting as follows:—

Sri Harim Paramanandam Upadheshtanamiswaram
Vyapakam Sarva Lokanam Karanam Tham Namamyaham
Sarva Kama Dukhae Devi
Sarva Thirthabhi Shechini
Pavani Surabhi Sreshtae
Devi TubhyamNamosthuthae

HON'BLE MINISTER, DIRECTOR, BROTHERS AND SISTERS,

Allow me to express my gratitude to the members of the Association for having given me an opportunity of presiding over and expressing my feelings to this conference of professional brothers. I request one and all to give a thought to my expressions which are prompted in me by the inordinate respect and reverence for all that is Indian and by my experience in the Animal Husbandry Department for over two decades. Indian Science in every branch including Animal Husbandry has been promulgated from Truths, and Sages have tried to explain and put them in every day life of one and all. Those that could not be explained, or which could not reach our comprehension, are discarded as superstitions—an easy way of disposal. But all the teachings of our sages contained in 108 Upanishads explaining every branch of science are Truths and nothing but Truths.

Veterinary Surgeons of India in general (and of Madras in particular) have been rather fortunate in that they have taken to the profession due to their good actions of previous Janmas (I am a believer in Hindu Philosophy) which lead us nearer to God. The salient features of such a life are poverty, harmlessness and above all association with cows which are rich in patience and selfless service. The goading of the Government's administrative powers have made us (Vets) Saints (Torchbearers). It is a matter of surprise that in the struggle for the freedom of India none of our professional colleagues have taken active part; either because our work and life, being one steeped in cattle welfare and associated with the calmness of a cow (self-sacrifice) did not give us much time for such an emotional activity; but yet we really did and do live a life of Ahimsa and selflessness almost nearing their ideal as is evident by our ungrousing attitude to our pay—which, if any, is the reverse of satisfactory—and to the non-recognition of our selfless service. Our popularity among the ryots, who are the guardians of our cattle, will stand testimony to the foregone statement.

I have been thus far talking high of cows and cattle in a conference of Animal Husbandry men. In any national economy cattle husbandry stands supreme among animal husbandry which follows human welfare. The subsequent domesticated animal husbandries like sheep, poultry etc., and agriculture come in the descending order, starting with cattle welfare which provides unrivalled selfless service to mankind, besides making the others to thrive automatically.

Cognisant of this truth, perhaps too well, the Indian Social and economic life centred round the cow and she has been assigned a celestial place next to God, for, never was the garland of Indian social life woven without God, cow, land and man. The Indian civilisation that has been built on animal husbandry as foundation has stood the tide and time

patiently observing the rise and fall of other nations as the Grecian, and the Roman—in short all these civilisations of the West kept this only as an adjuvant to human welfare.

The foreign domination has made us abhor the ancient truths enunciated by our sages. We have been led astray to adopt into our system, methods which are alien to our nation and which by no means suited to our conditions.

Administrators trained in the Western lines who lacked the experience of Indian conditions were asked to formulate and implement plans for animal husbandry. The plans and schemes laid with this outlook were thoroughly unsuited to the Indian soil and they failed to gain their objective. The result was, as we have seen and see even now, the complete deterioration of cattle—the foundation of Indian economy and national welfare. For instance, the utility points of a cow enunciated by Western thoughts are milk, meat, skin and hide This is fundamentally at variance with the Indian traditional truth-evincing principles about the uses of the cow (cattle) as milk, work and manure—skin and hide and meat being deleted from the uses of the cow. 'Today Gomatha is dying. If we cannot save her, we too shall die with her' so said Mahatma Gandhi (1.2-1941).

Agriculture that is fed by cattle manure and worked by cattle power produces rich food for man, leaving aside a great bulk of cattte feed. Thus the cycle of dependency of man, animal and land always keeping man as the highest, never failed and will not fail. It will be amazing to note that the Indian food comprises of the most nutritious food like wheat, rice, millets, pulses, oil seeds and oils etc. not to speak of fruits, milk and milk products. Thus the well-planned agricultural schemes yielded the main bulk of fodder and concentrates, such as straw, husk, oil-cake etc. as bye-products to the cattle for their upkeep. The cost of agriculture, therefore, was completely credited to man's account leaving none for the cattle. In addition our forefathers laid particular stress on the upkeep of the female stock and of the breeding bulls, designing the cow as the friend of Krishna, the Protector and the Bull as the conveyence of Lord Siva. The *Grow* More Food campaign shall compel people to grow more of human utility crops, discouraging the cultivation of commercial crops in useful lands.

The second important factor that is shouted from housetops is want of proper breeding Bulls.. By a proper selection of the best of them now available, discouraging export vehemently, taking advantage of the artificial insemination and castrating all other scrub-bulls, we could fertilise the female stock to produce better progeny in the course of an year. The cows must be served in such a way as to produce one calf every year thus reducing the dry period to a minimum, say to a maximum of two months. Thus a dry cow that is a burden on the ryot today will become more

productive and hence the attention on her will never be slackened. She will be able to maintain perfect health throughout her useful life.

As per 1945 census, there are 22 million head of cattle in Madras State. Of this 11 million are female stock. Of this only 2½ million are productive. About 4 millions are young heifers. The remaining are useless. By siring them at proper intervals so as to produce a calf in a year, the other 5 million cows can be made productive and thus the yield of milk could be increased to double that available now.

Third but not the least, the housing of the female stock should be cheap with the attention of the owner drawn to it in every spare moment of his. In ancient India, the cow-shed was generally a place near the human dwelling and hence always frequented by men. People were asked to do Gopooja every morning to ensure a healthy hygienic surrounding both for the cow and themselves. Gopooja ordains Darsanam of the cow, cleaning of the stalls and surroundings, washing the animal, decorating her with a mark of kunkumam, feeding her with proper food and allowing the calf to suckle prior to milking. This, in short, is the routine of scientific cow-keeping. Other animals were kept in Gardens near the Agricultural farms to afford an easy transport of their manure to the fields. It is a fact that the sight of a cow even to-day produces a kind of reverence among Indians which should be taken advantage of to drive home into their mind the old cheap methods of maintaining the cow in a most scientific way. The poor Indian peasant cannot equip the cow-shed with cement concrete flooring with solpes, manger and efficient drainage to drain away the urine and washings of the shed, not to speak of the rain water drainage, disinfect the shed with disinfectants, as advocated by the present day scientific methods as compared with a ramped flooring with gravel and mud over which a layer of sand spread to facilitate the removal of the dung and urine soaked in it.

Much has been talked of about the dearth of pasture as one of the main causes of deteriorations. The pastures in Western countries are generally lands where no crop of their human utility such as wheat, barley and oats could be grown and which always have to be maintained as wasteland due to their climatic conditions. But here with the increase in human population, every available acreage is utilised for cultivation with the favouring of the natural conditions available. Therefore, it will be criminal to maintain pastures for the sole use of cattle if this acreage could be brought under plough for man's good. Cows do require a gentle run in pastures not with the idea of picking up grazing but only with an intention of giving mild exercise, as the topes near the village of varying extents afford. They should not be exposed to the climatic conditions like Sun and Wind especially during the hot parts of the days. This, again, is taught to

us in the Mahabharata where Sri Krishna was tending cows only during his boyhood in Gokulam and not during his manhood. It perforce indicates that the cows were not allowed to roam about in a pasture all day long in as much as they were left in charge of children whom no parent would like to expose to such conditions for long periods especially in the hot sun. Became of the (Gopooja) paid in the city of Madras where though their movement is restricted and do not get sufficient exercise due to want of space, the cows yield more milk than those kept in the villages where they obtain more grazing and less of personal attention. To illustrate one such example from a particular breed the Ongole cows maintained in the cityyield more milk as compared with those of the Ongole tract.

Summarizing, therefore, brothers, if Gopooja as advocated by Mahatmaji—be followed in the case of the female stock the cow, we could increase the present yield of milk with the existing deteriorated stock by at least 10 per cent. By paying more attention to make the female stock yield a calf every year by properly managing the breeding side as aforesaid, cent per cent more cows could be made useful with an increase in milk to double that of what is now available. By taking to systematic breeding by proven sires aided by artificial insemination, better progeny and a better herd could be developed in the course of five years but be it borne in mind that Western Science and philosophy evolved in a different atmosphere is none too suited to our country with quite a different set up.

It must be admitted on all hands that we are witnessing sitting in a calm cool place of Indian Culture the atrocities committed in the name of religion, Science, Truth and Humanity. Let us not be a party to it. With our natural instinct to absorb the good from the West, let us string them along with the pearl garland of India's motto of 'Santhi' to everybody—nay to every living being—nay to the Universe viz. God, Cow and Man.

Messages wishing the Conference a success were received from :—

1. Major T. Murari.
2. Major Kartar Singh, H. Q., Madras Area.
3. Sri D. Sadasivam.
4. The members of the association undergoing training at the Indian Veterinary Research Institute.

Sri M. Ranganathan, Treasurer of the Association, proposed the Vote of thanks.

The gathering was then conducted to the poultry show organised under the auspices of the Association. Dr. Mrs. DeValosis declared open the show. The Hon'ble Minister, Director of Animal Husbandry and the visitors spent nearly an hour evincing keen interest in the exhibits.

Judging of the birds commenced at 2 P.M.

Prize distribution:—The function commenced at 5 p.m. with Sri R. Veeramani Iyer in the Chair.

Sri G. A. Sastry, Secretary of the Association submitted the following report:—

"Mr. President Mrs. Cherian, Hon'ble Minister for Agriculture and Animal Husbandry, Ladies and Gentlemen:—

It is with great pleasure that I present this short report about the poultry show you were gracious enough to witness this evening. It is the first time in the annals of this Association that such a show has been conducted and we can now be proud of the success we have achieved. It was with certain amount of reservation-nay-apprehension that we had decided to have this show. It is nearly 10 years since a poultry show had been held in the city of Madras and we thought it was high time that one was held in this year in the Madras Veterinary College. Without the support of the following donors, it would have been quite impossible to run this show and I thank them whole heartedly on behalf of this Association for responding to our appeal readily:—

1 His Excellency the Governor of Madras
2 The Race Club, Madras
3 Zamindar of Seithur
4 S. P. C. A., Madras
5 Co-operative Milk Supply Union, Ayanavaram
6 Sri D. Mariappa
7 ,, U. K. Menon
8 ,, B. V. Reddy
9 Dr. G. Venkatachalam
10 Mrs. Murray
11 Sri Sadasivam
12 ,, Lakshminarayanan
13 ,, M. C. Chellam
14 Jammi L. Narasimham
15 Sri Chelapathi Rao
16 Mrs. Dorman
17 Sri K. Venkatapathy Naidu
18 Officers, H. Q., Madras Area
19 Mr. Cronopolo
20 Sri R. N. Pandyan
21 Mrs. Lobo
22 Sri I. D. Mantramurti
23 ,, K. V. Ramachandra Iyer
24 ,, Sivaprakasam
25 ,, V. S. Seshadri
26 ,, Sanjeeva Chettiar
27 ,, C. K. Velayudhan Nair
28 ,, S. S. Vasan
29 ,, T. S. Lakshminarayana Iyer
30 Mr. Bertie A. D'Sonza
31 Mr. T. Mathews

Donations are still expected from the Animal Husbandry Department, Corporation of Madras, etc.

To make the necessary arrangements, a sub-committee consisting of:

1 Sri G. A. Sastry (convenor), 2 Sri V. S. Alwar, 3 Sri K. S. Krishnaswamy
4 Sri M. Dharmalingam, 5 Sri A. L. Ramaswamy, 6 Sri M. Muthugopal
7 Sri R. Veeramani Iyer,

was formed and I am grateful for the members of this Committee for their untiring help at every stage.

Birds of the following breeds, totalling 150, were entered. But for the uncertain weather, I am sure quite a larger number of birds would have been exhibited.

Rhode Island Reds	...	52	Turkeys	...	4
White Leghorns	...	25	Geese	...	2
Black Minorcas	...	6	Ducks	...	6
Wyandottes	...	3	Ducklings (Manila)	...	12
Plymouth Rocks	...	6	Guinea fowls	...	4
Game birds	...	6	Belgian Silkies	...	6
Desi	...	12	Pigeons	...	6
					150

The Zamindar of Seithur, Sri V. L. Ethiraj, Rajkumar of Pithapuram, Major C. S. Reddy, Mr. T. Mathews and American Arcot Mission Katpadi, were among those who exhibited their birds. Keen interest was evinced by the poultry minded public and there was continuous stream of visitors throughout the day. The Government Poultry Research Station, Teynampet, also participated in the show.

I am thankful to the following, whose knowledge on fowls is well known to one and all for having kindly consented to act as judges:—

1 Mrs. I. M. Azizuddin
2 Dr. I. M. Azizuddin
3 Sri H. Narahari Rao
4 Rev. DeValois
5 Sri B. V. Reddy

Mrs. Tara Cherian distributed the prizes.

Breed	*Class*		*Name of the owner*
White Leghorn	Cock	Ist prize	The Zamindar of Seithur
do	Cock	IInd prize	Major C. S. Reddy
do	Hen	Ist prize	Sri Venkatesan
do	Hen	IInd prize	The Zamindar of Seithur
do	Pullet	Ist prize	Sri V. L. Ethiraj
do	Trio	,,	Rajkumar of Pithapuram
Rhode Island Red	Cock	,,	Sri K. S. Krishnaswami
do		IInd prize	Major C. S. Reddy
do	Hen	Ist prize	Mr. T. Mathews
do		IInd prize	Mrs. Ranganathan
do	Pullet	Ist prize	Sri K. S. Krishnaswami
do	Trio	,,	Sri Gopal Reddy
Black Minorca	Cock	,,	Seargent Lewis
Plymouth Rock	Cock	,,	The Zamindar of Seithur
do	Hen	,,	The American Arcot Mission Katpadi
Bantoms	Pair	,,	Sri V. L. Ethiraj
Silkies	Cock	,,	The Zamindar of Seithur
do	Hen	,,	The Zamindar of Seithur

Breed	*Class*		*Name of the owner*
Wyandotes	Cock	1st prize	Sri V. L. Ethiraj
do	Hen	,,	Sri V. L. Ethiraj
Desi	Cock		Sri Chinnayya Chettiar
do	Hen	,,	Sri A. Raju
Guinea fowls		,,	The Zamindar of Seithur
Pigeon		,,	The Zamindar of Seithur
Turkeys	Tom	,,	Sri Purushothaman
do	Hen	,,	Mr. T. Mathews
Goose		,,	Seargent Lewis
Duck		,,	Dr. T. Mathews
Ducklings		,,	Seargent Lewis
Game birds	Cock	,,	The Zamindar of Seithur
do	Hen	,,	The Zamindar of Seithur
Best exhibit of the show.		,,	W.L.H. Trio of Poultry Research Station Teynampet.

After the distribution of prizes, Sri Narahari Rao, Poultry Development Officer, Madras, spoke on "Poultry Development in the State of Madras" and Rev. DeValois on "the economic aspect of poultry keeping."

Sri M. Ranganathan, Treasurer, proposed a vote of thanks.

The function came to a close with the screening of a film on Poultry keeping—a Billion Dollor industry in the United States of America by Rev. DeValois of the American Arcot Mission, Katpadi.

Second Day, Thursday, the 19th October, 1950

The proceedings began with Sri R. Veeramani Iyer in the chair. Besides the members, Sri R. Swaminathan, Sri C. K. Velayudan Nair, Sri K. S. Krishnappa, Sri I. Kurivilla, were present on special invitation.

The following professional papers were read and discussed:

1. Bunostomum bhavanagarensis n. sp. by Sri G. Ramanujachari, B.Sc., B.V.Sc., and Sri V. S. Alwar, B.V.Sc.,
2. Hydronephrosis in canines, by Sri S. Damodaran, B.V.Sc.

The following members were elected to the subjects committee which met at 2 p.m. and drafted the resolutions to be placed before the general body.

1	Sri W. Rama Rao (Anantapur Dt.)	
2	,, E. I. Rajendran (Trichy Dt.)	
3	,, S. Srinivasa Rao (Bellary Dt.)	
4	,, R. Subramaniam (Chittoor Dt.)	
5	,, P. L. Narayana Rao (W. Godavari Dt.)	
6	,, L. Ramaswamy (Chittoor Dt.)	
7	,, G. Venkataratnam	Madras Dt.
8	,, V. S. Alwar	
9	,, Frank D. Wilson	
10	,, V. Rathnasabapathy	

Third Day, Friday, the 20th October, 1950.—The Annual General Body meeting was held at 10 a.m. with Sri R. Veeramani Iyer, as president. The report of the Managing Committee for the year 1950 was read and recorded. Several resolutions bearing on the profession and the service conditions were moved and passed.

The following office bearers were elected for 1951.

President	...	Sri R. Veeramani Iyer
Vice-President	...	,, V. S. Alwar
Secretary	...	,, M. S. Ganapathy
Joint Secretary	...	,, K. T. K. Nambiar
Treasurer	...	,, M. Ranganathan
Members of the Managing Committee		Sri G. A. Sastry ,, P. Srinivasan ,, Dharmaraj A. Victor ,, Frank D. Wilson

In his concluding remarks, Sri R. Veeramani Iyer was glad that the three-day conference served to bring together professional brothren into close contact. He hoped that such conferences, which were of great value, would be held at different places in the districts as often as possible. He exhorted the members not to feel depressed over the remunerative nature of their profession but to consider its service aspect to the nation. In the ultimate analysis they were responsible for the feeding of the public with good milk, eggs and meat. He thanked the members for having elected him as President for the Conference.

Sri P. L. Narayana Rao, on behalf of the delegates from the districts, thanked the managing committee for the excellent arrangements made for the Conference. There was, he said, a great paucity of professional papers read during the year and he hoped that the position would improve at the next conference where he expected clinical and general discussions to be initiated. He said that this would help many of the members to participate in the discussions.

Sri G. Venkataratnam associated himself with the remarks of the previous speaker.

Sri G.A. Sastry, in proposing a vote of thanks, thanked the president, the members and delegates from the districts, the members of the Managing Committee, the Principal, Madras Veterinary College, the Warden of the Hostel and students of the College for all the help received during the conference.

Madras,
25th October, 1950

M. S. GANAPATHY,
Secretary.

THE MADRAS VETERINARY ASSOCIATION

Panikkar Memorial Fund.

The Managing Committee of the Madras Veterinary Association have passed the following resolution on the above fund.—

"That in as much as the G.M.V.C., diploma is abolished and in future all Graduates of the Madras Veterinary College will be only B.V.Sc., degree holders and in as much as it is highly desirable that a medal is awarded to the best student at the time of the annual convocation, this Managing Committee resolves that the Panikkar Memorial Fund be kept open until a target of Rs. 3000/- is reached. The amount so far collected is only Rs. 1100/- and, as this amount will not be enough to meet the requirements of the University for the award of the medal at the time of the convocation, this procedure is found necessary. The Managing Committee appeals once again to the profession to be so generous as to contribute some further amounts towards the fund and bring it to a successful termination".

The following is the further list of contributions towards the Panikkar Memorial Fund :—

Sri C. Krishna Rao	Rs. 2	Sri S. Damodaran	Re. 1
,, C. Venkateswara Rao	,, 2	,, P. Soundararajalu	,, 1
,, P. Rama Rao	,, 2	,, C. T. Doss	,, 1
,, K. S. Krishnappa	,, 2	,, R. A. Balaprakasam	,, 1
,, V. Sachidanandan	Re. 1	,, A. R. Vedanayagam	,, 1
,, G. Ramanujachari	,, 1	,, M. Ranganathan	,, 1

Cash on hand up to date towards the Panikkar Memorial Fund is Rs. 111-4-5.

P. SRINIVASAN,
Secretary.

College News

MADRAS VETERINARY COLLEGE

Results of Diploma Examination

The following candidates have passed the Final G.M.V.C. Diploma Examination of the Madras Veterinary College held in September 1950.—

1. Balasubramanian, A. V.
2. Narayana Rao, C. V.
3. Selvaraj, V. B.

Dr. I. M. AZIZUDDIN, B.A., G.M.V.C., B.V.Sc., Ph.D. (Edin),
Principal, Madras Veterinary College, Madras.

Vepery, Madras,
28th September 1950.

News and Notes

SCIENTIFIC MARKETING OF MILK

Government Measures Outlined

Measures undertaken by the Government of Bombay to increase the supply of milk and for organising the production on scientific lines and marketing it on co-operative basis were outlined by Mr. M. P. Patil, Minister for Agriculture and Forests, in a broadcast talk from the Bombay Station of All-India Radio, on Tuesday.

The Minister spoke about the work that is being done regarding the improvement of milk supply of the cities and towns other than Bombay where the Aarey Milk Plan is under execution.

In particular, he referred to three different schemes, the first one under which milk is collected in nearby villages and supplied to consumers in Poona, Ahmedabad and Hubli towns; the second under which loans are advanced to dairy farmers to develop their dairies on scientific lines, and the third providing loans to small cultivators for the purchase of dairy animals and equipment and carrying out repairs to cattle-sheds.

The Minister said: "Due to the four-fold increase in the price of milk during the last seven or eight years, public interest in the problem of milk supply to cities has been considerably aroused. With the growth of large towns in the State the demand for milk in these places grow rapidly. On account of the extremely perishable nature of milk, it became necessary to produce it in the towns themselves, which has resulted in the establishment of the system of town dairying which has now become a "curse" of modern times.

The dairies in urban areas keep only milch animals, which are fed with fodder transported from villages. The cost of labour required for producing milk at these dairies is also naturally higher than in the rural areas. The existence of a large number of milch animals in the cities has also created problems of public health, especially on account of the difficulty of disposing of their dung and urine: and whereas this useful manure ought to go back to the land which grew fodder for animals, it is generally allowed to go to waste.

Survey Work

Milk surveys of all major towns in the State recently carried out by Government show that the consumption of milk per head per day is as low as 1.3 ozs. in a city like Sholapur and as high as 4.5 ozs. in Ahmedabad.

Two factors have materially contributed to this low consumption of milk. There is first a serious overall shortage of milk and, secondly, rates of milk are beyond the purchasing power of the average citizen; in fact, the latter is due to the former.

In 1946, Government created a separate organisation for development of the dairy industry under a Dairy Development Officer and immediately surveyed the position of dairying, both in the towns and the countryside. These surveys led to the definite conclusion that unless and until the system of town-dairying is replaced by more scientific system applicable in our conditions, the dairy industry would never make headway and the people would not get sufficient milk which they require.

The survey also showed that in the dairy industry of today, not only we have animals of very poor milk productivity but there is also a complete absence of an organisation for production, transporting and marketing of milk effectively.

According to the Poona survey report, there are nearly 2,500 petty milk dealers engaged in producing milk in the town or in bringing it from villages in small quantites. It would be enough, to have a single organisation to handle the milk right from the beginning and deliver it to the customers in the town.

Urban Milk Plan

Reasonable Rates Given For Producers

In order to concentrate the dairy industry in villages and market the milk in towns, Government have undertaken schemes of milk supply for three important cities, Ahmedabad, Poona and Hubli. The scheme in Poona was put into effect nine months ago, but during the short time, I should say that the results obtained are very encouraging. Government collect milk in the villages selected for developmental purposes and assure the producer reasonable rates.

Milk in the procurement area is tested, filtered, bulked and transported to the cities through specially designed ice-chambered cans. Very large quantities of milk are thus handled under the scheme, and Poona is having now over 3,000 lbs. per day, which is distributed through 24 distribution centres. Milk is transported by vans to the Central Dairy in the town, where it is pasteurised by heating and instantaneously cooled down.

The producers of milk under the scheme appear to be so happy that they have been buying more and more of milch cattle of their own accord. In due course, Government would make necessary arrangements to provide loans for the purchase of animals, fodder and fodder concentrates, but this will be done in the second stage as soon as the marketing aspect is perfected. The proper way to begin the improvement of dairy cattle is the marketing of milk, and with this object in view the marketing aspect has been taken first. In course of time, however, schemes for improving the dairy cattle, through co-operative societies, would be taken up. For the present, it would suffice if the producer gets a fair price for the milk sold by him and the consumer is able to buy milk at a reasonable cost, which the scheme enables them to do. It may also be

mentioned that Government work these schemes on "no-profit no-loss" basis and, therefore, a reasonable price both to the producers and the consumers under the schemes is assured.

Government have taken up the milk supply schemes in the three cities only as a beginning. On gaining experience, it would be quite possible to introduce such schemes at other places as well. There are nearly 30 towns in the State with a population of over 30,000, and it would be realised that although much has been achieved so far much yet remains to be done.

In addition to these milk supply schemes, Government have also taken up schemes for helping large-scale dairy farmers in the State. At present, a number of dairy farmers, both large and small, distributed throughout the State are concentrating their attention only on the production of milk. Government desire that this system should be replaced and dairy farmers should undertake cattlebreeding operations as well. In order to encourage such dairy farmers, as wish to conduct their dairies on modern lines Government offer loans up to Rs. 50,000 each at 4 per cent. interest. The dairly farmer also has to invest an equal amount and produce at least 500 lb. of milk on an average per day. He has also to abide by all the technical conditions laid down by Government, some of them being maintaining one-fourth of the herd of a specific pure breed, utilisation and conservation of urine and dung for manure purposes, growing of green fodder required for the dairy cattle and selling of milk in unadulterated form.

Loans

Under the milk supply scheme, a number of villages would be taken up for improving the cattle of the area, and this work would mainly depend on the supply of pure, high pedigree bulls for improvement of the cattle. Government, therefore, rely on these private farms as on their own farms for the supply of pedigree bulls. The loans are returnable to Government within 10 years by paying six-monthly instalments.

There is also another scheme in operation at present. It consists in providing loans to small cultivators up to Rs. 1,000 each at 1 per cent. interest for the purchase of dairy animals, repairs to the cattle-shed and buying dairy equipment. The number of dairy farmers who have taken advantage of the scheme is very large. The scheme at present has been applied throughout the State, but, in future, it would be made applicable only to the areas where Government have undertaken the work of improving dairy cattle. Government hope that, with these measures, a beginning would be made for finding a solution to the intricate problem of milk supply, which is facing us today. Government, however, cannot undertake all these activities themselves and more and more people, particularly from rural areas, must come forward for organising the production of milk on scientific lines and marketing it on co-operative basis.

Correspondence

[The views expressed in letters addressed to the Editor represent the personal views of the writer and must not be taken as expressing the opinion or having received the approval of the A.I.V.A. Ed. I. V. J.]

The Role of Poultry Husbandry in Food Production

Sir,

The nutritive value of egg and poultry in the human diet is well known. Poultry and poultry products form supplementary food to meet the deficiencies in the supply of cereals and grains. Poultry production is essentially a part of the Grow More Food Campaign and is directed towards building up a healthier nation, objectives for which the Government are co-operating with the W.H.O., and F.A.O. If India has to catch up with all the leading countries of the world, her poultry population which is estimated to be 58 millions will have to be rapidly multiplied to be able to enhance child and maternal welfare, hospital and invalid care. It is against this back ground that the Poultry Research Section at this Institute was established in 1939. Since then, the Section has made important contributions in the field of breeding, technology, nutrition and disease control. In addition, over 300 post-graduates have been given specialised training in advanced poultry husbandry and they are now engaged in various States as Poultry Development Officers or Assistant Disease Investigation Officers (Poultry). Over 100 persons with previous experience of poultry-keeping have undergone the Farm Manager's course of 3 months' duration. During the war several military personnel received short courses of training in poultry farming at this Institute.

The Section has built first class stocks of white Leghorns and Rhode Island Reds, the two popular breeds in this coutry, to provide sound pedigreed and acclimatised foundation stocks to both Government and Private poultry farms all over the country.

Since the termination of the hostilities, the demands for hatching eggs and breeding stock have increased considerably. The various Military Poultry Farms established during the war have been given up and, in the food production drive of the country, the demand for quality stocks from all over the country is colossal. It is hoped that the development of the poultry industry will not receive a set back due to financial stringency in the various States.

Yours faithfully,

S. G. Iyer,
Poultry Research Section,
Indian Veterinary Research Institute, Izatnagar, U.P

Treatment of Mange in Animals

Sir,

With considerable interest, I read in the *Indian Veterinary Journal* of September 1950 the article on "Recent Advances in Chemotherapy as applied to practice " by Dr. D. D. Ogilvie, B.SC. (Edin.) M.R.CV.S., of the Imperial Chemical (Pharmaceuticals) Ltd., with particular reference to Insecticides and insect repellants by the use of D.D.T., and Gammexane in acarine parasites. Clinical article on the successful use of Gammexane 520 on Sarcoptic mange appears in the same *Journal;* so also a note in the mail bag at page 134 of the *Journal* by Sri S. P. Beri, B.A., L.V.P., of Ajmere on the use of Vitamin 'B' Complex and Vitamin 'C' tablets (T. C. F. products), in acute eczema, cure being effected after thirteen days' treatment.

Another useful insecticide is Hexyclan Insecticidal Dust crude Benzene Hexachloride. It is available at the Oriental Commercial Corporation, 59, Forbes Street, Fort, Bombay. It is reported to be as useful as D.D.T., against mosquitoes-anopheles (Malaria carriers), Culex, and Stegomia, as also in the control of Jassidae (Mango hoppers which damage the mango crop) in the form of Mango Dust 3%, partly deodorized, for dusting mango trees before the flowers open and after the fruits set. Hexyclan may, however, prove useful against ticks, lice and other vermins in veterinary practice.

Nixoderm is found to be effective in human beings to get rid of skin troubles such as eczema, itching skin, cracking, peeling, burning skin, rashes, ringworm, pimples, black heads and foot itch. I have personally tried Nixoderm in foot itch with wonderful results. It is an ointment manufactured by Messrs. Arnar & co., Buffalo, N. Y., U.S.A., for Messrs. Knox & Co., Los Angeles, U. S. A. This preparation may also be used with advantage in veterinary practice. Each 100 grams contains Acid Benzoic cryst 6.00, Acid Salicylic 2.50, Titanum oxide 5.00, Kaolin 12.00, Sulph. Prcip 4·60, Paravax 4.00, Lig Petrolatum 4·00, Snow white Petrolatum 60·15 and Menthol synth 1·75 grams. It is available at all the chemists.

While referring to the above mentioned literature and remedies for skin trouble etc., it prompted me to have a look into my old diary regarding the different treatments carried out against mange in the Zoo animals during the period of my service from 1925-1936, first as Assistant Superintendent and then as the Superintendent in the Victoria Gardens (a combined Zoo and a Botanical Gardens) in Bombay.

It may be mentioned that the animals in Zoo suffer from the same ailments as the domesticated animals. Mange is one of the important skin diseases which a Veterinarian has to contend with in a Zoo. It is common in bigger carnivora like lions, tigers, panthers, etc. Smaller carnivora like wolves,

jackals, foxes, wild dogs, dingoes (Australian wild dog), etc. It is also commonly seen affecting deer, antelope and camel. Various applications have been tried from time to time, amongst them being sulphur in oil or vaseline, chinosol, mercury lotions, etc., with varying results.

Odylen, with or without Aricyl, has also been used as a routine in carnivora. In this connection, it may be mentioned that the late Khan Saheb Ahmed Ismail Shaikh, G.B.V.C., the then Professor of Anatomy and Physiology in the Bombay Veterinary College and Canine Surgeon at the Bai Sakarbai Dinshaw Petit Hospital for Animals, Parel, Bombay, once visited the Victoria Gardens. While discussing the relative merits of Odylen, Professor Shaikh informed me that he was sceptical about the efficacy of Odylen. Probably he had then not sufficiently tried it but preferred his own old and sure methods of treating mange in dogs; for it may be recalled that the late Prof. Shaikh was a very skilful, proficient and practical Veterinary Surgeon, under whom we as students (1906—1908) gained considerable knowledge, practical hints and experience at his clinics. Besides he was an efficient Unani Physician, being in great demand and gave free treatment to the poor of the Parel village, where he lived near the college premises. Of course rapid progress has now taken place between then and now and chemotherapy is a recent advancement in the field of Veterinary Research.

Just about this time, Mr. Carl Hagenbeck, the great German Naturalist, who, along with his brother, owned the Tier-park, the famous Zoological Gardens in Hamburg in Germany, visited Bombay with his equally famous and well-kown circus, which was a great attraction at that time in Bombay, before he sailed away to Egypt with the full cargo load of ship, containing his circus animals and troupe. Mr. Hagenbeck used to visit the Victoria Gardens every second or third day, as he had purchased the six Gravy's Zebras which were then kept in the Gardens under deposit by the late Mr. Abdul Wahid, a well known collector of wild animals from Kenya in East Africa. When seeing me using Odylen for treating mange in zoo animals, he expressed satisfaction and informed me that he had great faith in this Bayer's product which he used for mange treatment in the circus horses and zoo animals at Hamburg Zoo, which was then a great nursery for the replenishment of livestock of wild animals in all the Zoological Gardens in Europe, England, America, etc. However, my experience was that in some cases Odylen was effective but, in others, not.

With camels I have found the application of Sulphur mixed 1 in 16 parts with Karanj oil very satisfactory. Karanj or Pongamia = Glabra (N. O. Legnminosae) is a partially deciduous tree, medium sized with shining dark leaves bearing pendant racemes of lilac-rose flowers. This tree is common in Mysore and Coorg, and is planted as an avenue tree, an object of shelter and admiration to the weary traveller. The flowers are used in a well

decomposed state for forcing crysanthemums and such other plants which require rich and heavy feeding. A useful oil (Karanj oil) is extracted from the seeds and the oilcake is used extensively as manure; while the fresh leaves make excellent green manure.

Sulphur in the same proportion mixed with Linseed Oil, or Tisi-ka-tel is also found useful for treating mange in camels. 'Tisi' or 'Ulsi' or Linum Usitassimum (N. O. Limiaccae) is a pretty little plant indigenous to this country, about 15" high with a slender stem, straight edged leaves and bell-shaped blue flowers. When the seeds ripen, the oil is extracted, which is the popular linseed oil or Tisi-ka-Tel. Other uses of this plant are linseed poultice, linseed tea and linseed meal. These need no description, being well known in use in Veterinary practice.

Another useful remedy for mange in carnivora, accompanied with or without the internal administration of Donovon's solution, as found to be infallible, is the following recipe.—Sulph. Subl. ℥ii, Acidi Salicylas grs x, Acid Boric grs. xv Creasoti mii, Oleum. Eucalyptiel mv, Vaseline Alba ad. ℥ii m.ft. unguentum, for external application with the following instructions. The animal should be first washed well in luke-warm water with ordinary bar soap or sunlight soap and then dried. After drying, the ointment should be rubbed well on the affected parts for two days. Then the animal should be washed thoroughly and the treatment repeated until cure is effected. Invariably within 15 days or so, satisfactory results are noticeable.

This treatment was tried over a year ago on a Terrier. It appeared that this dog was for sometime under treatment for Follicular type of mange in a Veterinary Clinic in Bombay. But the authorities of this clinic, after trying all possible remedial measures, declared the case to be incurable and advised the owner to get it destroyed to alleviate its sufferings. Subsequently the owner consulted me when I prescribed the above mentioned treatment with instructions to follow the directions carefully. After 15 days or so, the owner informed me of the satisfactory results and the dog was cured completely of mange within a few days.

Another case of mange, also in a Terrier, was likewise given the treatment on 12-7-1950. When I inspected the dog again on 17-9-50 I found that it was completely cured of mange and covered with hair over the affected parts.

This record of a few of my experiences may be found interesting to your readers.

Yours faithfully,

D. S. LAUD, G.B.V.C., F.Z.S., F.R.H.S.,
Superintendent of Markets and Slaughter Houses, Bombay Municipality (Retired).

Bombay,
25th Oct. 1950.

Abstracts

The relative rate of absorption of different oils and fats:—R. Bhalerao, D. Venkatappiah and C. P. Ananthakrishnan. *Indian J. Vet. Sci.* **17**, Part IV, Dec. 1947.

The relative rate of absorption of cow, buffalo, goat and sheep butter fats, the body fats of cow, buffalo, goat and sheep, the vegetable oils, cocoanut, sesame, groundnut, cottonseed, safflower and mustard, the hydrogenated groundnut oils of melting points of 34·1°C., 37·0°C., and 39·0°C., the hydrogenated sesame oils of melting points of 37·1°C., 38·7°C., 39·3°C., and the hydrogenated cottonseed oils of melting points of 35·5°C., 37·3°C., and 38·5°C., were determined after four hours by feeding 1·5 c.c., of each fat. The undigested fats in the alimentary canal were also examined for their chemical characteristics.

It was found that sesame oil and cocoanut oils were abosorbed at the same rate as cow-butter fat, while sheep-butter fat, safflower oil, groundnut oil and cottonseed oil were absorbed somewhat more slowly, but the absorption was not significantly less than that of cow *ghee*. All the body fats and hydrogenated oils were significantly less absorbed as compared with cow *ghee*. It was also found that hydrogenation lowered the rate of absorption of an oil.

It is suggested that the short chain fatty acids are more readily absorbed than the long chain fatty acids and among the long chain fatty acids, the unsaturated acids are more readily absorbed than the saturated acids.

Resazurin test for assessing the sterility of dairy utensils:—F. D. Aibara and H. Laxminarayana. *Indian J. Vet. Sci.* 17 Part IV, Dec 1947.

The applicability of the resazurin test for assessing the sterility of dairy utensils e.g. bottles, milkpails, churns, receiving tank and cooler, as a means of checking the efficiency of the cleansing and sterilization methods in the dairy has been examined.

The resazurin test was carried out on rinsings (1 ml. mixed with 10 ml. sterile separated milk and then incubated at 22°C. for 16 hours) and the colour changes in half an hour (at 37°C) fairly agreed with the plate counts of the rinsings. Resazurin reduction to a stage not lower than disc 5 (lilac shade) was an indication of satisfactory quality in all the utensils.

The anomalies found between different utensils and between plate counts and resazurin reduction have been discussed and the practical utility of the dye reduction test for application under commercial conditions indicated.

The resazurin test in the present form has not been found useful for examining receiving tank and cooler.

Some digestibility trials on Indian feeding stuffs.—Desi sugarcane sacchrum barbari jesw (*Katha*).—Lal Chand Dharmani, Kartar Singh Lohara and N. Akbar Ali. *Indian J. Vet. Sci.* 17, Part, IV, Dec. 1947.

Digestibility coefficient of different constituents of sugarcane (Katha *desi* variety) were determined with five Sahiwal heifers.

Sugarcane contains 19·8 lb. to 23·8 lb. total digestible nutrients per 100 lb. of the feed. When fed alone it forms a non-maintenance ration. It is inferior to wheat *bhusa* as a cattle feed.

Nutritive values of different parts of Napier Grass:—Indubhusan Chatterjee, M.Sc., L.Ag., Md. Abdul Hye, M.Sc., and Md. Sayed Ali. *Indian J. vet. sci.* 17, Part IV, Dec. 1947.

The object of this work was to ascertain whether in feeding Napier grass it would be more economical to put the whole plant to the feeding trough or to discard the coarser part. The results suggest that the coarser part is poor in composition with respect to all components except fibre and nitrogen-free extract. But on account of its coarse and tough integuments it is bound to involve an expenditure of a large amount of energy in the work of digestion. It is likely that its exclusion from the diet might prove more economical than its inclusion because of the saving of energy and because the diet would be more efficiently digested the loss of essential minerals would be negligible.

Shell sealing of eggs:—T. S. Krishnan. *Indian J. Vet. Sci.* 17, Part IV, Dec. 1947.

The comparative efficiency of lime-water and water-glass of egg preservation under Indian conditions has been studied. Treatment for only six hours with lime water appeared to be much more effective than five days with water-glass. Immersion for 18 hours in lime water seems to be sufficient for shell sealing.

Experiments on the transmission of Surra by the tick *Ornithodoros Tholozani* Laboulbene and Megren. S. K. Sen *Indian J. Vet. Sci, Vol. XVII, Part III, September 1947.*

The tick, *Ornithodoros tholozani*, was incapable of transmitting surra, under experimental conditions, from infected guinea-pigs to healthy rabbits.

Homeopathic Treatment of Warts.—Horny warts in calves used in the production of rinderpest vaccine were successfully removed at the Pasteur Institute of Nhatrang, by means of homeopathic treatment in the place of the usual allopathic methods: surgery, ligation, caustics. The base product

consisted of tincture of thuja, nitric acid, and causticum, a speciality made of lime and potash, said to be composed of calcium oxide and potassium bisulfate. After trying several homeopathic dilutions the following was adopted: 2 drops of the base to 100 drops of doubled distilled water (second solution); then 2 drops of second dilution to 100 drops of double distilled water (third dilution). Each of these dilutions is made in a neutral vial that is shaken vigorously for a few minutes in strictly homeopathic fashion and for immediate use. This mixture is given three times on consecutive days or at intervals of several days. Of 15 yearlings weighing 100 to 120 kg., all but 2 were completely cured in three weeks, at different times. Some of the warts dried at the base, flattened out, and dropped off in a couple of days or sooner; others diminished in size and disappeared more slowly. Always improvement could be seen within two days. The average time of recovery was five to seven days. Two required a fourth treatment and 2 were totally refractory.

The use of thuja, nitric acid, or the causticum alone failed. The number of warts varied from 156 on 1 calf, countless small ones on 1, and only five on another. The author (J. Vittoz) suggests this treatment for multiple papillomas in the mouths of dogs.

Jour. A.V.M.A., June 1948.

A Lactation Vitamin.—Anon (1947). Brit. med. J. August 2nd, 181. A substance from the oil of the fenugreek herb (Trigonell spp) has been isolated, which in doses of 0·125 mg. administered *per os* promoted lactation in 345 out of 350 cases. The volume of milk increased two to nine-fold depending on the stage of lactation, the most marked effect being in the earlier stages; the content of fat, vitamins A, B1, B2 and C increased. The active principle derived from fenugreek oil has been named "H" factor. The pure substance is fat soluble, exists in needle-like crystals with a melting point of 137°C and has a characteristic absorption band. It is thermostable, not readily oxidized and contains a single hydroxyl group. The "H" factor is not identical with the tocopherols.—E.K.

Vet. Bul. Vol. 18, No. 8, Aug. 1948.

Extract

Cortisone.—Research with Cortisone' one of the newest, most powerful of the "wonder" drugs, will begin soon at Michigan State College's school of veterinary medicine. It is believed to be the first veterinary school in the nation to work with the drug.

Michigan State has received a limited quantity of the rare hormone according to C. S. Bryan, Dean of veterinary medicine. Dr. Joseph Meites, associate professor of physiology, will coordinate the research.

Cortisone, which comes from the adrenal glands, has produced remarkable results in the treatment of asthma, arthritis, and many other diseases. It will be used at M.S.C. for experimental treatment of domestic animals. Still rare and expensive, the drug's use is confined mostly to clinical research.

" Humans have first priority for Cortisone, but much can be learned about the drug's effect on humans by doing research with animals. However, it is believed that the drug will be highly successful in the treatment of animal diseases when it becomes more plentiful," Dr. Meites said.

Dr. Meites emphasized that Cortisone is not a cure for disease, but rather a builder of resistance to disease. Treatment with the drug enables the body to withstand terrific stress while further treatment is being given to destroy the disease.

Dr. Meites has a personal stake in Cortisone and similar drugs. He was treated successfully this summer for a serious eye disease with ACTH (Adrenocorticotrophic Hormone). ACTH, a product of the pituitary glands, cannot be made synthetically while Cortisone can. ACTH is the hormone which causes Cortisone to be secreted from the adrenals.

News Bureau, Department of Information Services
Michigan State College, East Lansing, Michigan

Reviews

Dollar's Veterinary Surgery.—By J. J. O'CONNOR, M.R.C.V.S., Pp. xiv —1036, with 403 figures. Fourth Edition. Price 35*s.* net. *Bailliere, Tindall & Cox, London, W.C. 2.*

This fourth edition of the popular book, Dollar's Veterinary Surgery, has been brought out with a number of important and pleasing features by J. J. O'Connor, who has re-edited and revised it ably and well. As in the previous edition, the book has been divided into three parts. The first part dealing with General Surgery contains an interesting illustrated addition on the treatment of fractures by Stadar splint and other forms of bone pinning. The Second part on Operative Surgery has additions on the subject of anaesthesia including Trilene anaesthesia in small animals and intravenous anaesthesia in large animals by Chloral, Thiopentone, Ether and Anavenol. The last section on Regional Surgery has been enriched by an Appendix on Examination of horses for Soundness.

These additions have greatly enhanced the value of the book and it has become a still more important guide as a text book for the students and a reference book for the practitioner.

The publishers are Bailliere, Tindall & Cox and they have done their part in their usual excellent way.

Animal Nutrition and Veterinary Dietetics.—By R. G. LINTON, Ph.D., M.R.C.V.S., Third Edition 1950 by John T. ABRAMS, M.Sc., Ph.D., *Published by Messrs. W. Green & Son, Limited, Edinburgh. 42s.*

This is the latest edition of the standard text book on Animal Nutrition and Veterinary Dietetics by two eminent English Authors. The text like its earlier edition is comprised of 4 Sections with 29 chapters and is devoted to fundamental knowledge with regard to chemical composition and metabolism of nutrients; the study of foods and their nutritive value; the fundamental basis of feeding standards and practical feeding of animals. In the earlier sections, the inclusion of extensive treatises on topics like water, metabolism of Nitrogen-free extract and crude fibre digestibiltiy and biological value of proteins, avilability of mineral elements to live stock; the loss of inorganic elements from the body, mineral deficiencies in practice, physiological properties of Vitamins, the general nutritive value of each class of foods, dried grass, its production and its nutritive value; the comparative nutritive values of dried grass, hay, silages etc., are all new and welcome features in this edition. A new section on requirements of animals for maintenance, growth, reproduction, lactation and work is another novel feature of this edition. This new section has definitely provided a link between the fundamentals of nutrition and practical feeding of animals. In the last section dealing with practical feeding of animals, the general principles of feeding of different species of animals consistent with their physiological peculiarties have been well stressed and brought out. Separate chapters in the last section have been devoted to the practical aspects of feeding goats, rabbits, small domesticated carnivora and laboratory animals. The last chapter of this edition dealing with a brief account of the efficiency factors in nutrition satisfies the long felt need in this aspect. On the whole most of the chapters are complete and proper coherence is maintained between them.

The new edition is a thorough revision of the original text book giving up-to-date information on the different aspects of animal nutrition and Veterinary Dietetics and is well illustrated. It is really a text book of choice for students of nutrition, as well as for the Research Workers and also serves as useful guide to the practical farmer. C.V.V.

Neoplasms of the Dog.—By R. M. Mulligan, M.D. Pp. xi—138, and 59 plates. Price 31s. 6d. Bailliere, Tindall & Cox, London, W. C. 2.

Although reference to a great variety of neoplasms in dogs appears in many scattered scientific journals and also the subject treated in a general manner in Feldman's monograph on " Neoplasms of domesticated animals " (1932), no book dealing exclusively on canine neoplasms has appeared in Veterinary literature. This book by Mulligan satisfies the need.

The author has based his observations on 1500 canine neoplasms of which 100 are from autopsy and the rest from biopsy materials. The book begins with an introductory chapter, wherein data are presented on some of the statistical aspects of canine tumours, a field sadly neglected in treatises on animal neoplasms. In the next chapter, the author, basing his studies on 138 mammary tumours, has given a short account of the various histological types of these neoplasms in dogs. Many points of similarity to human breast-tumours are brought forth on canine mammary 'mixed' tumours, a parallel for which is not found in human oncology, and many original observations are made. The proof to show the composite nature of the mixed tumours are very convincing. An answer has been furnished to the much debated question whether carcinomatous transformation of mixed tumours occurs or not.

In chapters on epithelial tumours of the skin and adnexae and mesenchymal neoplasms, the information on frequency of occurrence of various types of neoplasms in different sections of the body are important, because it sometimes throws light on the etiological factors concerned in the particular tumour. This work also shows that in animals too, as in human beings, there is considerable variation in the incidence and types of tumours in different parts of the world. For example the author mentions of high incidence of perineal gland tumours, a not too frequent neoplasm of the dog in this country.

The evidence in support of a single case of endothelioma cited by the author is not convincing—whether the neoplastic transformation of the highly plastic mesenchymal tissue into specific structures resembling vascular tissue be called angioma or endothelioma, is still open to question. Again it appears rather confusing to apply the term histocytoma to the highly anaplastic extra genital lympho-sarcoma (round-cell sarcoma). Had the author supported the terminology with microphotographs showing the neoplastic transformation of the mesenchymal histocytes into the tumour cells, this confusion would have disappeared.

However, these are only minor criticisms in a book which is lucid and well written, presenting short description of all the common and some uncommon canine neoplasms examined by the author. The book is limited in its scope and does not permit any discussion on the work of others in the field of canine oncology. A good bibliography has been given at the end of the book and this will be of great use to the research worker in animal neoplasms. The illustrations are good and well annotated. There is no doubt this book will be read with benefit by the under-graduate, the post-graduate and the practitioner alike. K.P.C.

Nomenclature of fungi pathogenic to man and animals.—Names recommended for use in Great Britain. By the MEDICAL MYCOLOGY COMMITTEE of the Medical Research Council. (1949). Medical Research Council Memorandum No. 23. Pp. 12. *His Majesty's Stationery Office.* 6*d*.

'Medical Mycology is hampered by the multiplicity of names that have been given to fungi of medical importance. A recent census showed that the 65 species of fungi listed as pathogenic to man in the British Isles have been recorded in this country under 150 names and in other countries under many more'. These remarks from the Introduction of the memorandum gives the necessity for an authoritative publication containing the approved names for fungi.

Very great care has been taken in the choice of names by creating order out of chaos, as it were. In assigning the name of the fungus which is the causal factor of Ringworm in cats and dogs, the Committee has made the following interesting observations:—'A slightly more complicated example is afforded by the three names *Microsporum canis*, *M. felineum*, *M. lanosum*, which have been applied to the fungus causing microsporosis in cats and dogs. *M. canis* must be used because it is the earliest, although it only antedates *M. felineum* by a few months. The Rules do not take into account the appropriateness of names. The cat may be more frequently infected than the dog, but *M. felineum* may only be used for the fungus from the cat by an author who believes that different species of *Microsporum* infect cats and dogs'.

Under *Actinomyces israeli* (Kruse) Lachner-Sandoval the following remarks are made:—'According to Erikson (1940), actinomycosis in cattle is caused by a distinct species; unfortunately she was only able to compare human isolates from this country with cattle isolates from Australia and the question needs re-investigation. Erikson used the binominal *Actinomyces israeli* for the organism causing actionomycosis in man and designated the cattle organism '*Actinomyces bovis* Harz', a name which has frequently been applied to the actinomycete of human actinomycosis. McFadyean (1932) and Erikson both concluded that *A. bovis* is a *nomen confusum* because it can never be ascertained whether the name was first applied to the organism of actinobacillosis or to that of actinomycosis. If the cattle strains prove to be distinct the question of a new name must be considered. For the time being it is recommended that the strains from man should be regarded as *A. israeli*, those from animals as *A. bovis*.

The causal organism for Epizootic Lymphangitis is designated as *Histoplasma farciminosum* (Rivolta) Ciferri and Redaelli and it contains the following note—'Syn. *Cryptococcus farciminosus* Rivolta apud Rivolta and Micellone. The specific epithet, often incorrectly spelled *farcinimosus*, is derived from the Latin '*farciminum*', a disease of horses.

This authoritative publication, although confined to the fungi pathogenic to man and animals in Great Britain, will, we are sure, be welcomed all the world over.'

The Animal Health Trust—Third Report (1st July 1948 to 30th June 1949)

If the United Kingdom is the home of some of the finest breeds of livestock, one need not wonder at it. It is all the result of very hard work. The people of that country are highly animal-minded, and private munificence for livestock improvement has been a particularly striking feature there. The latest of such private effort is the creation of what has been well named Animal Health Trust which was formed in 1942 with the object of conducting research into the various livestock problems confronting that industry. The third Annual Report of this Trust which we have received is a delightful record of its activities for which those in charge of the Trust must be heartily congratulated. The report commences with a fine exposition of the aims and objects of the Trust in the form of questions and answers which should satisfy even the most discerning critic. This is followed by a resume of the activities of the Trust at the various stations viz. Equine, canine, poultry and farm livestock research stations. There is also a section on the independent research conducted at other institutions by the Trust's award of Research Fellowships for a number of Veterinarians.

In addition to the activities mentioned above, the Trust has published a series of Guides to Animal Health on Coccidiosis, Night Blindness in dogs and Fowl paralysis complex.

The Animal Health Trust of United Kingdom has set an example for other countries to follow and how we wish that our country with its teeming livestock population and its multifarious problems follows suit and creates a similar Trust!

ERRATA

Vol. XXVII, No. 2

1. Under Contents, General Articles, insert A note on Bovine trypanosomiasis in military farms and its control by Antrypol—By Major Sunder Singh Page 74.

2. Page 89, line 14
   For Sulphapyridine—poor absorption, moderate excretion.
   Read Sulphadiazine—poor absorption, moderate excretion.

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(1)	(2)	(1)	(2)

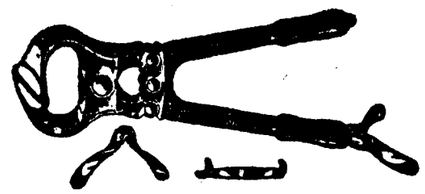
தமிழ்நாடு அரசுப் பாடநூல் நிறுவனம்,
எழும்பூர், சென்னை-600 008.

புலப்பெயர்ந்தோர்.

பெ. எண் : ப. எண் :

S.F. 259A-6 1,60,000—10-1-84.

Burdizzo Castrators with Patent Cord-Stop at Jaws.



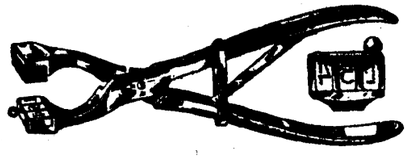
Beware of Imitation. **Do not be misled by spurious makers.**

Dr. Burdizzo's Bloodless Castrator for the Castration of Bulls, Horses, Sheep, Dogs, Pigs etc., is the only Castrator guaranteed to be of perfect manufacture, built up to a standard not known to price.

★

Burdizzo Tattooing Forceps.

Official Marker of many Cattle Breeding, Sheep Breeding and Horse Breeding Farms and Cow Testing Associations. With Interchangeable letters and Numbers for marking Cattle, Sheep, etc.



Nickel-plated, three space : in tin box. The usual set consists of a 3 space.forceps, 2 sets of Figures, complete Alphabets, and Tattooing ink.

Further particulars on request from the Representatives and Distributors in India:—

Dr. PANGAL'S VETERINARY INSTITUTE

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