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THE INDIAN VETERINARY JOURNAL

PUBLISHED BI-MONTHLY

(THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION)

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38°

Vol. XXVIII

MAY, 1952

No. 6

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Madras,
15th May 1952

EDITOR.

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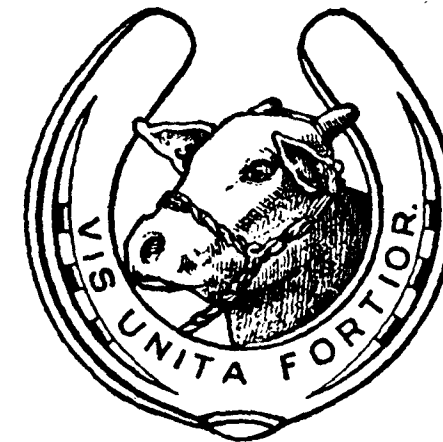
No. 6

THE INDIAN VETERINARY JOURNAL

[THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION]

PUBLISHED ON ALTERNATE MONTHS

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(ESTD. 1924)

EDITOR

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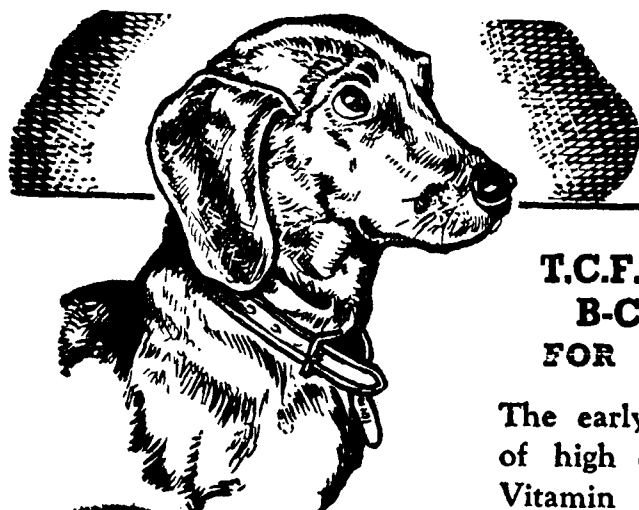
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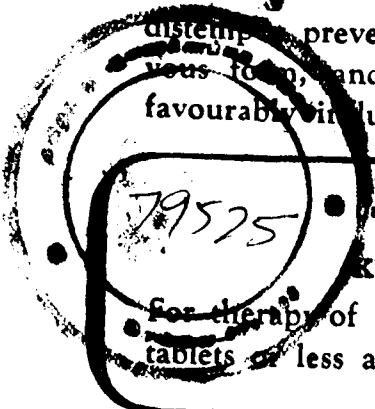
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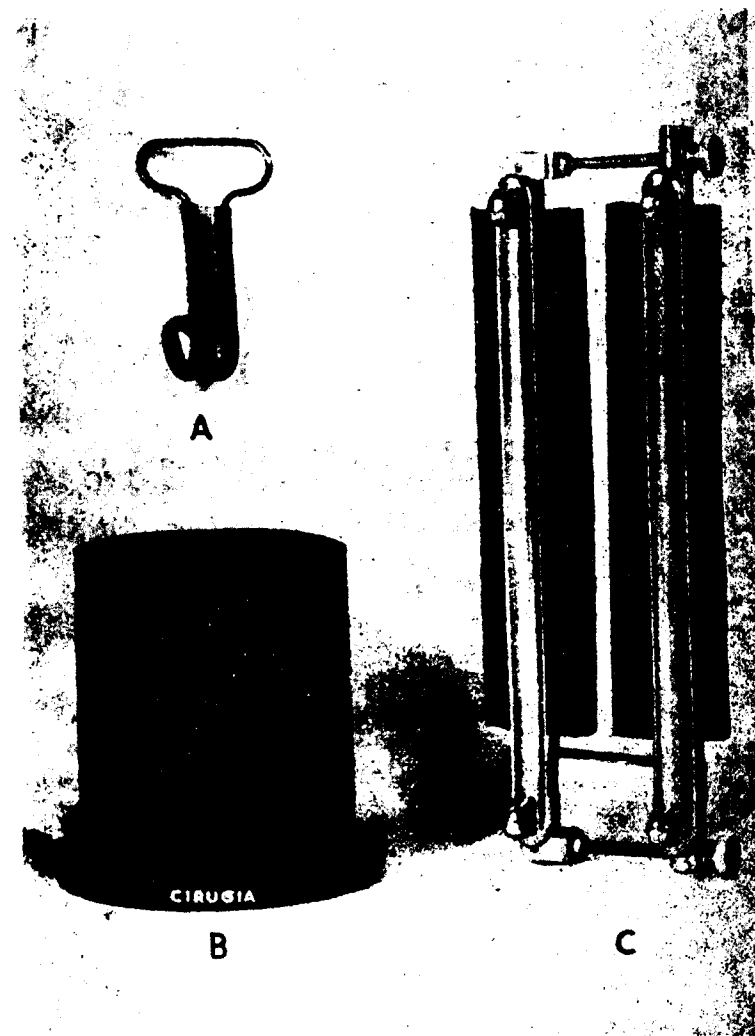
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THE

Indian Veterinary Journal

(The Journal of The All-India Veterinary Association)

Vol. XXVIII

MAY, 1952

No. 6

General Articles

THE EFFECT OF ATOMIC WEAPONS ON DOMESTIC ANIMALS*

By

J. F. LOUTIT, D.M., M.R.C.P., M.R.C.S.,

Radiological Research Unit, Atomic Research Establishment, Harwell.

The title of this talk might lead one to suppose that I am going to talk about material which is restricted from a security angle, but that is not so. The biological effect of ionising radiation has been publicised quite widely by the Atomic Energy Commission of the United States. They have published a book, "The Effects of Atomic Weapons," through McGraw-Hill & Co. Inc. and anybody who wishes to do further reading on this subject can obtain the complete document from any of the usual book-sellers.

Our knowledge of atomic weapons is limited. We do know, from the results of the two bombs exploded over Japan and the several trial bombs that have been exploded at Bikini and other proving grounds, that they are of varying size. The Japanese and Bikini bombs were said to be of the order of 20,000 tons T.N.T. equivalent, according to the semi-annual Reports of the United States Atomic Energy Commission, and according to the *New York Times* several bombs, larger and smaller than that, are now available to the Americans. For the moment, let us confine our discussion to what the Americans call the nominal bomb, that is, the 20,000 tons T.N.T. equivalent.

Firstly, I would say that this weapon is of primary use for its blasting effect. With the Japanese bomb a vast number of human casualties was caused by blast mainly due to the secondary effects from fallen buildings and flying debris. The second most important cause of casualties was burns. The clinical problem presented by the burns is not expected to be

*Reprinted from "The Veterinary Record", Vol. 63, No. 48.

different qualitatively from what one is used to in medical practice. The difference is that a large proportion of the burns are due to the primary thermal flash from the bomb, not the ordinary contact flame burns with which we are accustomed to deal. The clinical reaction of the superficial tissues to the flash burn is similar to that which occurs with the flame burn and depending on the depth of the burn there are varying degrees of reaction. The only difference I would say in the case of atomic bombs is the magnitude of the numbers affected. If the human and animal population is exposed to the primary flash the number of casualties is likely to be extremely high.

The third cause of casualty from the atomic bomb is the damage from ionising radiation. In the case of the nominal atomic bomb it consists mainly of gamma radiation from two sources—from the fission processes of the plutonium and from the immediate release of the fission products which are radioactive. These two combined cause a flash of gamma ray radiation which for all practical purposes is instantaneous, spread over a matter of a second or two.

The nominal atomic bomb was exploded over Japanese cities at a height of about 2,000 feet in order to obtain the maximal blast effect. The lower the bomb is exploded the less wide is the range of effective blast effect; above that height you get a little beyond the range of the maximal blast effect. At Bikini the bombs were exploded at different heights, one in the air at a lower height, and one was exploded in deep water. At the first experimental explosion in the New Mexico Desert the bomb was exploded near ground level on a stand. According to the size of the bomb and the height at which it is exploded you will get different radii of physical effects, that is, the blast effect, the thermal effect, and the effect of ionising radiation. If we take the nominal bomb we can draw approximate radii such as obtained over Hiroshima and Nagasaki.

From a point immediately below the explosion in a circle with a radius of three-quarters of a mile there is the combined lethal effect of all these physical forces with almost complete destruction of buildings, except the most sturdily built, earthquake-resistant structures. There is an intense thermal flux which is not penetrating but in the absence of protection there is sufficient to cause deep third degree burns on the skin, to cause ignition to clothing, and in the case of domestic animals scorching of hair. Also within that radius there is a flux of gamma ray radiation which is lethal to man and to most, if not all, domestic animals. In the smaller central ring there is the additional flux of another ionising radiation in the form of fast neutrons from the fission process. For our purpose we can exclude the effect of fast neutrons because any man or domestic animal as close to ground zero as that will die several times, from the secondary

effects of blast, from the thermal effects, and from the ionising gamma radiation.

In the case of a human population, one assumes that a large proportion might be in deep shelters or in surface shelters with a sufficient thickness of concrete or metal to give an effective protection not only against the thermal effects but against much, at any rate, of the ionising radiation, but I doubt whether domestic animals can be so accommodated.

In a wider radius up to two miles, that is between the three-quarters and two miles limit, one is beyond the lethal range of the ionising radiation but one will be within the range of flying debris and in the range of damaging heat effects. In the case of the human skin up to two and a half miles, and probably up to four miles, one can get second and first degree burns. The hairy domestic animal is likely to have better natural protection than man against this heat flux in the range of 1 to 10 calories per sq. cm. There might be a little scorching of the hair in the midway zone but my guess would be that in the periphery of the zone, at any rate, the hair of domestic animals will act as a natural protection. Apart from the intermediate zone, the ionising radiation will not be serious. Both the thermal flux and the gamma ray flux fall off extremely rapidly with distance so that while in the first three quarter mile there is an extremely high flux of gamma rays farther away it rapidly falls to negligible amounts.

I will not discuss the clinical syndromes of blast effects, primary or secondary, or the thermal effects, although they will account for most of the casualties both to man and to domestic animals. I am going to talk about the clinical effects which one might expect from the ionising radiation, the gamma rays. Assume that domestic animals are in light barns which, although they might be blown over, will not cause lethal damage to the animals and which are of sufficient thickness to protect against the thermal effects. Then, provided the animals are not damaged by falling beams and the like, it is possible to envisage domestic animals being damaged only by the gamma rays of the bomb.

The great thing to remember about damaging effects of any ionising radiation, including gamma rays, is that radiation attacks the process of division and multiplication of cells. The cytologists can demonstrate structural changes in the chromosomes, fragmentation, cross-union and deletions. Cells with such chromosomes may be able to exist but usually cannot satisfactorily divide. In practice, that means that any tissue which is regularly and constantly reproducing itself is the one which is most likely to be damaged. Given that axiom, I think at any time you will be able to work out for yourselves which are the tissues which will be most affected. In point of fact, these are the lymphatic tissues, the haematogenic tissues, the germinal epithelium and the mucosa of the intestinal tract. These four

stand out head and shoulders above any other. In a slightly lower degree of magnitude comes the skin.

What will be the effect of damage of the tissues which are constantly reproducing themselves? In the first place, from the pathologist's point of view, there will be an immediate and profound drop in the blood lymphocyte count. Within the first 24 to 48 hours, in the case of a lethal dose of gamma radiation, it will fall to 5 or 10 per cent. of the normal level and it will stay down there until death, or if it is a sub-lethal dose it will begin to recover about the fourth or fifth week. The next event is a fall in the polymorphonuclear leucocytes. There may be an initial rise in the polymorph count but that is very short-lived and by about the sixth or seventh day the count of the granular leucocytes will have fallen to the same level as that of the lymphocytes. The platelet count will behave in much the same way as the count of the granular leucocytes. The red cell count falls much more slowly and from that you can infer that the life in the peripheral blood of the lymphocytes is about five or six hours, of the granular leucocytes and the platelets of the order of two to four days, and of the red cell of the order of 100 days.

Within the first few hours human beings show clinically what is known as radiation sickness if the dose is sufficiently large, that is, if it is of the order of a lethal dose or half a lethal dose. Most domestic animals and experimental animals do not show this condition of radiation sickness which in the human being is characterised by nausea, vomiting and a feeding of profound prostration and muscular fatigue, with inability to drive the muscles to work. The experimental rodent hardly shows this preliminary phenomenon at all. The dog and animals which can vomit do show it. The first sign in the experimental animal—the mouse, the rat, the rabbit and the guinea-pig—is with a mid-lethal dose after about a week or a fortnight, depending on the exact height of the dose. Then a clinical syndrome of aplastic anaemia develops.

In the first place you get the signs which would be expected from agranulocytosis. No symptoms apparently are due to the lymphopenia which precedes the granulopenia. The function of the lymphocyte is still a mystery but it is thought by some to be bound up with the defence mechanism of the body and the production of specific antibodies. Certainly in this post-radiation stage there is a profound depreciation in the ability of man and the domestic animal to form antibodies to a new antigen. If a primary antigenic stimulus is given after a heavy dose of radiation, the antibody response is delayed in some cases for many weeks. If a primary antigenic stimulus is given before the irradiation, the antibody response seems to be unaffected. I would say, therefore, that if there is any protective inoculation to be done it should be started before any liability of exposure to radiation.

The main effect of the radiation is clinically observable in the stage of agranulocytosis. Animals get spontaneous necrosis in skin and mucous membrane. The mucous membrane in the mouth and throat undergo this septic necrosis with a failure of the usual granulation tissue response. The bacteria just invade the tissue and there is no inflammatory barrier to oppose it. Particularly does this occur in the intestinal tract where, as you remember, the intestinal mucosa is also seriously damaged and ulcers throughout the small and large intestine occur. There is a bacterial invasion from the gut into the blood stream. With the lack of production of the antibodies to new antigens the animal tends to die at about the second or third week following the mid-lethal dose with general sepsis and septicaemia.

In the later stages of the aplastic anaemia syndrome, after a fortnight or so, the lack of platelets and other factors in the clotting mechanism begins to make itself felt and at that stage following on the agranulocytic picture, you get this haemorrhagic syndrome with haemorrhages into the skin, into the mucous membrane, with haematuria, and blood in the stools. This haemorrhagic syndrome is another major cause of death.

The genital epithelium is one of the most sensitive tissues of the body and radiation leads to temporary sterility. The skin is a tissue which is intermediate between the most sensitive and the most resistant. The effect on the skin will be shown largely as epilation. The gamma radiation is so penetrating that less energy is absorbed in the superficial tissues and the skin than with longer-waved X-rays. Radiation burning, unless one is extremely close to the source of the gamma rays and the flux is extremely high, is less frequent than with X-rays.

In the critical mid-lethal dose range one will expect epilation to occur, and one will expect after rather superficial wounds from debris of any sort or even from minor punctures a loss of powers of repair of the skin so that invasion of these wounds by bacteria is to be anticipated and as far as possible an aseptic technique should be followed in the handling of any such wounds.

Let us now consider the important sub-lethal effects. One must talk about dosages even though I do not define the unit of dosage—the Röntgen. 500 R is considered to be a 50 per cent. lethal dose for man and the mortality curve is accepted to be sigmoid with mortality beginning at about 300 R and being 100 per cent. at 700 R. We have not a great deal of information about the relative sensitivity of domestic animals. The rabbit is the most resistant experimental animal and the guinea-pig and the dog are the most sensitive animals. The pig and goat are comparable with man, rather in the middle of the range. I know of no comparative studies of horses, cows and sheep, but one could expect them

to be within that range. If the domestic animal receives a dose between mid-lethal and something of the order of 100 R we may expect to see the radiation syndrome in a mild form. The animal will have a milder but not fatal degree of anaemia, and in the absence of other damage will be expected to recover, but if in addition to this sub-lethal dose of radiation it has minor surgical trauma or has a moderate or severe burn, the combined effects of the radiation syndrome and the other damage is likely to be fatal. The two will act together in terms of upset to the animal. The sub-lethal amount of ionising radiation will cause a failure of the normal recovery processes from trauma and burns.

That is the major effect which we have to expect from atomic weapons. The strategists expect that these bombs if they are dropped will be dropped and exploded in the air at a height at which it is calculated they will do the maximal physical damage from their blast effect. Strategists do envisage that for highly specific targets the bomb may be exploded at a lower level. The great feature of the nominal bomb, as exploded at Hiroshima and Nagasaki, was that it was exploded at such a height that virtually all fission products went up into the stratosphere and there was no problem about the deposition of radioactive fission products on the ground. If the bomb is exploded at the height of the New Mexico test explosion, say 100 feet, one would expect quite a significant proportion of fission products to be deposited in the immediate locality. In this country, even with a nominal bomb exploded fairly high in the air, the rain can bring down these products upon us so that the effects of radioactive fission products have to be considered.

It must not be forgotten that fission products can be obtained not only from bombs but from atomic piles and put into containers and dropped either as a radioactive missile or as a psychological warfare weapon. This radiological warfare is a possibility but is not probable because of certain technical difficulties. Fission products are isotopes of elements in the middle of the periodic table, most of the elements which the ordinary biologist has never heard of, elements from atomic weight of about 75 up to 150, including the rare earths. Some of these fission products will be deposited as an oxide and most of the oxides are insoluble in water, but it cannot be said dogmatically that they will be insoluble in body fluids. Also among the fission products are one or two elements of which the oxide is soluble, for example, barium and strontium, alkaline earths which will be metabolised in the same way as calcium in bone, and the element caesium which behaves like sodium. Furthermore, amongst the fission products is iodine which will be liberated in an elementary form. Iodine can be absorbed from the atmospheric air through the lung and specifically located in the thyroid. Other fission products present in the atmospheric air can be absorbed from the lung if they are soluble in body fluids. If

they are deposited on the ground and on herbage they can be consumed by the herbivorous animals and the strontium, barium and caesium will be absorbed. What are the hazards from these? Unless the concentration on the ground is extremely high it is unlikely that the deposition of these radioactive fission products would produce any immediate symptoms, but the great faculty of radioactive isotopes is to produce new growths.

These long-lived strontium and barium isotopes go to bone and may be expected to produce ultimately osteosarcoma. I know of no parallel in domestic animals, but in man one has the well-known radium dial painter's poisoning, where the early painters not taking adequate precautions against the radioactive material which they handled, absorbed through their lungs and intestinal tracts radium which, like strontium and barium, is in the group of alkaline earths and is deposited like calcium diffusely in bone. These workers suffered in large numbers from this osteosarcoma and osteitis or bone necrosis. Similar lesions would be expected in the case of animals which pick up significant quantities of radioactive strontium and barium.

If fission products are present in the air in sufficient quantities some of the insoluble oxides may be drawn into the deeper recesses of the lungs. The bulk of these insoluble oxides will, of course, be deposited in the upper respiratory tract and be coughed up or swallowed or whatever the domestic animal does with its sputum, but a certain amount will get into the lung. It certainly does in experimental animals and it may ultimately be expected to produce by radiation in the lung and the adjacent bronchi, new growths. The elementary iodine absorbed from the air or the intestinal tract will locate in the thyroid and may cause in the days to come, depending on the dose, symptoms of hypothyroidism or thyroid neoplasm.

Finally, if there is an extremely high concentration of fission products in the air and this high concentration gets deposited on the skins and coats of the animals, the radioactive fission products mostly being *beta* ray emitters will be expected to damage the skin of the animals and might in sufficient concentration cause radiation burns of the skin.

These probabilities are extremely low but they do deserve consideration from the veterinary angle. If I understand the strategists aright, it is expected that atom bombs will largely be dropped not over agricultural areas but over industrial areas and areas with high concentrations of men and materials, but it is always possible that within that area there may be something like slaughter yards where there is a high concentration of domestic animals, so that the problem has to be faced. The probability of atomic bombs being dropped over agricultural land is low and can only be expected, I think, from miscalculation or accident on the part of the air-crew. The effects might be expected to be extremely local, but the person on the spot, in conjunction with any Civil Defence authorities, will have to sort out the problem.

EXPERIMENTAL BREEDING OF DAIRY CATTLE FOR HOT CLIMATES*

By

J. P. MAULE M.A., Dip. Agric. (Cantab.), A.I.C.T.A.

There are two basic methods of breeding for improvement in the productivity of indigenous or local cattle stocks. There is, firstly, selection from the best available strains or types, without the introduction of any other breed. This is, in certain circumstances, the soundest long-range policy. The second method is by crossbreeding, which has tended to show more spectacular and rapid progress in the first few years, though it has a number of disadvantages.

In recent years increased attention has been paid to the problem of developing dairy cattle adapted to hot climates and able to give an economic yield of milk. This has become all the more important because of the need to raise the output of milk and butterfat for human consumption.

The problem is being tackled in two ways, either by the improvement of indigenous cattle—namely of zebu type—or by crossbreeding, mainly between zebu and European breeds.

Crossbreeding of cattle is purely a means to an end, and there are various alternatives for proceeding after the half-bred (F_1) generation. These include grading-up to one or other of the parent breeds, or mating alternately to sires of each breed—the so called criss-cross breeding. The development of new breeds or types of livestock is a direct outcome of crossbreeding combined with selection from within the crossbred types. In so far as zebu (*Bos indicus*) cattle are concerned, crossbreeding has two separate objectives. In the first place, attempts have been made to improve either beef or milking qualities of inferior native or indigenous zebu stock by crossing them with European breeds (*Bos taurus*). The results, in most cases, have not been successful; although the halfbred dairy cow, probably as a result of heterosis, certainly gives more milk than its indigenous dam, there is a rapid loss of constitution and lack of adaptation as the proportion of European blood increases. The alternative system of crossbreeding is designed to improve European stock by infusing into them the characteristic qualities of zebu cattle, such as hardiness, adaptability to hot climates, and ability to make full use of inferior foodstuffs. Work on the crossbreeding of cattle in the tropics for increased milk production has been carried out mainly in India, the West Indies, the Philippine Islands, and East Africa [9]. This includes the use of improved zebu breeds (e.g. the Sahiwal, or Montgomery of India) for crossing with European stock, and it is with this aspect that we are particularly concerned. The fact must not be overlooked, however, that some of the best zebu breeds, developed by careful selection for their milking or beef qualities, are being used to an increasing extent for upgrading or crossing

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with other, often less well developed, zebu types. Such work is in progress in Africa and South America, and in the East. This development will also be referred to below. Crossbreeding for beef production is outside the scope of this review, but the creation at the King Ranch, Texas, over a period of 25–30 years, of the Santa Gertrudis breed, which was recognized as such in 1940, served to focus attention on the possibilities of combining, in a new breed, the qualities of both zebu and European cattle. Kelley [1] has summarized the extent to which crossbreeding has been carried on in the tropics and subtropics, and has described the ecological considerations involved and the specialization of zebu cattle for tropical conditions.

Adaptation of Zebu Cattle

It is as well to mention briefly the qualities in zebu cattle which make them so much better suited to hot climates than European stock.

1. Zebu cattle have a higher tolerance for heat than European breeds.
2. They are tolerant of, or resistant to, many tropical diseases to which European cattle readily succumb.
3. They are credited with a greater efficiency of food utilization and lower food requirements for the production of milk, meat, or work than European breeds. There is, however, little definite proof of this contention.

The most important quality is that of the zebu's high tolerance for heat. By this is meant the animal's ability to balance the gain and loss of heat at a body temperature which is compatible with the proper functioning of the physiological processes. Heat tolerance depends on a number of factors, of which the most important are ability to avoid excessive heat absorption, low heat production by the animal, and ability to get rid of surplus heat fast enough.

Findlay [2] has recently reviewed this whole problem, and further work on the reactions of different types of European cattle is in progress. Bonsma [3], working in South Africa, has drawn attention to the importance of the type of coat and thickness of skin in different breeds. He has also shown that a black skin, and a smooth silky coat with white, yellow, or red hair colour, are the ideal combination to give high heat tolerance.

Breeding for Milk

There is still considerable conflict of opinion regarding the possibility of creating a tropical dairy breed combining the high yield of the European parent with the hardiness, heat tolerance, and adaptability of the zebu parent. The introduction of European cattle into most parts of the tropics, especially where the ultimate aim is the general raising of the level of milk production, is now generally ruled out as being unsatisfactory. Thus

Wright [4], describing work done in Ceylon, states: 'It cannot therefore be too strongly emphasized that European cattle suffer from certain grave disabilities in a tropical environment which render them quite unsuitable for milk production except in very limited areas, and under very specialized conditions of management,' and he concludes by saying: 'The detrimental effect of the present methods of uncontrolled crossbreeding (i.e. in Ceylon) is, indeed, apparent from even the most casual survey of the island's existing stock. It is true that such stock do meantime provide a fair proportion of the urban milk supplies, but only at a heavy cost in loss of size, conformation, and constitution, and in a short milking life.'

Much of the pioneer work on crossbreeding, as well as on the selection of indigenous zebu milch breeds, was carried out in India, where crossbreeding on the military dairy farms was designed to increase the production of milk, and little or no account was taken of draft qualities. Though crossbred cattle on the military dairy farms certainly gave higher yields of milk than did ordinary zebu cattle, this work was not of permanent value and did nothing towards the general improvement of Indian dairy cattle.

The recently published results of work carried out at Alabang stock farm in the Philippines between 1932 and 1940 [11] have tended to confirm the previous reports regarding the unsuitability of high-grade European cattle (in this case, Ayrshires) in the tropics. The yields of $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{7}{8}$ Ayrshire grades, resulting from crosses of Ayrshire bulls with indigenous or Indian cows, fell from 3212 lb in 276 days in the F₁ to 2549 lb in 240 days for the $\frac{3}{4}$ bred, and 1718 lb in 191 days for the $\frac{7}{8}$ grade, with 20 per cent. mortality in the latter and 47 per cent. mortality in the $\frac{15}{16}$ grade. By comparison, Red Sindhi cows (one of the smaller zebu breeds) averaged 2240 lb in 245 days.

Adaptation of Pure-Bred Cattle

Before dismissing the possibility of acclimatization of European dairy cattle in the tropics as impracticable, it is worth noting that Shorthorns, Friesians, and Jerseys have done well in Fiji [12]. Moreover, a strain of Jerseys in Jamaica has not shown any deterioration over a period of 38 years. Further reference to this strain is made below.

Experimental Breeding in the West Indies

In the West Indies, work has been in progress for over thirty years with the object of establishing a type of dairy cow combining both European and zebu blood and adapted to local conditions. In Trinidad [8], this work has been mainly with Holstein-Friesians and zebu stock derived from importations of Ongole, Mysore, and Sahiwal cattle from India; in Jamaica, the zebu blood used was largely derived from one Sahiwal bull, but crosses were made with Jersey, Guernsey, and Holstein cattle; while

in the Leeward Islands, crosses between Senegal (N'Dama) cattle and Red Polls have been made. The most detailed results have been obtained in Jamaica, where, of the three European dairy breeds tried, the Jersey has proved to be the most satisfactory.

An analysis of the three breeds and their zebu crosses has been made by Howe [5]. This analysis shows that the half-bred Jersey-zebu and Holstein-zebu gave, respectively, the highest percentage of butterfat and highest milk yields. There was little difference between the $\frac{3}{4}$ and $\frac{1}{2}$ Guernsey-zebu. This is shown below, all yields being given in lb for 305-day lactations:

	Purebred	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{7}{8}$	Av. all crossbreds	
					Milk	Butterfat %
Jersey	4,020	4,156	3,192	4,520	3,997	5.18
Guernsey	3,549	3,304	3,967	3,993	3,881	5.11
Holstein	—	3,740	5,104	5,506	3,142	4.25

More recently, a detailed study of the Jamaican work with Jerseys and Holsteins based on a comparison of different families has been made by Lecky [6]. The Jersey work has revealed two things not brought out in the earlier analysis. Firstly, that two families of pure-bred Jerseys have been bred which are apparently adapted to the local climatic conditions and have given consistently good milk yields. Secondly, that, contrary to Howes' results, grades containing from $\frac{1}{2}$ to $\frac{7}{8}$ Jersey blood gave the best results. Here, too, several families were found to give outstandingly good yields, and one in particular may be developed by inbreeding into a fixed type suitable for the tropics.

In his study, Lecky places emphasis on production of both milk and butterfat rather than on type, and has disregarded the conventional method of fractional breeding. Thus the families of grade Jersey-zebus all contain varying amounts of zebu blood. This zebu blood is mainly (but not entirely) derived from the one pure-bred Sahiwal bull which was imported to Jamaica in 1920. The average yields of these different families are as follows:

The Norbrook family is clearly outstanding, and the present intention is to line breed this and the Honeybelle family, and select from them two types of hardy, high-producing dairy cattle. It is interesting to note that three of the best cows in the Norbrook family had no Sahiwal blood, and that the 29 daughters of the Sahiwal bull averaged only 4693 lb milk and 243 lb of butterfat.

Yields of selected Jersey and Jersey-zebu families in Jamaica

Family	Number of Animals	Per centage with more than $\frac{3}{4}$ Jersey blood	Av. 305-day lactation yield		Max. milk yield lb
			Milk lb	Butterfat lb	
Pure-bred Jersey Honeybelle	29	—	5,327	263.6	7,293
Perfection	23	—	5,185	257.6	7,369
Grade Jersey Norbrook	20	75	6,474	354.4	11,393
Dolly	11	82	5,118	267.3	7,499
Madge	18	95	4,583	240.2	7,808
Ada	16	94	4,326	223.5	6,937

In comparing results with Holstein cattle in Jamaica [10] and in Trinidad, where Jerseys have not been imported, it is noteworthy that whereas the $\frac{3}{4}$ bred is considered to be the best type in Trinidad, the half-bred was found to be superior in Jamaica (see below). However, though there has been no analysis of the Trinidad work comparable with

Milk Yields of Holstein-Friesians in the West Indies

Type	Trinidad Av. lactation yield in lb	Jamaica Av. 305-day yield in lb
Pure-bred	2,979	—
$\frac{7}{8}$ grades	3,612	3,470
$\frac{3}{4}$ grades	4,486	5,104
$\frac{1}{2}$ grades	4,316	5,506
$\frac{1}{4}$ grades	3,287	—

that of the Jamaican, two facts emerge from the available reports. The first is that no strain or type of crossbred Holstein-Friesian has been bred possessing the hardiness and milking ability (especially in terms of butterfat) of the Jerseys and Jersey-zebu grades in Jamaica. Secondly, the pure-bred or high-grade Friesian, both in Trinidad and Jamaica, shows a striking loss of constitution, is slow to mature, and is difficult to get in calf. Thus in Jamaica the percentage of discards among grade Holstein-Friesians was as high as 53, average age at first calving for 61 cows in 1935-48 was $3\frac{1}{2}$ years, and the interval between calves was 18 months, while in Trinidad this interval was, for pure-breds, just over 17 months.

An entirely different approach has been made at the Allahabad Agricultural Institute in India, where an attempt is being made to evolve a type of Jersey $\times$ Red Sindhi cross with as little as $\frac{1}{32}$ part of Jersey blood. This experiment aims at improving the known dairy qualities of the Red Sindhi by infusing just sufficient Jersey blood to raise the total yield of milk and butterfat. The pure-bred Red Sindhi had an average yield of 3084 lb milk, and crossed with a Jersey bull the first cross cow gives nearly 50 per cent. more milk (4551 lb), but backcrossing of the Red Sindhi reduces this, and the $\frac{1}{16}$ Jersey gives only 26 per cent. more milk than the pure-bred Sindhi. Although the two breeds are said to cross very well, and both yield a high butterfat content, it seems problematical whether this type, if eventually fixed, will be greatly superior to the best strains of Red Sindhi in India. Average yields of over 4000 lb have been obtained with Sindhis at Government farms in India.

The value of the Red Sindhi for crossing with the Jersey in other countries where a high degree of heat tolerance is required is likely to be of special interest. Millen [7], when he started the Allahabad experiment, remarked on the fact that this crossbred had a particularly pleasing appearance, and that the two colours blended well. It is all the more interesting, therefore, to know that an experiment in crossing these two breeds is now being undertaken by the U. S. Department of Agriculture at Beltsville, Maryland. This is a long-range experiment begun late in 1946, when two Sindhi bulls and two heifers were imported from Allahabad. The bulls were mated to Jersey cows with the object of comparing the milk production, growth rate, and heat tolerance of these first crosses, and later of the back crosses, with the pure-bred Jerseys. To date, 29 females and 21 males have been born, and the first 10 F_1 heifers have completed their first lactations on thrice daily milking. The average yields of the ten heifers and that of their dams (first lactations) were as follows:

	Milk lb	Butterfat %	Butterfat lb	Age at First Calving
10 F_1 Sindhi $\times$ Jersey daughters	8,697	5.92	515	yr mths yr mths 1 11 to 2 2
9 Jersey dams . .	9,588	5.75	551	1 11 to 3 5

Growth rate has been slightly greater in the crossbred heifers than in either their Jersey dams or the pure-bred Sindhis. The F_1 crosses were less affected by exposure to a hot atmosphere and had a lower respiration rate than the Jerseys.

Although it is too early to assess the value of this experiment, these preliminary observations suggest that the Sindhi $\times$ Jersey cross may

provide a basis for developing a suitable heat-tolerant dairy cow. The F₁ heifers were mostly red in colour, but the F₂, back-cross to Jersey resembles the Jersey closely and has no hump at all.

To sum up this work on crossbreeding for milk production in the tropics and subtropics, there are three questions to be answered, namely: (1) What are the most suitable breeds with which to start? (2) To what extent has the development of crossbred types been successful? (3) What are the chances of creating new types of cattle suitable for general upgrading of dairy stock in the countries concerned?

The most suitable European breed seems undoubtedly to be the Jersey. This breed crosses well with the zebu and appears to be more adaptable to hot climates than other breeds. Of the zebu breeds, the Sahiwal and Red Sindhi both seem to be successful, although, of the two, the Sindhi may be preferable.

The second point is that, with the exception of the Jamaican work, very little progress has been made in developing a crossbred tropical dairy cow. However, there is some evidence to suggest that a crossbred Jersey-Sindhi or Jersey-Sahiwal cow may be developed.

The third point is by no means easy to answer at this stage. It does not follow that improved types of dairy cattle raised under the best farm conditions will be successful in the general upgrading of indigenous or unimproved dairy stock. Moreover, it is by no means certain that such a policy would be practicable or desirable in many areas. Thus it may be inferred that new types would at first be confined to special areas and to chosen breeders, and would not be widely distributed for breeding.

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A CASE OF ACARIASIS IN A DOG ASSOCIATED WITH MITES OF THE GENUS CHEYLETIELLA*

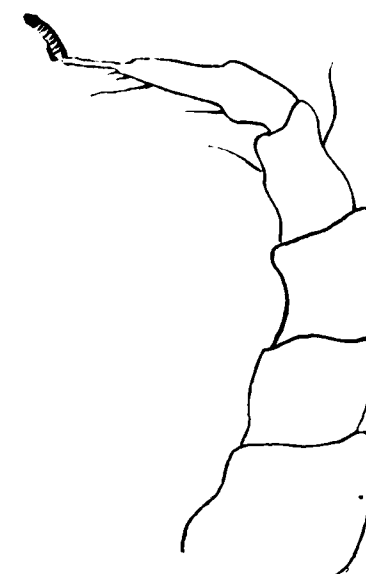
BY

D. D. NAGPAL, B.V.Sc.,

Section of Parasitology, Indian Veterinary Research Institute,
Mukteswar-Kumaun, U.P.

(With three figures in the text.).

Routine examination of skin scrapings from dogs revealed in one instance the presence of *Demodex folliculorum* in association with numerous specimens of a species of mite which, when examined in Berlese's medium, proved to be indistinguishable from *Cheyletiella parasitivorax*, (Ménio)* (Figs. 1 & 2) except for the fact that each leg was furnished with a comb-like structure borne on a short unjointed pedicle (Fig. 3). From the literature extant on the subject it is evident that this is the first record of the occurrence of *Cheyletiella* on domesticated animals in India. Mites of this genus are characterised by the enormous palpi attached to a distinct beak, each palp being composed of three articles, with a tubercle or papilla near the tip on the inner side.



Text Figure 3

Camera lucida drawing of the leg of *C. parasitivorax* showing comb like structure.

The symptoms exhibited by the dog consisted of severe pruritis with an ulcerous lesion over the middle of the neck behind both the ears. There was redness on the inner surface of the limbs extending beneath the belly, on

*The author is deeply indebted to Dr. S. K. Sen, retired Entomologist, for giving the tentative specific identification.

the shoulders, neck and the head. Hard papules were present in this area and the purulent matter exuded by them had dried into crusts. The diseased area was denuded of hairs, the skin being swollen, thickened and thrown into folds in many places. The dog had a very impoverished look.

Attempts to cure the animal with sulphur, iodine, tetmosal and several other acaricidal applications were unsuccessful.

The precise role played by members of the genus *Cheyletiella* has been the subject of controversy. The commonly occurring species *C. parasitivorax* has been regarded as a commensal, being a predator of the relatively soft-bodied parasites in association with which it usually occurs on its host. According to Magnin (1878), *C. parasitivorax* occurs in the company of Listrophorids upon which it feeds, thus representing Ewing's (1912) semi-parasitic stage in the evolution of a truly parasitic mite. This view is shared by Banks (1915) who described the species of the genus *Cheyletiella* as auxiliary parasite, often occurring on birds where they feed on other mites present. Michael (cited by Banks, 1915) reports *C. parasitivorax* as using rabbits fur as hunting forest. Other workers have similarly referred to *C. parasitivorax* as of benefit to its mammalian host by feeding upon species of *Listrophorus*, *Psorergates*, *Myobia* and *Notoedres*.

On the other hand, Picagalia (1886) has incriminated a species of *Cheyletiella* as causing dermatosis in a horse, but his opinion rests only on the fact that the hay on which the horse fed contained numerous examples of this mite. Pillers (1925) described a case of mange in domesticated rabbits which he believed to be due to actual attacks of *C. parasitivorax*. Many other workers have attributed atypical mange to this species but have not, as remarked by Cooper (1946), produced conclusive evidence to support their opinion. Kuschner (1940) recorded the occurrence of *C. parasitivorax* in a dog in association with *D. canis*. The round skin lesions caused by the latter were surrounded by red, somewhat elevated almost hairless "randzones" covered by a layer of heaped up, furfuraceous scales, among which *C. parasitivorax* were abundant. According to Kuschner, the cheyletid mites, although originally feeding on *Demodex*, also produced the "randzone" lesions in areas from which the follicular mites had been exterminated by them. In the absence of the young stages of *C. parasitivorax* in these areas, the latter may perhaps be regarded as representing no more than a form of damage to the skin caused by the cheyletids while foraging for *D. canis* to prey upon. *C. parasitivorax* is now known also to occur on hairs of cats, possibly sometimes feeding on the cat mange mite *Notoedres cati*. Olsen and Roth (1947) cite two instances of human dermatitis resulting from contact with cats infested by the mite. In one of these, an itching papulous eczema persisted for a year in all three members of a family but disappeared when a heavily infested cat which apparently was the source of infection was destroyed. Lomholt, Jersalid and Boas (1948) of the Danish Dermatological Society likewise reported the occurrence of dermatitis in human

Illustration of the mite *C. parasitivorax*



Fig. 2
(Female)

Fig. 1
(Male)

Photomicrographs were taken with Spencer's vertical camera, the source of illumination being the Spencer's daylight lamp.

Magnification is X 60 140



Seated (L. to R.)—Dr. S. N. Ray, Dr. H. N. Ray (O.C.P.S.), Dr. P. Bhattacharya (O.C.A.G.S.),
Dr. S. Datta, (Director), S. Balwant Singh (O.C.B.P.S.), B. R. Ramchandani (A.O.),
Dr. T. S. Gulrajani (R.O.), Sivaramakrishnan (Hyderabad).
Standing (1st row.)—Gopal Rai, S. L. Mukerjee, S. K. Chowdhury, K. C. Sinha, H. M. Bhatia (Punjab),
K. S. Gopalakrishnan (Madras), S. Shanmugham (Madras).
" (2nd row.)—S. Saroop, H. R. Mehta, N. S. Varma (U.P.), R. N. Sircar (Bihar).

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subjects belonging to two families which had cats heavily infested with *C. parasitivorax*.

As would appear from the description of the lesions in the case reported in this note, they were wholly attributable to *Demodex* mites. But the possibility cannot be excluded that these lesions were superimposed by others—although not clinically detectable—due to *C. parasitivorax*, for the dog in question did not prove amenable to treatment by means of drugs which had been used with success in the treatment of two other dogs affected with demodectic mange.

Acknowledgments

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AN UNDIAGNOSED DISEASE AMONG CATTLE AND BUFFALOES OF THE NORTH KANARA DISTRICT

By

H. V. KULKARNI,

Disease Investigation Officer, B.S. Poona.

History :—Outbreaks of a disease of cattle and buffaloes, undiagnosed so far and known as 'Helva Rog' locally, are being reported from about the year 1920. The disease is enzootic and sporadic in nature and does not appear in an epizootic form. It has been found to be prevalent in animals particularly of the hilly tracts of the Sirsi, Siddapur, Yellapur and Kumtha talukas of the North Kanara District. This area is on the eastern slope of the Western Ghats and is thickly covered by forest and perennial vegetation. The soil is damp almost throughout the year. The climate is cool, very humid and malarious. The annual rainfall is between 80 to 150 inches. Betel-nut and leaves, cocoanut, rice, cardamom and plantains are the chief products of this tract which are cultivated with the help of large

springs of water found abundantly there. The whole plateau is between 2500 to 3000 feet above the sea level.

This disease has been under investigation for the past twenty years by different workers and has been interpreted variously as Pectoral form of H.S., Surra etc.

Symptoms:—The prominent symptoms reported in the affected cases are loss of appetite, high temperature, profuse viscid salivation, swelling and protrusion of the tongue with a slight swelling, difficult breathing, impaction or tympanitis, arched back, stiffness of all the four but specially of the hind legs, inability to stand as if attacked by paraplegia, sometimes oedema of thighs and lower portion of the belly, and eversion of and bloody discharge from the rectum in a few cases.

Course of the disease:—The disease runs a course varying from a few hours to five to six days.

Mortality:—Mortality varies from 25 per cent to 90 per cent. The co-efficient of attacks and deaths in relation to cattle population was once found to be 4.3 percent and 3.3 percent respectively.

Seasonal occurrence:—The disease breaks out in middle and end of the monsoon. Outbreaks are generally recorded from August to November every year.

Investigation:—During the year 1933-34, an outbreak of this disease in cattle and buffaloes was studied and a Trypanosome (?) was found in the blood of an affected case. It was, however, not possible to incriminate definitely this Trypanosome as the causal agent of the disease.

In the year 1934-35, an investigation conducted on one affected animal found in an outbreak showed that the disease was only a pectoral form of H.S.

During the year 1936-37, in the blood smears of two affected cows a large Trypanosome was detected and it was identified as *T. theileri* by the Indian Veterinary Research-Institute. A third case in a heifer showed in the blood circulation a microfilaria. Three more affected cattle showed no organisms in their blood smears. Blood samples from the last three cases were collected and three experimental animals—two heifers and one bull—were each injected with 10 c.c. of the mixture of the three blood-samples. The two heifers developed fever on about the tenth day and showed a secondary rise of temperature on the 15th day. In the blood smears of one of these animals during the height of fever, a few *T. evansi* were detected (?).

In the year 1947-48, twelve villages were visited which were reported to be previously affected with the disease. Blood smears from

55 animals from the sheds in which cases were reported to have occurred were found negative.

14 samples of serum from debilitated animals from villages reported to be affected with the obscure disease were sent to the Indian Veterinary Research Institute, for complement fixation test, of which two samples proved positive for surra.

During the course of investigation of this disease, smears taken before and after death were found negative except in a very few cases in which a few Trypanosomes were detected.

Conclusion:—Trypanosomiasis or pectoral form of H. S. was the conclusion arrived at from the investigation undertaken in the past.

Investigation carried out during the year 1951-52

During my stay at Sirsi in the month September, 1951, two reports of this disease were received.

(I) **Village Sannahalli (Taluka Sirsi):**—No sooner a report from the Police Patel was received, this place was visited with the object of getting a case or cases for examination and investigation.

It was reported by the villagers that one bullock suddenly died of the disease locally known as 'Helva-Rog' a few days back. One heifer which was reported to be suffering for a period of about 8 days was available for examination.

None of the symptoms recorded in the past could be observed as the said animal was on the point of recovery. Line firing marks were noticed on its lumber region. The animal was found to be able to walk.

Blood of this animal was collected for C. F. Test. Blood and faeces yielded negative results.

(II) **Village Kannalli (Taluka Sirsi):**—On receipt of a report about deaths in cattle, this village was immediately visited. It was reported by the villagers that all the four affected animals (3 cows and one bullock) had suddenly died on the previous day showing symptoms such as, loss of appetite, salivation, difficult breathing, tympanitis, inability to stand as if attacked by paraplegia, eversion of rectum and death within 6 to 12 hours.

At the time of my visit to this place there was no affected animal for examination and investigation, but a cow which had died a few hours back was available for post mortem examination.

Post mortem Lesions:—The prominent lesions noticed were congestion of brain and lungs, haemorrhagic endocarditis with a small quantity of yellowish serous exudate in the pericardial cavity, severe gastro-enteritis,

intestinal contents bloody and yellowish grey, spleen, liver and kidneys congested, thoracic and abdominal cavities contained small amount of yellowish and reddish tinged serous exudate, and lymphatic glands slightly congested and enlarged.

Materials such as brain, spinal cord, cerebro-spinal fluid, heart-blood, pieces of spleen, liver, heart, and lungs etc., were collected for various laboratory tests and examinations.

Biological tests:—Two laboratory animals—one guinea pig and one rabbit—were subcutaneously injected at about 8 p.m. on 27th September 1951 with the heart blood collected from the cow post-mortem. The rabbit died on 30th September showing symptoms of loss of appetite, dullness, fever and inability to stand or move. Post-mortem showed severe gastro-enteritis and haemorrhagic tracheitis indicative of Pasteurellosis.

The guinea pig was found resistant.

(b) 57 days old culture was used to prepare the suspension of washings. A loopful of growth on agar slants sown with the cow's heart blood was diluted in 2 c.c. of double distilled water and 1 c.c. of this culture washing was injected into a healthy rabbit subcutaneously on 22nd November, 1951. The rabbit died on 1-12-1951 showing the same symptoms described above. Post-mortem lesions were more or less the same as stated above.

(c) Another healthy rabbit was injected on 22-11-1951, with the culture washing prepared from the growth (52 days old culture) found on agar slant sown with the first rabbit's heart blood and it died on 6-12-1951. Clinical symptoms and post-mortem appearances noted above were observed in this case also.

Cultural examination:—Heart blood collected from the cow was sown on agar slants and *P. bovisseptica* was isolated. Smears prepared from the growth found developing on culture media were found positive for Pasteurella-like organisms.

Subcultures were made and smears prepared from these growth also yielded positive results for the presence of bi-polar organisms.

Heart blood of the rabbit (No. 1) (injected with heart blood of a cow on 27th September and died on 30th September) was sown on agar slants and, after 24 hours, smears prepared from the growth, were examined with positive results for the presence of organisms indistinguishable from Pasteurella organisms.

(b) Heart blood of the rabbit No. 2 (which was injected subcutaneously on 22nd November, with 1 c.c. culture washings (57 days old culture) and died on 1-12-1951,) was sown on agar slants.

Typical growth was found developing and smears prepared from it were positive for H. S.

(c) Heart blood of rabbit No. 3 (which was injected subcutaneously on 22nd November, with 1 c.c. culture washing (52 days old culture) and died on 6-12-1951) was sown on agar slants and smears prepared from the growth were positive for H. S.

Microscopical examination:—Smears prepared from the heart blood of the cow and of the three rabbits were examined and bipolar organisms identical with *P. bovisseptica* were found present.

Pathological Examination:—The following is the report on the examination of materials of the cow sent to the Bombay Veterinary College.

(1) **Spinal cord:**—Three sections of the spinal cord were examined. They show slight autolysis, but no pathological lesions; stained by Giemsa—no organisms seen.

(2) **Heart:**—Sections show autolytic changes. Blood vessels are congested; sarcosporidia are present.

(3) **Lung:**—Shows autolytic changes, which have masked the pathological lesions. However, congestion, oedema and emphysema can be made out.

(4) **Spleen:**—Due to autolysis staining is poor. No pathological changes are seen.

(5) **Liver:**—Putrefactive changes and organisms are present.

Chemical Analysis:—In order to rule out any possibility of deaths due to any poisoning, stomach contents of the said cow were forwarded to the Chemical Analyser, Bombay, and the results were negative.

Materials collected at Sirsi have been forwarded to the Indian Veterinary Research Institute and Bombay Veterinary College for various laboratory tests and examinations.

Materials sent to the Bombay Veterinary College, have on microscopical and cultural examinations and biological tests, proved negative for Pasteurellosis except the cerebrospinal fluid which has proved pathogenic to rabbits and a strain of Pasteurella has been isolated.

Material forwarded to the I.V.R.I. yielded negative results. "It probably got inert by the time it reached Mukteswar."

Conclusion

(a) During the year 1934, Shri R. N. Naik, the then Veterinary Investigation Officer, Bombay state, had an opportunity to attend a case in a bullock and he had, on microscopical examination, detected bi-polar

organisms identical with the *P. bovissepticus* in heart blood smears of the said animal and declared the disease was H. S.

From the clinical symptoms, post mortem lesions and the presence of Pasteurella organisms in the heart blood smears, he described the condition to be the pectoral form of H. S.

(b) Investigational work was further carried out and in a very few cases Tryps. were detected in the blood smears of affected animals as well as in one of the experimental animals.

A few samples of serum from animals from villages reported to be affected with this disease condition were sent for C. F. Test and about 15 per cent. of the samples were found positive for Surra.

In the absence of positive results for the presence of Trypanosomes in all the affected cases and in view of the bovines serving as carriers of surra parasites, the disease condition cannot be said to be Trypanosomiasis.

(c) From the symptoms gathered and the post mortem lesions observed by the author as well as from the results of the microscopical and cultural examinations and biological tests carried out and obtained in the Poona laboratory, the disease can be said to be an intestinal form of H. S.

(d) The writer had a similar experience in an outbreak of obscure origin in cattle of Yervada Prison Jail, Poona, and the material collected in that outbreak, on microscopical and cultural examination and biological test, proved positive for H. S. Symptoms heard of and post-mortem findings noticed were exactly similar to those observed at Sirsi.

(e) Symptoms recorded in the past were also seen by the writer on two occasions, while serving in the Baroda State.

The usual form of H.S. that is ordinarily reported in this State is the Exanthematous (Oedematous) one and the disease is mostly prevalent amongst buffaloes. But, from the above findings, it would appear that the intestinal form of the disease is also prevalent and in which the animals mostly affected have been found to be cattle. Buffaloes are not, however, exempted. They have also died due to this form of the disease in many outbreaks,

(f) Past records maintained at the Sirsi and Siddapur dispensaries were studied and it was found that the outbreaks of Anthrax, H. S. and Surra have been microscopically confirmed in this area during previous years.

Further it was observed that the intensity of H. S. infection was greater than that of Anthrax and Surra.

(g) In brief, it may be said, in general, that the disease condition prevailing in cattle and buffaloes of this area is only Pasteurellosis of the oedematous, pectoral or intestinal form.

(h) In view of the above findings and experience of the author, it is suggested that vaccination against H. S. may be undertaken before the commencement of the rainy season in a few groups of villages where the H. S. and the so called undiagnosed disease have been recorded seasonally with a view to further confirm the diagnosis of the disease and also to win the confidence of the cattle owners about the nature of the disease.

In this connection, it will not be out of place, to mention that one cultivator in this area possessing about a hundred cattle was losing a few animals every year due to this undiagnosed disease but during the past 15 to 16 years he was persistent in getting his all animals protected against H. S. just before the onset of monsoon and as per his statement he did not lose a single animal, since then.

MERCUROCHROME AS SEMEN STAIN

By

C. KRISHNA RAO, G.M.V.C., B.V.Sc., M.S., (Calif.),
Department of Animal Husbandry, Madras Veterinary College.

Mercurochrome (disodium hydroxymercuridibromfluorescein) has recently been introduced as a histological stain (Sharma, 1951) and 1 to 2% aqueous solution was reported to give excellent results. It was therefore tried for staining the smears of semen of some farm animals to determine its suitability as a semen stain and the preliminary work on this aspect is presented in this note.

Methods

The semen of the buffalo-bull and the bull and the epididymal contents of the stallion, ram and buck were used in this investigation. Simple air-drying was employed for the fixation of the smears. The following formulas of mercurochrome were tried:

1.1 to 10% solution in distilled water,

2.1% solution in aniline water (aniline water was made by mixing 4 c.c. of aniline oil and 100 c.c. of distilled water),

3.1% solution in 5% carbol water, and

4.1% alcoholic solution (1 gram of stain dissolved in 100 c.c. of 95% alcohol).

All the above stains were filtered before use.

The period of staining varied from five seconds to fifteen minutes after which the smears were washed in running tap water and air-dried or pressed in the folds of a blotting paper for quick drying.

Results

Of the various formulas tried the aqueous solution was found to be the best. The different strengths of aqueous mercurochrome did not show much variation in their staining capacity and 1% solution gave results quite comparable to those obtained with stronger solutions. With 1% aqueous solution even exposure for five seconds produced a clear pink staining and sperm morphology was very clear. With longer exposures the intensity of staining increases but even after fifteen minutes' exposure there is no danger of overstaining. After staining for fifteen to thirty seconds the sperm took a bright pink colour and this amount of staining gave all the clarity and uniformity of staining required for morphological study in routine artificial insemination work. When deeper staining is desired smears may be stained for one minute but staining for longer periods is of no great advantage. The neck stained lighter than the rest of the sperm. Bacteria that were present also took the same intensity of stain as the sperm. 1% aqueous solution remains in good condition for several months and smears stained with it remain without fading for over a year. The other formulas tried in this investigation also gave satisfactory results but were slightly inferior to the aqueous solution.

Mercurochrome shows great promise as a semen stain. Unlike certain other stains like crystal-violet and basic fuchsin which stain both the sperm and the background material, thereby necessitating the use of a clearing agent like chlorazene, mercurochrome stains the spermatozoa alone which appear bright pink against a white background. 1% aqueous mercurochrome is highly recommended for staining semen smears for the following reasons:

1. No clearing agent is required.
2. Staining is rapid, a period of fifteen to thirty seconds being sufficient.
3. Staining is excellent and stained smears remain in excellent condition without fading for over one year.

The author desires to thank Dr. I. M. Azizuddin, Principal, Madras Veterinary College for the interest shown in this investigation and Dr. V. R. Rajagopalan, Director of Animal Husbandry, Madras, for permission to publish this note.

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SALMONELLOSIS IN CHICKENS (A field and laboratory study of three outbreaks)

By

S. G. DIXIT, G.B.V.C., P.G.,

Assistant Disease Investigation Officer (Poultry), Bombay State, Poona.

Introduction:—Salmonellosis has been known to occur amongst poultry for quite a number of years now. Several outbreaks caused by *Salmonella pullorum* are on record in foreign countries, but there are very few on record in this country. In this paper it is intended to describe in detail three outbreaks caused by motile salmonellas on a farm near Poona. One of the outbreaks was described in a previous paper published in the *Indian Veterinary Journal* (1950 July).

History of outbreaks:—On a farm near Poona, heavy chicken mortality was recorded during the hatching seasons of 1948, '49 and '50. Hatching season in this part of the country commences from September and lasts upto the end of March each year. It was, however, the usual practice on this farm to start hatching of duck eggs from July onwards. In August 1948, some of the duck eggs kept for hatching failed to hatch, inspite of the fact that embryos had developed to size. This was attributed to some fault in the incubator temperature or moisture in the incubator which has to be especially attended very carefully in case of duck eggs.

Subsequent to this the hatches of eggs (fowls) also suffered and the percentage of dead-in-shell started getting high, and also the mortality amongst chickens during the first week of life. During 1949 hatching season, the same story was repeated, the disease, starting with dead-in-shell in duck eggs, spread over to ducklings and then to chickens.

In 1950 hatching season, however, there was considerable mortality amongst duck eggs and ducklings but the percentage of dead-in-shell in fowl eggs and also the 1st week mortality amongst chickens was more or less normal except in three broods. This time the incubators were thoroughly disinfected before setting a hatch and so mortality occurred only amongst chickens (between the age of 0 and 12 days) when they came to brooders (the three broods) the disinfection of which was probably not thorough.

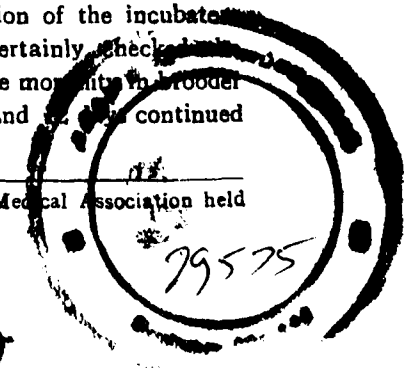
This time, careful attention was paid to disinfection of the incubators during the middle of the hatching season, which certainly checked the dead-in-shell percentage to an appreciable extent but the mortality in brooder houses amongst the chickens between the age of 0 and 12 days continued practically throughout the hatching season.

*Read at the 29th Conference of the Bombay Veterinary Medical Association held at Bombay on 28th December 1951.

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Symptoms:—Majority of the hatches on this farm during 1948 and 1949 hatching season had high percentage of dead-in-shell varying between 30 and 50. The mortality amongst chickens that used to get hatched was also considerably high until about the 7th day after hatching, whereafter it used to be on the decline, though it usually continued upto 12th day.

The chickens used to doze for a few hours with closed eyes followed by inability to stand, lie down on a side and die in about 24 hours from the onset of these symptoms. Diarrhoea with white pasty material sticking to vent was marked in many cases. Some of the chickens that had died in shell also presented this diarrhoeic symptom as though they had suffered from diarrhoea right inside the shell. The percentage of mortality amongst affected was over 90, while over 50% of the chickens hatched out were lost during the first 12 days of life.

Post-mortem lesions:—Hundreds of dead-in-shell chickens and ducklings were opened, when the following post-mortem lesions were noticed.

"Paleness of internal organs particularly spleen, haemorrhagic spots on the liver and spleen in few cases, walnut size yolk sacs which were bloated up in most cases".

The post-mortem lesions in chickens that died during the first week of life were more constant than in those that died in the shell and consisted as follows.

"Serous exudate under the skin, paleness of internal organs, with small white necrotic spots on the liver and spleen (in about 10% cases). Yolk sacs were unabsorbed and were of considerable size and presented greenish discolouration in few. Gall bladder distended. Nothing abnormal with rest of the organs. Surprisingly enough, though diarrhoea was a constant symptom, intestines were rarely found to be congested to any appreciable extent."

Laboratory study:—In the 1948 outbreak, cultural work was undertaken only to a limited extent and it was not possible to isolate salmonella organism from dead-in-shell. An unidentified motile salmonella was, however, recovered from the liver and spleen of chickens that died during the 1st week of life. That year the work ended there.

In 1949, extensive cultural work was undertaken, but all attempts to isolate salmonella from dead-in-shell with the exception of two cases sent to Indian Veterinary Research Institute failed. That Institute, however, isolated a motile salmonella from the liver and spleen of dead-in-shell ducklings. Other organisms recovered from dead-in-shell included (1) *B. coli*, (2) *B. aerogenes*, (3) *B. alcalingens*, (4) *B. pyocyaneus*. The occurrence of the last one particularly, though of some significance, it is doubtful if any importance is to be attached to it.

Out of 127 post-mortems on chickens that died during the first week of life, isolation of organisms from heart blood, spleen or liver was attempted in only 30 cases (fresh deaths or killed in extremis). Out of these it was possible to isolate a motile salmonella from 16 cases (work at the Army Pathological Laboratory, Poona, and the Indian Veterinary Research Institute). Further typing work at the Indian Veterinary Research Institute revealed that the organism belonged to group E of Kauffmann White Scheme for grouping salmonellas, while from serological typing done at the Army pathological Laboratory, Poona, the organism was identified as *S. anatum*. Incidentally *S. anatum* belongs to group E of Kauffmann White Scheme. Isolation of these organisms was possible from heart blood and yolk sac, the latter, appeared to be a valuable organ for isolation work.

In 1950 hatching season, the percentage of dead-in-shell in duck eggs was normal though the disease appeared amongst ducklings. A motile salmonella belonging to group E of Kauffmann White Scheme was isolated. Only one of the three broods (chickens) that suffered over 70% mortality was available for examination.

The post-mortem lesions mentioned before were more or less constant in all the 50 cases post-mortemed. Isolation of causal organism was attempted in 15 cases, from 7 of which it was possible to isolate salmonella. Further typing of the organisms done at the Army Pathological Laboratory, Poona, revealed the organism to be *S. typhimurium*.

Pathogenicity tests:—Pathogenicity tests were carried out with salmonella organisms isolated from 6 cases (5 from 1949 *S. anatum*, one from 1950, *S. typhimurium*). Chickens were specially hatched out for the purpose. Ten day old cultures were used to prepare the suspension of culture washings. A loopful of organisms was diluted in 5 c.c. of double distilled water. This culture wash was prepared just before use and the dose used was 0.1 to 0.2 c.c. The chickens were injected subcutaneously. Four chickens were used in each lot, with four controls. The controls alone failed to show any illness.

The organisms proved non-pathogenic when tested on adult birds in which no symptoms were produced at all after artificial infection.

Agglutination tests with Salmonella antigen:—During 1949, while the outbreak was still in progress, all the laying stock on this farm (308 hens) was tested with *S. pullorum* antigen obtained from the Indian Veterinary Research Institute. Quick whole blood test was carried out, but none of the layers showed any agglutination at all.

At the instance of the Officer-in-charge, Poultry Research Section, Indian Veterinary Research Institute, Izatnagar, the laying stock was further tested with antigen prepared from locally isolated strain of Salmonella (*S. anatum*). By the time this was done the farm had disposed of nearly half

the number of layers. Three tests were carried out and the results were as shown below.

S. No.	No. of birds tested.	No. that showed suspicious agglutination.
1st Test	120	11
2nd Test	134	6
3rd Test	99	5

All these five were tested with tube test after a month from the last test, but all proved negative.

The results indicate that out of 11 hens that showed suspicious agglutination on 1st test, 5 got cleared of the infection on second test and one more got cleared up on the third test. The five that showed suspicious agglutination on the final test (third) were tested with tube test after a month from the 3rd test, but all were found to be negative.

Since it was a significant fact that all the three outbreaks to start with were from duck eggs kept for hatching, the 17 ducks kept on this farm were tested with *S. pullorum* and *S. anatum* antigens. Tube tests were carried out and four ducks have shown positive agglutination to *S. anatum* antigen. With a view to find out the source of infection, the water from the *nala* (sewage water) running just behind the Poultry Farm, where ducks were allowed to swim, was bacteriologically examined. A non-lactose fermenting organism has been isolated from the water. The infection appeared much concentrated in the portion of the *nala* just where ducks were allowed to swim, though three samples were taken at a distance of a furlong from each other. Further typing of the organism is in progress.

Treatment:—During 1948, the outbreak appeared in a severe form and the only treatment tried was substitution of buttermilk for drinking water. This had hardly any effect on mortality which continued till the end of hatching season.

During 1949 and '50, however, sanitary measures along with thorough disinfection of incubators with formaldehyde vapour were rigidly enforced and that favourably affected the dead-in-shell percentage. Sulphamezathine given in drinking water for first five days of life also failed to check the mortality amongst chickens. The drug was, however, used for a limited number of batches and has to be tried a little more before discarding.

Summary

- (1) Three outbreaks caused by two motile strains of salmonella organisms were recorded on a farm near Poona, during three consecutive hatching seasons.
- (2) Source of infection for all the three outbreaks appeared to be duck eggs kept for hatching on the farm.

(3) Salmonella organisms (motile) could be isolated from chickens. Heart blood, liver and spleen, and yolk from yolk sacs were the organs from which isolation was possible. Yolk sac was the organ of choice for isolation work and it rarely failed.

(4) The organisms were further typed serologically and were identified as *S. anatum* (1949), and *S. typhi-murium* (1950).

(5) Pathogenicity tests were carried out with isolated strains (1949 and 1950) and both were found to be highly pathogenic for one day old chickens though they were non-pathogenic to adult birds.

(6) Treatment with substitution of buttermilk for drinking water was of very little use while Sulphamezathine (I. C. I.) in drinking water also failed to reduce chicken mortality between 1st and 5th day of life. The drug, however, needs to be tried sufficiently.

(7) Disinfection of incubators with formaldehyde gas brought down the percentage of dead-in-shell to some extent.

(8) Testing of layers with antigen in the case of motile salmonellas is of little advantage and the infection gets cleared by itself during the course of one season.

"ABNORMAL VENA HEMIAZYGOS" (IN THE OX)*

By

P. SRINIVASAN, B.A., G.M.V.C., B.V.Sc., M.Sc.,

Assistant Lecturer in Anatomy, Madras Veterinary College.

The vena hemiazygos in the ox passes along the left face of the aorta, turns down across the left side of the aortic arch, runs backwards over the left auricle and joining the great cardiac vein opens into the coronary sinus. (Fig. 1.)

The following interesting abnormality was noticed for the first time in a dissection subject, a buffalo calf. Instead of turning downwards, the vein continued its course forwards in the anterior mediastinum on the left face of the oesophagus, related below to the vagus and joined the subcostal vein at the level of the union of the latter with the dorsal and vertebral veins. (Fig. 2)

A study of the developmental history of the azygos veins will reveal the nature of the abnormality.

The venous drainage of the body wall in the earliest stages of the embryo is effected by the anterior and posterior cardinal veins on either side. The veins on each side meet in a common cardinal vein or the Duct of Cuvier which opens into the sinus venosus. The anterior cardinal veins become the

*The author is at present, Lecturer in Anatomy, College of Veterinary Science, and Animal Husbandry, Osmania University, Hyderabad—Deccan.

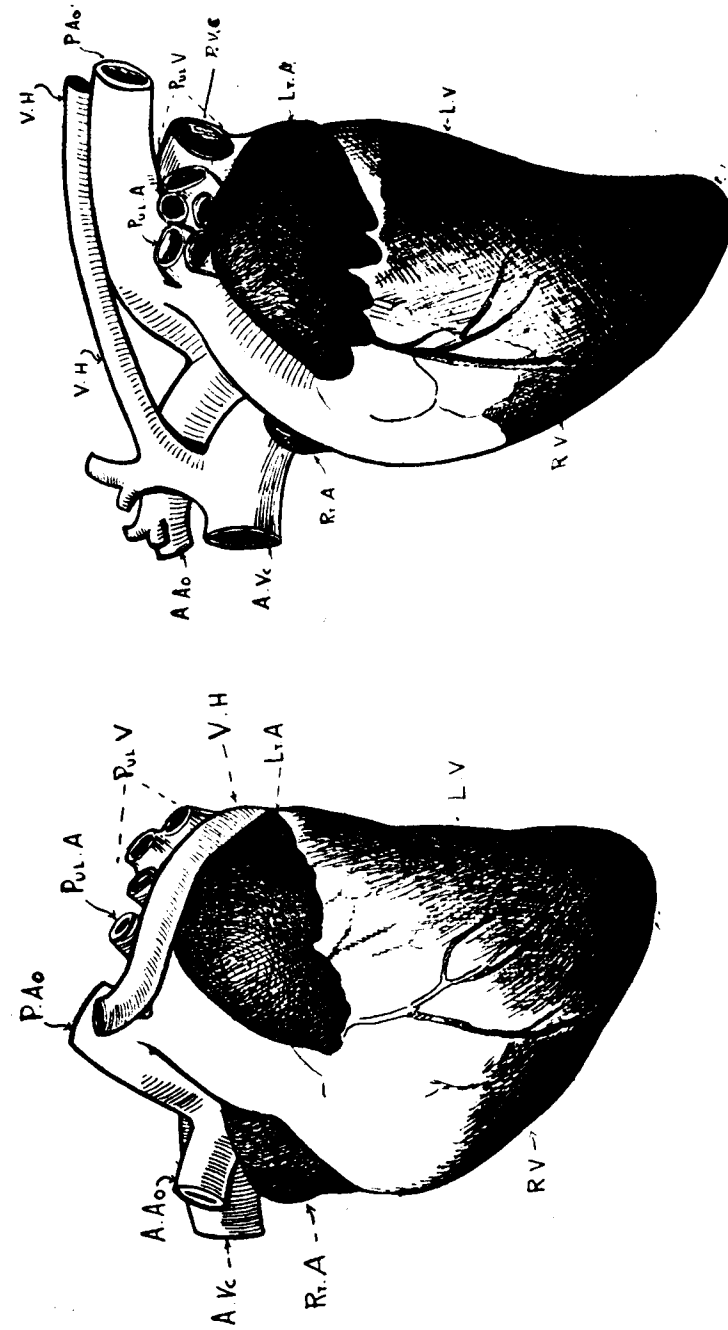


Fig. 1

Fig. 2

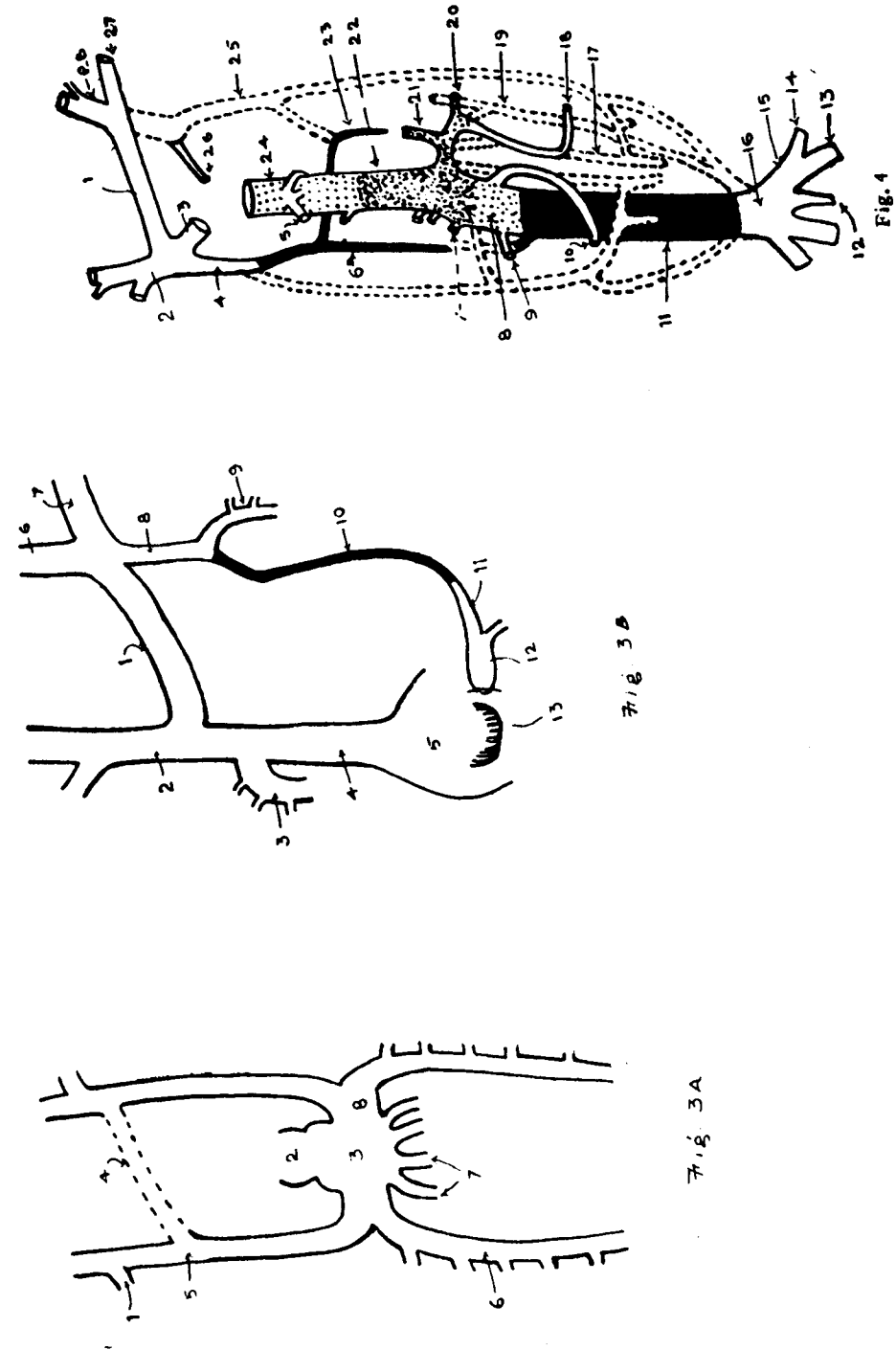


Fig. 3A

Fig. 3B

Fig. 4

DESCRIPTION OF FIGS. 1-4

Fig. 1. Heart - Ox (Lt. view)

A.Ao. : ant. aorta ; P.Ao. : post. aorta ; A. Vc. : anterior vena cava ;
 Pul. A. : pulmonary artery ; Pul. V. : pulmonary veins ; Rt. A. : rt. auricle ;
 Lt. A. : Lt. auricle ; V. H. : Vena Hemiazygos ; R. V. : Rt. Ventricle ; L. V. :
 Lt. Ventricle.

Fig. 2. Heart - Ox (Lt. view) abnormality

A.Ao. : ant. aorta ; P. Ao. : post aorta ; V. H. : Vena Hemiazygos ;
 A. Vc. : ant. venacava ; P. Vc. : post. vena cava ; Pul. A. : pulmonary artery ;
 Pul. V. : pulmonary vein ; Rt. A. : Rt. auricle ; Lt. A. : Lt. auricle ; R. V. :
 Rt. ventricle ; L. V. : Lt. ventricle.

Figs. 3 A & B. Diagrams showing the origin of the branches of the anterior venacava and coronary sinus

Fig. 3 a—1. Sub-clavian ; 2. atrium ; 3. Sinus venosus ; 4. Left innominate ; 5. Precardinal ; 6. Post cardinal ; 7. Vitelline umbilical ; 8. Left Duct of Cuvier.

Fig. 3 b—1. Lt. innominate ; 2. Rt. innominate ; 3. Accessory azygos ;
 4. Anterior vena cava ; 5. Rt. atrium ; 6. Lt. internal jugular ; 7. Lt. Sub-clavian ; 8. Lt. anterior intercostal (Lt. precardinal) ; 9. Lt. anterior intercostal (Post. cardinal) ; 10. Ligament of Marshall (Lt. duct of Cuvier.) ; 11. Vein of Marshall ; 12. Coronary Sinus ; 13. Eustachian valve.

Fig. 4. Diagram representing later stages of development of the Post. vena cava

1. Lt. innominate ; 2. Rt. innominate ; 3. anterior vena cava ; 4. azygos (Pars post. cardinal) ; 5. Hepatic ; 6. Azygos (pars precardinal) ; 7. Rt. suprarenal ; 8. Post. vena cava (Pars renalis) ; 9. Rt. renal (Renal I) ; 10. Rt. sex vein ; 11. Post. vena cava (Pars precardinal) ; 12. middle sacral ; 13. Lt. hypogastric ; 14. Lt. ext. Iliac ; 15. Lt. common iliac ; 16. Post. cardinal anastomosis ; 17. Lt. subcardinal (degen.) ; 18. Lt. sex vein ; 19. Lt. precardinal (degen.) ; 20. Lt. renal (renal collar) ; 21. Lt. supra renal (Lt. sub-cardinal) ; 22. Post. vena cava (Pars hepatica) ; 23. Lt. post. cardinal (degen.) ; 26. Coronary sinus (Lt. duct of Cuvier) ; 27. Lt. Subclavian ; 28. Lt. internal jugular.

internal jugular veins of the adult and the external jugular veins develop secondarily as vessels draining the mandibular region and opening into the internal jugular veins. An obliquely directed vein, the left innominate vein, arises from the left internal jugular and joins the right internal jugular and directs the venous flow from the left to the right. (Fig. 3). Subsequently only the most cranial portion of the internal jugular caudal to the left innominate retains its lumen constituting the left superior intercostal vein of the adult while the rest of it, up to the Cuvierian duct, becomes impervious—the ligament of Marshall (oblique vein)—and the horn of the sinus venosus becomes transformed into the coronary sinus. The right internal jugular caudal to the junction of the left innominate and the right Cuvierian duct form the anterior vena cava of the adult. (Fig. 4.)

The posterior cardinals are transitory and soon degenerate completely except for the small proximal portions which form the roots of the azygos veins in the adult. The azygos veins are developed chiefly from the prerenal segments of the supracardinal veins. In man and most other mammals (horse, dog etc.) the two azygos veins are connected through a transverse anastomotic branch. Subsequently the left supracardinal cranial to the anastomotic branch degenerates and the caudal part, the vena hemiazygos drains into the vena azygos on the right. In the ox and pig, however, the prerenal segment of the left supracardinal persists completely and joins the proximal part of the left post cardinal. Hence the vena hemiazygos in these animals opens into the coronary sinus through the left Cuvierian duct. During the course of the migration of the sinus venosus towards the right, the vena hemiazygos along with the left Cuvierian duct is pulled around the heart and hence lies against the heart wall for a considerable distance. As the heart muscle grows in bulk, the cardiac veins find their way into this vessel.

In conclusion it may be summarised that in the ox and pig the vena hemiazygos is composed of the prerenal segment of the left supracardinal, the root of the left post cardinal and the left Cuvierian duct. In the present instance, (due to very early degeneration of the left Cuvierian duct even before the migration of the heart into the thorax) the vena hemiazygos (post cardinal segment) is brought into communication with the left superior intercostal vein (anterior cardinal).

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GRASS SILAGE

By

YASHPAL CHANDRA GUPTA., B.Sc. Agri., ASSOC. I.A.R.I.

*Agricultural Officer, Government of India,
Cattle cum Dairy Farm, Karnal.*

High quality forage is usually an important source of vitamins, minerals, proteins and carbohydrates. This forage can be obtained from well managed pastures of selected grasses and legumes. Such nutritious pasture provides most economical feed for high and efficient production of milk and maintenance of dry and draught stock. Regulated grazing can be practised when pasture is in flush. Usually the quantity of pasture available during periods of abundance, such as the monsoon season, exceeds the requirements of cattle. When properly preserved and conserved, it can help to augment the fodder supply during periods of scarcity. Ley of grasses and legumes once established continues to supply fodder for several years and, given proper rest to recuperate, the cost of production of pasture is usually very low.

In India several grasses grow wild and in abundance during the rainy season and often are not utilized for grazing or other industrial purposes. On the contrary in other areas indiscriminate grazing eliminates desirable nutritious grasses which, otherwise, under controlled conditions, would yield abundance of fodder. Therefore, simultaneous controlled grazing and preservation of grasses when available in excess can go a long way in reduction of cost of maintenance of cattle. These grasses can be preserved as hay or silage.

Silage Vs Hay.—Ensilage offers several advantages over the production of hay. Unfavourable weather conditions during the rainy season usually make the production of quality hay rather difficult, if not impossible. In the preparation of superior quality silage, wet weather generally is helpful as moistening of the stuff in the pit conduces to less loss and quicker fermentation. It is stated that as much as 30% of the feeding value of the crop may be lost in hay-making whereas the nutrient losses brought about by fermentation in silage making hardly exceed 20 percent. These losses in silage have been further reduced by addition of molasses or phosphoric acid, which reduce the need for excessive fermentation of the stuff into lactic and acetic acids. Besides, silage occupies smaller space in storage compared to hay. The silage remains preserved in *kuchcha* or *pucca* pits, but, for the purpose of hay, special stacks have to be set up which essentially required to be mud plastered, so as to reduce spoilage due to rain and storms. In view of these advantages preservation of pasture grasses as silage offers the best method of storage.

Ensilaging the grasses.—Grasses which generally have high protein value at flowering stage should be cut near about that stage when the pasture is likely to yield a high return from a small unit area. In such an area grazing should completely be restricted sufficiently in advance of the harvesting of the forage. The stuff should be cut early in the morning when dew is still on the leaves and carted to the silo pit. Chopped material should always be preferred for ensilage. If an ensilage cutter is near at hand the same should be moved to the pit and set up there for blowing the stuff into the pit directly after chopping. The material should be chopped into pieces of one inch lengths. Chopped material fills in easily and can be packed tightly to exclude maximum quantity of air. Un-chopped material should also be well trampled to exclude air pockets, within two hours after the cutting of the grass from the field. Un-chopped grass requires special care in packing and a close supervision to pack the material tightly is very essential, otherwise losses mount up disproportionately. Sometimes water is sprinkled when the herbage offers difficulty in packing or rapidly tends to dry up. Besides, high humidity hastens up the process of fermentation. If molasses are available at cheap rates they may be sprinkled over layer of grass from 9" to 12" in thickness.

The silo pit after it has been stuffed to the brim, should have packing of grasses. This should slope from centre to the sides. This is essential from two points of view. Firstly, it serves to weight down the material in the pit and secondly the slope prevents rain water from entering into the silo pit and thus checks spoilage of the fermented material. The silo should be sealed off with straw and finally with earth to a thickness of twelve inches. Sometimes cracks appear at the surface. These should be sealed off immediately they are noticed. It takes from six to eight weeks after ensiling for the grasses to ferment and ripen into good quality silage.

Common nutritious grasses.—At Karnal several grasses with high nutritive value are met with. Some of these grasses are flourishing in the paddocks. Their average yield as estimated by pasture cuttings are given below :

TABLE I
Average out-turn of Common grasses at Karnal.

Botanical name	Common name.	Av. out-turn per acre in maunds.
1. CENCHRUS CILIARIS	<i>anjan</i>	400
2. DICHANTHIUM ANNULATUM	<i>apang</i>	600
3. ECHINOCHLOA COLONA	<i>sanwak</i>	300
4. SORGHUM HALEPENSE	<i>baru</i>	200
5. DACTYLOCTENIUM AEGYPTICUM	<i>makda</i>	200
6. CYNODON DACTYLON	<i>dub</i>	200
7. SETARIA GLAUCA	<i>kangni</i>	150

Cenchrus ciliaris together with *Cenchrus segitatus* occupies an area of about ten acres. It has 14.49% Crude Protein and 12.08% mineral matter. It is a real pasture grass. *Dichanthium annulatum* is another predominant species in the paddocks. It develops to a good height and has bushy nature of individual plants. *Echinochloa colona* grows wild in fallow fields and with the lines of the row crops. Other grasses occur as weeds on un-cultivated area and bunds of drains and channels.

Silage of grasses.—Due to abundant availability of *anjan* (*Cenchrus ciliaris*) and *sanwak* (*Echinochloa colona*) in the monsoon season, these grasses were ensiled without chopping. The silo pits dug for filling were rectangular *kuchcha* pits 20' x 10' in size and 5' in depth. The particulars of the quantity filled and yield of good quality silage are shown in table II below :—

TABLE II

Yield and period of ensiling.

Botanical name	Common name	Quantity filled in silo.	Dates of filling silo.	Quantity of silage obtained.
CENCHRUS CILIARIS	Anjan	700 mds.	16 to 21-8-48	477 mds.
ECHINOCHLOA COLONA	Sanwak	800 mds.	10 to 14-8-48	588 mds.

The loss on the actual quantity ensiled works out to 32% and 26.5% respectively for *anjan* and *sanwak* grasses. It is natural to expect a high rate of loss in small pits. These losses can further be reduced by putting larger quantities in silos of bigger dimensions. However, the size of the silo pit is determined by the animals to be fed. Where small quantities are to be dealt with, it is possible to reduce the loss by ensiling in masonry silo-pits.

Silage cost.—*Anjan* and *Sanwak* grasses can be seeded in the pasture after inverting the old stubble followed by preparatory tillage and broadcasting the seed at the rate of 10 lbs to an acre. The average cost as it worked out at Karnal is given in table III.

TABLE III

Cost of cultivation of pasture per acre.

Cost of ploughing with victory plough.	Rs. 7 8 0
Cost of 4 ploughings with <i>desi</i> plough.	Rs. 22 0 0
Cost of 10 lbs seed.....	Rs. 10 0 0
Mixing seed with <i>desi</i> plough.....	Rs. 5 8 0
Total.	Rs. 45 0 0

The grasses continue to grow luxuriantly in the pasture and reseed it for at least 5 years. The cost of cultivation thus spread over 5 years amounts to Rs. 9/- per acre. Assuming the rent of such a pasture land to be Rs. 25/-, the carry over cost is Rs. 34/- or Rs. -/15 maund taking the average yield to be 400 mds per acre. Debiting the charges of harvesting and carting forage to the ensiling cost, the actual costs incurred in the preparation of silage of *anjan* and *sanwak* grasses is shown in Table IV.

TABLE IV

Cost of ensiling.

	<i>anjan grass</i>	<i>sanwak grass</i>
Cost of harvesting.....	Rs. 45 12 0	Rs. 85 8 0
" carting.....	Rs. 47 8 0	Rs. 34 0 0
" filling.....	Rs. 21 4 0	Rs. 21 4 0
" covering the pit.....	Rs. 8 12 0	Rs. 8 12 0
	Rs. 125 4 0	Rs. 149 8 0
Quantity of silage obtained.	477 mds.	548 mds.
Unit cost of making one maund silage.	Rs. 0 4 3	Rs. 0 4 5

To this should be added the depreciation, repairs and maintenance charges on the pit. As already stated, a pit of the size of 20 x 10 x 5 ft can hold 700-800 mds of forage for ensiling. This is normally dug out by six men in two days. On this basis, assuming the life of a well repaired pit to be 10 years, the depreciation charges, interest, repairs etc would be about Rs. 2/- per annum. The cost spread out on maundage ensiled works out to 0.6 pies per maund. Collectively then the cost of silage in the experiment is as under :—

TABLE V

Estimated mean value of grass silage.

Cost of raising green grass.....	Rs. 0 1 5
Cost of harvesting grass and ensiling.....	Rs. 0 4 5
Depreciation, interest, repairs on silo pit.....	Rs. 0 0 0.6
Total	Rs. 0 5 10.6 or say Rs. 0 6 0 per md.

Succulent fodder is thus obtained at 6 as. per md. During periods of fodder scarcity such cheap and nutritious fodder is rather difficult to obtain in villages and, as a result, cattle have to be maintained on dry stalks of *jowar*, maize etc.

Food value of grass silage.—Samples of grass silage were analysed at the time of ensiling and at the time of feeding the stock. The results of analysis of samples are given below :

TABLE VI
Nutritive value of grasses and their silage.

	ANJAN		SANWAK	
	Grass 8.23	Silage 25.60	Grass 8.70	Silage 25.67
Moisture.....				
Ether Extract.....	1.93	4.08	1.97	3.90
Crude proteids.....	14.49	7.73	6.74	4.86
Soluble Carbohydrates.....	38.09	36.45	45.59	44.08
Soluble mineral matter.....	12.08	5.10	9.07	6.26
Sand and Insoluble matter.....	5.36	10.53	5.34	8.44
Crude fibre.....	28.05	36.11	31.29	32.46
Total nitrogen percent.....	2.32	1.24	1.08	0.78
Albuminoid Nitrogen %.....	1.97	0.89	0.97	0.65
Albuminoids percent.....	12.30	5.56	6.0	4.06
Albuminoid ratio.....	3.46	8.24	8.28	13.61
Food units.....	73.64	60.55	65.64	63.98

It will be observed that the loss in nutritive value was higher in *anjan* than in *sanwak* grass. The principal deterioration in *anjan* occurred in loss in albuminoids %. Thus the food units of silage were 60.5 compared to 73.6 of the original material. Comparatively the loss in albuminoids was much less in the conversion of green grass of *sanwak* into silage. Thus the loss in food units was small.

TABLE VII
Chemical composition of jowar silage as given by Sen (1946)^o

Total ash.....	10.63
Ash sol in HCL.....	5.51
Crude protein.....	5.89
Fibre.....	37.33
Nitrogen free extract.....	44.38
Ether extract.....	1.77

Jowar silage contains about 5 to 6% protein. In both *anjan* and *sanwak* grasses, the values are 7.7 and 4.9% respectively, which compare favourably with *jowar* silage. The silage of these grasses was fed to the dairy cows of this Farm and all animals relished the stuff. Not a single animal refused to eat it. Constant feeding of a few cows with it did not indicate any adverse effect on their milk yield.

Since silage is apt to give a taint of peculiar smell to the milk, it is advisable to feed silage to cows after the milking is over. Byre should be kept ventilated, otherwise silage odour will linger on in the byre. It is preferable to feed silage outside the milking byre.

The author is indebted to Messrs S.P. Jain and V.B. Subbaiah for conducting the chemical analysis of these grasses and their silage in the Division of Soil Science, through the kindness of the Director I.A.R.I., New Delhi.

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OBSERVATIONS ON STILBOESTROL IMPLANTATION IN COCKERELS

By

K. J. SIMON, G.V.Sc., D.V.M.,
Veterinary Surgeon, Cochin.

Introduction

Harris & Thimann (1946) report that Emmens showed that implantation of estrone tablets greatly reduces the size of testes of birds. Kelly & Roberts (1950) observe that implantation of stilboestrol tablets will be effective in suppressing the effects of androgens in cockerels for about 6 to 8 weeks. They state that stilboestrol failed to bring about increased gain in weight in Light Sussex Cockerels. In their opinion this might be due to either over-dosage which might have caused cessation of growth or the non-susceptibility of the breed used in the test to estrogens. They have found decrease in the weight of testicles, absence of crowing and fighting and improved culinary qualities in treated cockerels.

According to Sampath Kumar (1951), the secretion of gonadotrophic hormone was inhibited in cockerels fed with synthetic estrogens.

Sherman (1948) is of opinion that female estrogens are in some way connected with the rate of growth and maturation of the skeleton.

Nickolson (1951) states that, even though stilboestrol implants are not causing harmful effects on cockerels, it is not yet known whether there is any risk to consumers.

The object of the present study is to contribute some data on the effects of stilboestrol implantation on cockerels.

Materials and Methods

The experiments were conducted on three groups of fowls. The first group consisted of 12 four-months' old cockerels. The second group consisted of 8 cockerels of the same age. The third group consisted of 4 cockerels aged about 5 months. They were all fed on a mash containing oilcake, bran and meat scrap. They were let free with a few pullets.

Lip pellets of 15 mgms. of stilboestrol manufactured by Norden Laboratories, Lincoln, Nebraska, were used for pellet implantation. Pellets were subcutaneously implanted, with a locally made pellet injector, just behind the head. Leg bands with numbers were used for numbering the birds.

Experiment 1.—In this experiment two sets of birds, each set consisting of 6 cockerels of the same brood were used. From the first set two were kept as controls and one 15 mgms. stilboestrol lipellet was

implanted subcutaneously just behind the head of the other 4 birds by the pellet injector on 10-1-1951. In the second set of birds also, two were kept as controls and the other four were given two lipellets of 15 mgms. subcutaneously on the same day. One control from the first set was killed on 10-1-1951 and the weight of its testicles was noted down. Observations were made on the growth of comb crowing, fighting and sexual appetite of controls and test birds.

On 7-2-1951, two test cockerels from each set and the remaining control cockerels from the first set were killed and the internal organs and the fat deposits were examined and the weight of the testicles recorded. The meat of one test and one control cockerel was cooked separately in special stoves with same quantity of water, condiments, etc., and taking the same time for cooking, and the comparative culinary quality of the meat was thus tested.

One control cockerel from the second set and one test bird from each set were killed and examined on 14-2-1951 and the other control bird and the remaining two test cockerels were killed on 21-2-1951 and examined and the observations were noted down. In these instances also, the culinary quality of the meat was tested as previously.

Experiment 2.—In this experiment, two sets of 4 three months' old cockerels from the same brood were used. The cockerels were weighed at regular intervals. On 1-3-1951, one 15 mgms. lipellet was subcutaneously embedded on the neck of three test cockerels of the first set and two lipellets of 15 mgms. were subcutaneously embedded on three test cockerels of the second set. One cockerel was kept as control from each set. On 18-4-1951, the stilboestrol lipellets were dissected and taken out and the birds were sold.

Experiment 3.—The right testicles of 4 birds in the experiment were removed by operation on 1-5-1951 by using the castrating set and the testicles were weighed and noted down. After the healing of the wound on 10-5-1951, the residue of one pellet of stilboestrol, dissected and removed from the birds in the second experiment, was subcutaneously embedded into each of the three cockerels and one was kept as control. The test and control cockerels were killed on 21-5-1951 and the testicles were weighed.

Results and Discussions

The combs of the test birds were getting paler and their growth was depressed. The test birds were not crowing and fighting. They were not only not trying to cross the pullets which were let loose with them, but were seen squatting at the approach of control cockerels. Kelly & Roberts observed absence of crowing and fighting in stilboestrol treated cockerels.

The findings in this experiment are in agreement with the above observation.

Table No. 1 shows that the testicles of test cockerels Nos. 3 to 6 and 9 to 12 decreased in weight after stilboestrol implantation. No appreciable difference could be noticed between test cockerels implanted with one lipellet and those with two lipellets. The test birds on autopsy showed fat deposits in large quantities and their meat was comparatively very soft and more tasty than the meat of the controls, while the bones of the test birds were found to be very hard to bite; that was not so in the case of control birds. This confirms the opinion of Sherman that female estrogens are in some way connected with the rate of growth and maturation of the skeleton.

In the second experiment also, the test birds were showing the same characters as in the previous experiment. There was no appreciable difference in gain in weight between test and control birds. The comparative gain in weight is shown in table No. 2.

Kelly & Roberts state that stilboestrol failed to bring about increased gain in weight in Light Sussex cockerels and they attribute it to either overdosage or the non-susceptibility of the breed, used in the test, to estrogens. In this test local cockerels were used and in some of the birds only one pellet was implanted, which also did not show increased gain in weight.

The results of the experiment No. 3 clearly show that the residue of the stilboestrol lipellet after implantation is active. The average weight of the right testicles of the birds used for this test was 70 grains on 1-5-1951. On 21-5-1951 the weight of the left testicles of the control bird on autopsy was found to be 80 grains and the left testicles of the test birds on an average weighed only 35 grains on the same date, i.e. 2 weeks after the implantation of the residue of stilboestrol lipellet. This shows the reduction in weight of the testes of the test birds in the experiment, even though the weight of the control bird increased. Further work has to be done on this subject before chemical castration of cockerels is popularised in India, where people will not usually discard the head of the fowls while cooking. Nickolson observes that it is not yet known whether there is any risk to consumers of chemically-treated capons. Sampath Kumar could inhibit the secretion of gonadotrophic hormones in cockerels by feeding them with synthetic estrogens. But it is not yet known whether the residue of stilboestrol will be active even after boiling. Still it can be assumed that undesirable effects may be produced by consuming chemical capons without removing the head.

Summary and Conclusions

A study on the effects of stilboestrol implantation on cockerels is herein reported.

Stilboestrol implantation causes absence of crowing and fighting, depresses the growth of comb, reduces the weight of testes and produces more fat and soft meat and increases the hardness of the bones in cockerels.

Its administration does not produce increased gain in weight.

The residue of stilboestrol six weeks after implantation is active and its re-implantation causes decrease in the weight of the testes.

TABLE 1

Showing the weight of testes of test and control cockerels.

Cockerel No.	Date of implantation of stilboestrol lipellets	Date of autopsy.	Weight of testes in grains.	Remarks.
1	—	10-1-1951	23	Control.
2	—	7-2-1951	82	
3	10-1-1951	7-2-1951	6	One lipellet implanted.
4	10-1-1951	7-2-1951	4	
5	10-1-1951	14-2-1951	4	
6	10-1-1951	21-2-1951	5	
7	—	14-2-1951	86	Control.
8	—	21-2-1951	94	
9	10-1-1951	7-2-1951	5	Two lipellets implanted.
10	10-1-1951	7-2-1951	3	
11	10-1-1951	14-2-1951	5	
12	10-1-1951	21-2-1951	5	

TABLE 2

Showing the average weekly gain in weight of Controls and test birds.

Week.	Controls. Weight in ozs.	Test Cockerels implanted with one lipellet. Weight in ozs.	Test Cockerels implanted with two lipellets. Weight in ozs.
1st.	1.00	1.80	1.20
2nd.	3.00	2.70	2.30
3rd.	3.50	2.70	2.80
4th.	1.50	3.20	2.50
5th.	3.00	2.800	3.30
6th.	3.00	3.50	3.50
Total gain in weight.	15 ozs.	16.70 ozs.	15.60 ozs.

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PSEUDOMONIASIS IN GUINEA-PIGS

By

R. D. KATIYAR G.B.V.C., P.G.,

Government Vaccine Depot,
Patwadangar (Nainital), U.P.

Pseudomoniasis amongst young guinea-pigs was first described by Schergo (1937) as an epizootic septicaemia. He isolated a capsulated organism from the blood and viscera of young guinea-pigs dying from a rapid bacteraemic infection. He suggested the name *Pseudomona caviae* for the casual organism.

An epizootic septicaemia due to *Pseudomoniasis* was diagnosed by the author amongst guinea-pigs of this depot in September 51. A consignment of 40 guinea-pigs was received from Indian Veterinary Research Institute, Mukteswar, on 10-8-51. After about one month the disease broke out amongst these animals. We lost all the 40 guinea-pigs. These guinea-pigs were of about 4-6 months age. Both the sexes, weak and strong, were equally affected. Treatment with sulfa drugs did not have any effect.

Ten dead guinea-pigs were autopsied and smears and cultures from heart blood, lungs, liver and spleen were prepared.

Symptomatology.—It may be mentioned that, in small laboratory animals, clinical symptoms are not generally pathognomonic. Detection of sick animals depends much on one's experience.

The onset of illness was sudden with fever of 104°F. to 104.5°F. Ruffled coat, half-shut weeping eyes and hunched up sitting postures were observed. Some guinea-pigs developed trembling, sunken eyes and diarrhoea before death. Duration of illness was 2-3 days in acute cases and 7-14 days in chronic cases.

Post-mortem findings.—(1) General septicaemic congestion of lungs, liver, pleura and spleen.

(2) In 70% cases there was consolidation of lungs (Pneumonia). Brown discolouration of apex of lungs was prominent.

(3) Small foci of deep necrosis in the liver and spleen which did not project above the surface of the organs.

(4) Small punctate haemorrhages in the stomach and intestine.

Bacteriology.—Smears and primary cultures were made from heart blood, lungs, liver and spleen on nutrient broth, nutrient agar and blood agar. Sub-cultures were carried out on peptone water, sugar media, glucose phosphate broth etc. for studying morphological and bio-chemical characters.

Morphology.—The causal organism was capsulated gram negative rod. Encapsulation was observed only when isolated from the animal body. Motility was easily demonstrated in cultures 12-18 hours in dextrose broth and peptone water.

Cultural appearances.—Profuse growth in 24 hours on the usual nutrient broth and agar slants.

Agar Slant.—Translucent, slightly raised granular growth. The medium became greenish yellow in 48 hours and turned into brownish yellow in 5 days.

Nutrient Broth.—Dense turbidity, slight powdery sediment and thin pellicle formation.

Gelatin Stab.—Infundibuliform liquifaction of gelatin. The liquid was greenish yellow in colour.

Bio-chemical reactions.—Glucose, saccharose, mannite, maltose, dulcitate, inulin and lactose sugars were inoculated. Acid, but no gas, was formed in glucose only in 48 hours. Greenish yellow pigment developed in all sugars except dulcitate after 96 hours. In this respect it differed from *Pseudomona caviae* of Schergo (1937) which fermented dextrose, maltose, mannitol, lactose and sucrose with acid production.

No indol formation was demonstrated by oxalic acid method. It reduced nitrates and formed ammonia but not H₂S. It was catalase

positive whereas Schergo found *Pseudomona caviae* as catalase negative. Methylene blue was reduced. It was M R + and V P—.

Animal confirmatory test.—Two mice were injected intraperitoneally .2 c.c. of 24 hours' peptone water culture. Both of them died within 24 hours. Capsulated gram negative bacilli were seen in the smears prepared. These bacilli on culture gave cultural and bio-chemical reactions which were identical to those given by the organisms isolated from the guinea-pigs.

Discussion

From the pathogenesis of the disease and the bacteriological and pathogenicity test of the organisms isolated, it is quite evident that the cause of the epizootic was Pseudomoniasis. The causal organism differed in its fermentative activities and catalase production from that of *Pseudomona caviae* of Schergo.

Summary

(1) An outbreak of epizootic septicaemia due to Pseudomoniasis amongst guinea-pigs was investigated and diagnosed.

(2) Ten post-mortems were conducted and cultures were made from the lesions for the isolation of the causal organisms.

(3) The casual organisms proved pathogenic to mice on being injected intraperitoneally .2 c.c. of peptone water culture.

(4) Pseudomoniasis caused cent-per-cent mortality amongst the guinea-pigs. Pseudomoniasis, like salmonellosis, when once it breaks out, causes havoc and a great dislocation in the breeding of guinea-pigs and in experimental work.

Acknowledgment

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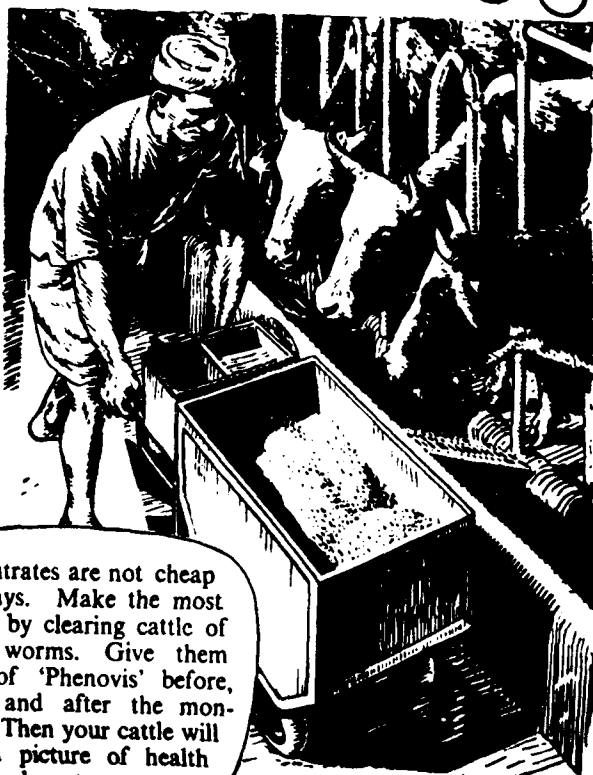
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Editorial

IMPROVEMENT OF DAIRY CATTLE

Among the subjects that create a lively and interesting discussion in meetings of Animal Husbandry workers in India is the one relating to the improvement of dairy cattle. This is natural not only because it is a subject of great national importance but also because of its varied complexity. India is a country which carries a heavy burden of cattle population, major portion of which is of a non-descript nature and of poor quality. This large number is a great problem to livestock workers. Again, the cow is an animal of great veneration and there is a good deal of sentiment in the disposal of the aged and weak, the disabled and uneconomic ones. Some people may call it false sentiment; others may describe it in other ways; but, whatever it may be, whether false or true, the sentiment is there and no amount of argument or pleading can convince the people and permit the adoption of quick methods for bringing the large enormous number to economic proportions. Further, the cow in India is not merely a dairy animal: it is also the mother of the bullock which is the chief motive power behind all the agricultural operations. Till recently, the importance of the milk as an essential article of dietary was not stressed to the same extent as it is done now. And, consequently, the demand for high yielding cows was very little and the breeder was content to concentrate on the breeding of the draught bullocks needed for farm work and transport. Even this was confined to the select breed tracts and carried on by the few descendants of the cattle breeders of old. The bull-calf had all the attention it needed in the form of the total monopoly of its mother's milk; the cow-calf

had all the neglect with its mother being completely stripped to meet the needs of the owner. With the growth of the cities and industrial areas, the demand for milk increased and this was met to a certain extent by the transport of high yielding cows from rural tracts to these centres. The demand, however, soon outstripped the supply. With the enormous increase in human population and with the growing milk consciousness, the milk supply has become very very inadequate. It has been estimated by experts that the deficiency in our milk requirements is nearly 400% and that it is essential to make good this deficit soon if the health of the people of the country is to be brought to an optimum level. The development of our cattle with an eye to their increased milk production has thus become very urgent. Admittedly, there are two ways of doing this and these may be either by selective breeding of the indigenous stock or by cross-breeding the local stock with imported sires of well known dairy breeds from European countries. The latter has been tried before and given up as unsatisfactory. In that connection, we invite the attention of our readers to an article on the subject by Maule which we have extracted in this issue of the Journal. It gives food for thought and will, we are sure, be perused with interest by those working in that line. The other method of improving the local stock by selective breeding has the merit of being approved by all as 'the soundest long range policy', though a comparatively slow method. This method, we are given to understand, is the one that is going to be tried in this country extensively and, in fact, is being pursued in certain tracts already. It is good as far as it goes, but we are bound to sound a note of warning that improvement of dairy cattle by attention to breeding aspect alone will not solve our problem and bring an all round general improvement in our cattle. Equally important is the improvement in the environmental factors especially in feeding and general management. It is notorious that the majority of our animals are in various grades of malnutrition and underfeeding mainly due to the great deficiency in the general availability of the roughage and concentrates. And unless this fodder problem is solved satisfactorily no lasting improvement can be effected in the general standard of our animals. It must

here be remembered that, in countries where livestock work has progressed to a high level as in the United Kingdom, the fodder problem has been absent and that there has been sufficiency, if not abundance of cattle feeds. It is also necessary to remind ourselves that the indigenous cows in villages have responded remarkably to good feed, care and management when once they are taken to a farm and that their improvement in milk yield has been in some cases more than 50 per cent of their original. And, therefore, we should consider it imperative that priority must be given to improve the fodder position in this country. This point has been put forward with sufficient emphasis by the All-India Veterinary Association in its memorandum to the Planning Commission and we hope that it is getting all the attention it deserves from those in charge of development of livestock in this country.

MYSORE SERUM INSTITUTE

The Mysore Serum Institute, the only institution of its kind in the State of Mysore, is just completing 25 years of useful service in the cause of the animal health of Mysore. The livestock wealth of this State is very great. There are nearly 5 million heads of cattle in addition to 3-6 million heads of sheep and goats, not to speak of the large number of poultry, ponies and other farm stock. To maintain these animals in a state of health and to improve their standard of efficiency by the control of diseases has been one of the chief aims of this Serum Institute and it can lay claim to a good amount of research work. It is one of the pioneer institutions which manufactured, and still manufactures, Goat-virus for the control of rinderpest. It is therefore befitting that it is celebrating its Silver Jubilee shortly. We are publishing separately the appeal issued by Dr. P. M. Narainswamy Naidu, the President of the Mysore Serum Institute Silver Jubilee Celebration Committee. The aim of the appeal is to collect funds to equip the Institute with a Mobile Research Laboratory-van to enable it to undertake field investigations and therefore it should appeal to every lover of animals. We cordially endorse the sentiments expressed therein and we do hope that the co-operation of the profession would be forthcoming in an abundant measure.

INTERNATIONAL VETERINARY CONGRESS IN STOCKHOLM IN 1953

The Organizing Committee of the XVth International Veterinary Congress in Stockholm in 1953, has sent the following for the information of the profession.

The Organizing Committee of the XV. International Veterinary Congress has the pleasure of sending its first official bulletin concerning the Congress. The Congress will take place in Stockholm in 1953 according to the decision made in London in 1949 by the XIV. International Congress. As a suitable time for the Congress, the Organizing Committee has decided Sunday, August 9th to and including Saturday, August 15th.

According to the preliminary programme suggested by the Organizing Committee, the scientific part of the Congress will comprise:

1. *Plenary meetings* dealing with subjects within the following branches of veterinary sciences; these sessions being held in the mornings.

Infectious Diseases,
Mastitis in Cattle,
Metabolic Disturbances,
Food Hygiene,
Comparative Pathology.

2. *Sectional meetings* divided up in the following way; these sessions being held in the afternoons.

SECTION I. *Infectious Diseases*.—Bacterial infection and intoxication (including spirochaetosis, rickettsiosis, and mycosis). Virus diseases and bacteriophages. Vaccination, serum therapy, and problems of immunity.

SECTION II. *Diseases caused by animal parasites*.—Protozoal diseases. Diseases caused by helminths. Diseases caused by arthropods.

SECTION III. *Poisonings*.—Poisonings from industrial works. Plant poisonings. Poisonings especially from DDT preparations, other combatants and certain rat killers, etc.

SECTION IV. *Metabolic disturbances, Deficiency diseases, and Allergies*. Metabolic physiology. Metabolic disturbances and deficiency diseases. Allergic diseases.

SECTION V. *The Physiology and Pathology of Reproduction and of Lactation*. Physiology and the technique of artificial insemination.

Fertility disturbances in male and female animals. Udder diseases including diagnosis and combating.

SECTION VI. *Animal Husbandry*.—Hygiene, feeding, and care. Genetics and breeding. Artificial insemination (breeding and organization).

SECTION VII. *Diagnosis, Therapy, and Surgery*.—Diagnosis (roentgenography, electrocardiography, etc.). Chemotherapy. Antibiotics. Anaesthesia and narcosis. Surgery.

SECTION VIII. *Food Hygiene*. Meat hygiene. Milk hygiene. Control of fish, shell-fish and tinned goods. Methods of storing and tinning. Food poisoning.

SECTION IX. *International Veterinary Co-ordination Problems*.—International standardization of serodiagnostic methods and of bacteriological preparations (sera, vaccines, and allergens). Transport and quarantine regulations. International transmission of semen. International co-operation for producing veterinary educational films.

The definite scientific programme will be published as soon as it has been confirmed, in accordance to the Statutes of the Congresses, by the Permanent Commission for International Veterinary Congresses together with the Organizing Committee.

Simultaneously, invitations to read papers before the sections will be sent out.

Particulars concerning the names of the plenary lecturers appointed by the Organizing Committee and the titles of their papers will be given as soon as possible, and also a communication concerning the Congress fee.

Invitations to membership of the Congress will be distributed in Aug., 1952.

The address of the Organizing Committee is: XV. International Veterinary Congress, Organizing Committee, c/o Isaksson, State Veterinary Medical Institute, Stockholm 50, Sweden.

For the Organizing Committee

AXEL ALEGREN,
Chairman.

AXEL ISAKSSON,
Secretary.

News and Notes

PRESERVATION OF WILD LIFE

To preserve the fauna of India, to prevent the extinction of any species and to preserve wild life, the Government of India have appointed a Central Board for Wild Life. It will have H.H. the Rajpramukh of Mysore as its Chairman and include the following members:

Mr. K. S. Dharmakumar Sinhji of Bhavnagar; the Inspector-General of Forests and a representative each of the Geological Survey of India, the Zoological Survey of India, the Botanical Survey of India, the Bombay Natural History Society, the Bengal Natural History Society, the National Institute of Sciences, the Ministry of Natural Resources and Scientific Research, the Ministry of Transport, the State Forest Department, the Zoological Gardens and the Fisheries Development Adviser. The Secretary of the Board will be an officer of the Union Ministry of Food and Agriculture.

The functions of the Board will be: (1) to devise ways and means of conservation and control of wild life through co-ordinated legislative and practical measures, with particular reference to seasonal and regional closures and declaration of certain species of animals as protected animals and prevention of indiscriminate killing; (2) to sponsor the setting up of national parks, sanctuaries and zoological gardens; (3) to promote public interest in wild life and the need for its preservation in harmony with natural and human environment; (4) to advise Government on the policy in respect of export of living animals, trophies, skins, furs, feathers and other wild life products; (5) to prevent cruelty to birds and beasts caught alive with or without injury and (6) to perform such other functions as are germane to the purpose for which the Board has been constituted.

"Hindu" 12-4-51

Coccidiosis in poultry—A new product for the combating of coccidiosis in poultry has been announced in the *British Veterinary Journal* for February 1952. It is named 'Nefco'—nitrofurazone—which is administered by simply mixing with dry mash and is said to be effective in extremely small doses. In an article on the use of this drug, C. Horton-Smith and P.L. Long summarise their conclusions as follows:—

Nitrofurazone is an effective coccidiostatic agent and is a valuable means of controlling established infections of caecal coccidiosis when fed to chickens at a food concentration of 0.022 per cent for seven days.

Nitrofurazone is of value as a preventive when fed at a concentration in the food of 0.011 per cent for ten days to chicks kept on litter which may be heavily infested with coccidia.

UROLITHIASIS IN BOVINES IN BIHAR

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Nitrofurazone permits the normal development of immunity to caecal coccidiosis in chicks exposed to infections of *Eimeria tenella* during treatment.

The action of nitrofurazone is partly schizontistatic and partly schizonticidal.

Retirement

The Government of Malaya have permitted Mr. R. S. Narayanan, G.M.V.C., Deputy State Veterinary Surgeon, Kedah, Alor Star, Malaya, to retire from public service on pension in accordance with the Pension Ordinance applicable to officers of over 50 years of age. Mr. Narayanan has returned to India and he is staying at 9/51, Sivasubramaniam Street, R. S. Puram, Coimbatore. Though retired after 25 years of public service in Malaya, Mr. Narayanan does not contemplate complete retirement from practicing the profession. He is only 52 years of age and wishes to pursue his professional work if suitable opportunities occurred or become available to him.

Clinical Articles

UROLITHIASIS IN BOVINES IN BIHAR

By

S. K. SINHA, G.B.V.C., (Hons.),

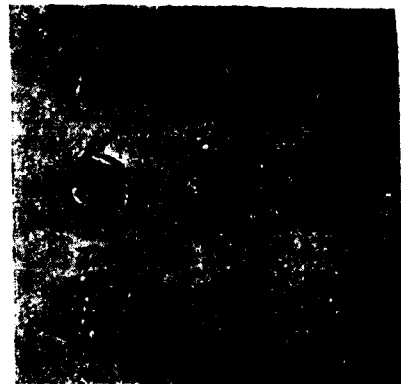
Veterinary Assistant Surgeon, Burahia, Bihar.

Though urolithiasis in animals has not attracted much attention in our country where major epizootics keep veterinarians busy, yet, in certain parts of India the problem of urolithiasis has, of late, come to lime-light, not because of its being a clinical entity or a surgical syndrome, but because it has provided an avenue for animal nutrition research workers for work on mineral metabolism. Urolithiasis is ranked among the items of animal diseases requiring investigation in Bihar. To a veterinary clinician in the field, this urolithiasis often proves a very difficult one where the animal, in spite of its being in good condition, suffers from retention of urine and finally dies of uraemia. One is often hard pressed to afford relief to the animal. The writer had the opportunity of working in certain areas of Bihar where these cases are found in large numbers and has carried out observation on about 100 affected bovines. There appears to be a paucity of information on the clinical details of urolithiasis among bovines and operation on such cases is thought to be difficult and not quite successful. The author wishes to present in this paper some details of these cases and also give the surgical treatment carried out in such cases.

Distribution.—These cases of urolithiasis are found in various areas in Monghyr district, e.g. Lackhisarai, Burhee, Sheikhpura, etc., where the soil is rich in calcareous deposits.

Susceptibility.—The disease is noticed only in males. Females do not suffer from it as their short easily dilatable urethral passage enables them to void the small stones with comparative ease. Animals of all ages are susceptible but the majority of the subjects were between 3-5 years of age. There appears to be no correlation between condition and susceptibility.

Sites of the calculi.—From the observations carried out on 100 bovines, it is found that these stones are invariably in the urethral passage. Cases which died from retention of urine were subjected to a careful post-mortem examination and in none of these cases was any calculus detected in any other location. It appears that the curvature of the urethra affords a better opportunity for the deposition and formation of these calculi more than any other place in the urinary tract. From cases treated or post-mortemed, 75 per cent of cases had calculi between the anterior and posterior curvature, 20 per cent between the posterior curvature and the ischial arch and only 5 per cent between the anterior curvature and glans penis.



Specimens of Calculi.

Nature of the calculi.—Calculi extracted from these cases are of varying sizes, from the size of a pea to a small marble. These are smooth, shiny, round or oval in shape. In one case the calculus was elongated conforming to the urethral passage. The colour varies from dull white to deep cream. These calculi were chemically analysed by the officer i/c Pathology and Bacteriology section (Sri M. R. Dhanda) of the Indian Veterinary Research Institute, Mukteswar, and his report says that they were of the following composition :

Calcium Carbonate	71%
Magnesium Carbonate	26%
Phosphates expressed as Ca, (Po ₄),	3%
Urates	nil
Oxalates	nil

Symptoms.—Symptoms are sudden in onset. The animal is restless. There is partial or complete stoppage of urine with symptoms of colic. It remains standing for hours or even days without lying down. The bladder, at this stage, can be felt per rectum and is found distended. The animal looks dull and later on becomes comatose and dies of ureamia. In a debilitated animal, careful manipulation may reveal the stone in some part of the urethra which is not possible in a well conditioned animal.

Prognosis.—Prognosis cannot be termed as bright. Cases where symptoms have started recently, say, a day or two, early operation can be undertaken, when, ordinarily, the animal recovers. But there may be recurrence of the trouble as the surgical damage to the urethra may afford a rough surface for the formation of calculi. In cases where the animal has been in distress for long, and is in a comatose condition, surgical operation may hasten the death.

Treatment.—As has been remarked before, the condition requires immediate surgical intervention. Details of the operation technique carried out by the author are set out below.

The most important precaution to be taken in these cases is the proper casting of the animal. The animal should be cast very gently and carefully on a very thick bedding of straw, as a sudden fall on a hard ground may induce rupture of the highly distended bladder and cause sudden death of the animal. After properly casting and securing the animal in a dorso-lateral position, epidural anaesthesia is induced by injecting 15 to 20 c.c. of a 2 per cent. solution of cocaine, novocaine or procaine. This may not be necessary in every case. Thereafter, the skin in the median line about 2-3 inches posterior to the scrotum is shaved and disinfected with Tincture of iodine and an incision of 2-3 inches is made on the skin taking precaution that the penis is not damaged. The skin and facia are detached carefully and with the aid of two or three fingers of the left hand, the penis is gripped carefully and brought out of the incision. This causes, to some extent, the stretching of the urethral passage and this may be helpful in locating the calculus in the urethra. When the calculus has been located, an incision over the site brings it into view and it can be dislodged with an artery or dressing forceps. After the removal of the same, the penis is pushed back into its place. The urethra is not sutured nor the skin wound except at its posterior end. The

anterior part is left open to ensure proper drainage of urine. The part is dusted with Sulphanilamide powder. In a healthy young animal, the wound heals up in about nine or ten days but, in an old debilitated animal, it takes longer, even a month or so. The after-care consists of providing the animal with adequate bedding, light nutritive diet and rest. The wound should be dressed with Tincture of Iodine and the area washed with Condy's fluid. Sutures are removed according to the healing of the wound.

Sequelae.—These may be (a) Haemorrhage, which can be stopped by injecting Adrenaline hypodermically or, in very obstinate cases, by applying thermocautery (b) Oedema, which usually subsides within about nine or ten days with Sulphanilamide dressing and (c) Fistula, which usually is a rare complication and which may persist for a long time without much discomfort to the animal.

Details of some of the cases treated are given below.

S. No.	Date and Register No.	Age.	Condition.	Site of Calculi and Number.	Operation details.	Remarks.
1.	April 1948.	5 Yrs.	Fair.	13 Calculi in the posterior aspect of the flexure.	Operation not done. Animal died.	
2.	" "	do	V. Good.	One calculus between the anterior and posterior curvature.	Operated; cured and discharged after ten days.	
3.	" "	do	Fair.	Posteriorly 30 Calculi.	Operated; cured and discharged after 12 days.	
4.	" "	4 Yrs.	Fair.	One calculus between the anterior curvature and glans penis.	Operated; cured and discharged after two weeks.	The calculi reformed and the animal succumbed to it a year later.
5.	" "	3 Yrs.	Fair.	One calculus in the posterior aspect of the curvature.	Operated; cured and discharged.	
6.	July 1949.	4 Yrs.	Fair.	One calculus as in No. 5.	Operated; died of gangrene.	
7.	April 1949.	1 Yr.	Fair.	Long calculus elongated at the posterior end of the curvature.	Operated; and cured.	
8.	1-7-51, No. 220 O. P.	2 Yr.	V. Good.	One calculus between the anterior and posterior curvature.	Operated; and cured.	
9.	16-7-51, No. 2475 O. P.	Yrs.		One calculus as in No. 8.	do do	
10.	22-7-51, No. 256 O. P.	1 Yr.	Fair.	One calculus as in No. 8.	Operated; case is still under treatment.	

Summary.—The treatment of urolithiasis in bovines has been outlined. Stones are usually found in the posterior aspect of the sigmoid flexure and surgical intervention is the only reliable procedure to save the animals' life. The technique has been outlined.

Acknowledgment

The author acknowledges gratefully the guidance and help given by Mr. M. I. Malik, B.Sc., M.R.C.V.S., Director, Veterinary Services, Bihar, Moulvi Q. Khan, Assistant Director, Bhagalpur Range and Shri M. R. Dhanda, (Dip. Bact.) Officer-in-charge Pathology and Bacteriology Section I.V.R.I., Mukteswar, for the analysis of the urinary calculi. Acknowledgment is also due to Messrs. B. M. Prasad, G. Prasad and B. D. Gupta for their advice.

CAESARIAN SECTION IN A COW

BY

V. KANAKARAJAN, G.M.V.C.,

Veterinary Hospital, Kallakurichi, Madras.

Subject.—A local bred cow was admitted for dystokia at 4 p.m. on 7-10-51, as I. P. No. 892.

Diagnosis.—The cow had not been meddled much by the lay people. Membranes had ruptured and the cow had been straining in vain for the previous 4 hours and was much tired. The maternal passage of the cow was much swollen. Examination, after an enema, revealed a dead calf in breech presentation in lumbo-sacral position with flexion of both tarsus (thigh and croup presentation.) The tail of the calf could be seen out.

Treatment.—Efforts at repulsion of the foetus and extension of its hocks were useless as there was not much room for this manipulation. The pelvic inlet was too narrow for the foetus to pass through. I did not want to tire the cow or myself by continuing the manipulations further. With the owner's consent, I decided on Caesarian section, encouraged by my previous two happy results.

Preparation.—Chloral hydras $\frac{1}{2}$ an ounce was given as a drench with jaggery. An area of the skin, 4" broad from the transverse processes of the lumbar vertebrae downwards for about 18" alongside last rib on the right side was shaved and sterilised with tincture of iodine. In about 20 minutes after administration of chloral, the patient lay down on the floor. She was propped up on her brisket keeping right flank uppermost. Right hind leg was drawn back by a rope held by an assistant while both the fore were tied together and secured to a post in front.

Technique.—A bold cutaneous incision 3" from the transverse processes of the lumbar region was made downwards for about a foot in length, parallel to and at about 4" from the last rib on the right side; the same incision was continued through the muscles and then carefully over the peritoneum. The little haemorrhage that occurred was mopped with a towel wrung out in normal saline. When peritoneal separation was completed coils of large intestines protruded out through the incision, but they were gently pushed in, while an assistant lifted up the uterus and closed the opening. A transverse incision was made on the uterus for a length of 6" and after locating the foetus it was extended by about 2" on either ends; the head was nearby and, grasping it, the foetus was gently extracted out of the uterus; the umbilical cord was ligated with chromic catgut and pushed in; along with the calf, placenta also came out in tact: uterus was swabbed with saline towels: care was taken to see that no discharge escaped into the abdomen by spreading towels at the edges of the operated wound.

Pouring in about an ounce of sulphamezathine, uterus was sutured by Zerney-Lambert sutures; peritoneum was united by continuous catgut sutures while the muscles were united by interrupted catgut sutures; finally the skin was closed with interrupted silk sutures and painted with the tincture of iodine. The operation took 40 minutes and the patient was snoring in sleep. An electuary with ammonium carbonate, ginger and jaggery 1 lb was given and the patient opened her eyes 2 hours after.

Next morning, to the great surprise of the owner, the cow was standing up and walking about in search of grass: temperature was 102, pulse 60 and respiration 40: intravenously 40 cc of 30% sulphamezathine solution was given. 1 lb of jaggery was dissolved in rice gruel and given as a drench.

The third day, the patient was brighter; the temperatures pulse and respiration were 102, 57 and 30, respectively. Sulphamezathine 1 ounce in jaggery was given as bolus. Fourth day; temperature persisted but respiration numbered 20 and pulse 45. The patient started ruminating. $\frac{1}{2}$ measure *cumbu* was given cooked with soaked gingelly oil cake $\frac{1}{2}$ lb and jaggery 1 lb. This food was continued throughout her stay in the hospital. From this day onwards appetising powders were given: udder was stripped morning and evening and vaginal douching was given with proflavine sulphate. It was remarkable that the maternal passage was without any effete material. Skin wound healed up very nicely with painting of tincture of iodine and dusting of sulphamezathine. Linimentum saponis was rubbed over the shaved area as there was a slight inflammation adjacent to sutures. The patient was discharged cured on the 10th day, having removed the sutures the previous day.

The cow was sent for and seen 5 months after for any sequelae viz., hernia of the uterus, metritis etc. The cow was quite normal and she was put to a bull 2 months' back.

'SULPHAMEZATHINE' IN THE TREATMENT OF HAEMORRHAGIC SEPTICAEMIA IN CATTLE

By

S. N. MANNA, G.V.Sc.,

Veterinary Assistant Surgeon, Taniluk, Midnapore, West Bengal.

During an outbreak of Haemorrhagic Septicaemia in July 1950, I saw an affected heifer on 5-7-50 two days after the onset of the disease. The symptoms were: Prominent swelling in the submaxillary space, difficult breathing, dribbling of thick saliva, temperature 105°F., and off-feed. The owner had treated the heifer by a village quack from the onset and had given up hope. A bullock belonging to his neighbour had died of a similar affection the same day. I suspected that the heifer was suffering from Haemorrhagic Septicaemia and decided to use 'Sulphamezathine' Sodium, 33 $\frac{1}{3}$ % solution (I.C.I.). The owner required a lot of convincing to use this medicine, and finally agreed to the treatment.

I injected intravenously 50 c.c. of 'Sulphamezathine' Sodium 33 $\frac{1}{3}$ % solution and instructed the owner about proper feeding.

On the same day I received information about another case in a heifer in an adjacent village. On inspection, this case showed off-feed, shivering, salivation, and had been lying down for about four hours. The temperature was 106°F., and further enquiry showed that one cow of a neighbour had died two days previously showing these same symptoms. I suspected this case also to be one of Haemorrhagic Septicaemia and treated it in the same way as the previous case. On 6-7-50 morning the temperature dropped to 104°F., and salivation and shivering had diminished. I again injected 25 c.c. of the solution.

On later examination of the first case I found considerable improvement and the heifer was feeding. On my return to these villages after four days I found both the cases completely recovered.

In another case of a cow suffering from Haemorrhagic Septicaemia, I gave 40 x 0.5 Gm. tablets of 'Sulphamezathine' with complete success.

AN OUTBREAK OF INTESTINAL FORM OF HAEMORRHAGIC SEPTICAEMIA IN BOVINES

By

S. N. V. IYENGAR G.B.V.C.,

Lecturer in Veterinary Science, College of Agriculture, Dharwar.

Introduction.—There were a few sudden deaths amongst the animals belonging to the Yeravada Central Prison Farm, Poona, in June, 1951—two buffalo heifers and two cow-heifers on the 20th and 1 bullock and

two bull-calves on the 21st. On enquiry it was reported that all the animals showed colicky symptoms and died suddenly after three or four hours. On the 21st one affected bullock was observed which exhibited the following symptoms.

Clinical symptoms.—Dullness, temp. 102°F. ghastly look, m.m. of the eyes congested, dilatation of the pupil, winking of the eyes and loss of vision, frothing at the mouth, grinding of the teeth, smacking, nodding of the head, shivering, wheeling in a circle and falling down. The animal was unable to swallow at this stage and was gasping for breath; tympanitis set in. Faeces were covered with blood and mucus. The animal looked at the belly, struggled and died in 4 to 5 hours. The symptoms which were recorded by Dr. H. V. Kulkarni, the then D. I. O. Baroda, in his article on oedematus form of H. S. in the *Indian Veterinary Journal* (Vol. XVII, P. 41) were not observed in this case.

Post mortem examination.—Detailed P.M. examination on all the seven cases that died were conducted after examining the blood smears and excluding the possibilities of Anthrax infection. Eversion of rectum, swelling and protrusion of the tongue and haemorrhages from nostrils and anus were observed in almost all cases. There was no oedematus swelling at the throat or dewlap in any case.

There was marked hyperaemia of the lungs. The heart was studded with multiple haemorrhages. The liver showed cloudy swelling. The spleen was normal. Abomasum had acute haemorrhagic inflammation. The intestines were highly inflamed and there was throughout multiple haemorrhages showing horizontal streaks under the mucous membrane and there were typical small nodules through out the intestines under the m.m., the nodules containing serous infiltrations. Haemorrhagic enteritis was characteristic of all cases.

Microscopical and cultural examinations and biological tests.—The smears from tip of the ear of the affected animal were negative. But the smears from the heart were positive for *Pasteurella* organisms.

One c.c. of emulsion prepared out of the affected tissue of liver and spleen was injected into a rabbit, which did not die. The same material was seeded on agar slants. After 24 hours in the incubator, greyish white slightly raised glistening growth was found developing on them. These growths on biological test killed one rabbit in 18 hours and a pure culture of *pasteurella* was isolated. The heart blood from the rabbit was also inoculated on agar slants and after 24 hours typical growths as stated above were observed. Smears prepared from them were positive for bi-polar organisms. 1 c.c. emulsion of the heart tissue of one of the dead animals was injected into a rabbit subcutaneously and it died after 10 days, the

FRACTURE OF THE CERVICAL VERTEBRAE IN A HORSE*

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delay in killing this rabbit indicating that the *pasteurella* infection was of a very low virulence.

Diagnosis.—The sudden deaths and the symptoms of eversion of rectum, the haemorrhages from anus and nostrils and the absence of oedematous, hard and painful swelling in the region of the throat and dewlap (which are characteristic symptoms of the usual form of H. S.), very closely resembled Anthrax.

But from the above laboratory tests and post mortem examinations, the outbreak has been diagnosed as one of Bovine Haemorrhagic Septicaemia (Intestinal form).

Conclusion.—This outbreak is recorded as it is an unusual form of H. S., in cattle and also to bring to the notice of my colleagues, especially field workers, the very close resemblance between Haemorrhagic Septicaemia (Intestinal form) and Anthrax in cattle.

Acknowledgments

My grateful thanks are due to Dr. H. V. Kulkarni, Disease Investigation Officer, Bombay State, Poona, for carrying out microscopical and cultural examinations and biological tests and giving his diagnosis and to Dr. J. P. Ghogale, Prof. of Veterinary Science, College of Agriculture, Poona, for giving professional advice.

FRACTURE OF THE CERVICAL VERTEBRAE IN A HORSE*

By

J. M. MURPHY, M.R.C.V.S., D.V.S.M.,

Dublin Corporation.

On Monday 10th October 1941, a telephone message was received at the Office of the Veterinary Department that a Corporation horse at grass on an estate in the outskirts of the city, in endeavouring to jump a wire fence on the estate, had tripped, fallen and broken his neck.

I proceeded to the estate and met the man in charge. I asked him where the horse was and he informed me that they had got him back to the stable. "But the message I got was that he had broken his neck." "I know," he said, "that was what we thought, but afterwards we got him up and he walked to the stable."

I proceeded to the stable and found the horse, a chestnut gelding, 17 hands, in a very distressed condition. He was standing but was

*Irish Veterinary Journal, March 1951.

trembling all over and was in great respiratory distress. He would and could come forward alright but was very much disinclined to move backwards. There was profuse generalised patchy-sweating. I decided that he certainly must be severely injured in neck or back but just couldn't say where. This was at 1-30 p.m.

I again attended the animal at 6 p.m., when I found him standing quietly in the stable. The profuse sweating was gone, the respirations were normal, and he ate some hay and could drink water; in fact, he appeared in a less hopeless condition.

On Tuesday, 11th October, at 8-45 a.m., I again attended the animal. He was standing quietly and apart from the fact that his mane was dripping wet, the sweat was falling from it on to the floor, at first sight there did not appear to be much wrong with him. He had, however, inco-ordination of movement and although he could be got to take a step or two forward or backwards in a straight line, yet if you tried to turn him you could see he had very little control of his legs.

At 6 p.m. I again attended and found little change.

On Wednesday, 12th October, at 8-45 a.m., I again attended and found the animal down and unable to rise. His neck was sweating profusely but behind that his body and his legs were all stone cold and apparently he had lost the use of his legs. I decided to have him slaughtered to save further suffering.

When the slaughter man arrived at 10-45 a.m. the animal had just died.

On post mortem examination, I found that two of the cervical vertebrae were broken in several pieces.

The feature of interest here is that the animal lived for 48 hours with such a bad series of fractures and that for portion of this time he appeared almost normal.

A FREAK OF NATURE

By

C. V. NARASIMHAM, G.M.V.C.,

Veterinary Assistant Surgeon, i/c Veterinary Hospital, Nellore.

A weak and debilitated cow, in her ninth pregnancy, gave birth to a full term calf on 8-4-51 in a village in Kovur Taluk, Nellore District. As it was without an anus, it was brought to the hospital on 10-4-51. On examination of the calf, the following peculiarities were noticed.

It had two well-developed testicles separately under the skin on either side of undeveloped sheath and without any scrotum. A small rudimentary penis about two inches long was found extending from the



pelvic arch without the covering of the sheath. At the tip of the prepuce, hairs were present. There were also female genital organs. Right vulvar lip and clitoris were present, but the vagina was not well developed.

In the photo attached, a rubber catheter and glass rod have been inserted in the urethral opening and rectum respectively to show their relative positions distinctly.

Abstracts and Extracts

The effect of continuous ingestion by poultry of Benzene Hexachloride.—By D. J. G. BLACK and J. GETTY, Department of Agriculture, University of Reading and H. R. JAMESON and H. PIRIE, Imperial Chemical Industries, Ltd. *Br. Vet. J.* Vol. 106, No. 10.

The gamma isomer of benzene hexachloride (referred to throughout this paper as gamma BHC) is being used to an increasing extent for the protection of grain and feeding stuffs from insect attack. It may, for example, be applied to grain before milling at the rate of one-half part per million and so find its way into bran and middlings, much of which is eventually disposed of as poultry food. It is of practical interest, therefore, to determine the risk of taint in eggs or poultry flesh as a result of the continuous ingestion by the birds of small amounts of BHC. Investigations

have already been carried out by other workers (12) on the possible toxicity of BHC, and results reported here deal only with tainting effects. With this object, two experiments were carried out at Lane End Farm, Shinfield (University of Reading), in collaboration with Imperial Chemical Industries Limited—a preliminary test in 1947 and a second assessment in 1948.

1. Crude BHC and 90 per cent gamma BHC are commercially available and are likely to be used in the protection of cereal feeding stuffs from insect attack. These chemicals have been added at varying levels to the diet of laying hens to determine whether, if used in this way, they would taint eggs or poultry flesh.

2. After continuous ingestion for 6½ months of amounts upto 84 ppm. crude BHC in the feed, equivalent to an intake of about 10 mg. BHC per hen per day, no taint was discernible in the flesh or fat of the birds after cooking.

3. In the 1947 experiment, where eggs were boiled under normal domestic conditions taint was just discernible at feeding levels of 8 ppm. crude BHC. The 1948 experiment suggested that continuous feeding of 1 ppm. gamma BHC was close to the threshold of significant taint.

4. After continuous feeding of 1 ppm. gamma BHC, a number of eggs were recorded on chemical analysis as containing small but detectable amounts of BHC. But this was also shown to be the case in eggs from the control group, and the differences between the BHC content of the eggs in these two groups were not significant.

5. Continuous feeding of 42 and 84 ppm. crude BHC resulted in appreciable quantities of BHC appearing in the eggs.

6. In no case were significant differences observed between control and treated groups in respect of egg production, live weight, food and water consumption, and no changes were found on post-mortem examination.

Sodium Fluoride: A Discussion of its use in the treatment of Ascariasis in Pigs.—By G. C. BRANDER. *Vet. Rec.* No. 28 Vol. 62 15th July 1950.

Sodium Fluoride is an effective and safe anthelmintic for pigs provided it is used with a full understanding of dosage methods and the type of animals to be dosed. Two methods of giving the dose can be employed and both will give efficient anthelmintic effect:—

- (1) The dose can be given as 1 per cent. of a dry meal fed to the pigs. In this method the pigs are fed in even groups of up to eight and are given the amount of dry meal that they would normally eat in a day.

This method has much to recommend it as the danger of absorption of Sodium fluoride is reduced by the absence of fluid in the meal, and the only factors to be carefully supervised are the weight of the powders and the weight of the meal. The concentration of the drug used is sufficient to cause vomiting should the greedier pigs eat an excessive quantity of meal. The best type of meal to be used for dosing is a finely ground meal into which sodium fluoride readily can be mixed.

- (2) The dose can be given at the rate of 0.1 to 0.5 gramme commercial sodium fluoride per lb. body weight. (Equivalent to 0.075 to 0.1 gramme technical sodium fluoride per 1 lb. body weight.) If the drug is to be given in a wet mash the minimum dose should be employed and the pigs *must* be weighed. It is not safe to depend on a pig-keeper's estimate of the weight of his pigs as even the most experts are often quite wrong in their guess. A weight variation of 10 or 15 lb. can make quite a difference to the dose given.

Proteins for Egg Production.—D. PARTHASARATHY and S. G. IYER. *Indian J. Vet. Sci. & Ani. Husb.* Vol. XX, Part II.

An experiment on the comparative values of rape cake meal, earthnut meal, fish meal and meat offal as protein supplements to a laying ration was for a period of 12 weeks, with Rhode Island Red pullets. The maximum production was obtained with meat offal, rape cake meal coming next. Fish meal and earthnut meal followed in order. No significant differences in egg size were observed among the groups. Food consumption was a little high in rations containing rape cake and fish meal. The efficiency of food utilisation as expressed by the number of pounds of feed to produce one egg was highest with meat offal, rape cake, fish meal and earthnut meals following in order. The general health was satisfactory in all the birds.

Keeping Quality of Ghee.—By NOSHIR N. DASTUR, A. RAHAMAN and N. B. Shroff. *Indian J. of Vety. Sci. & Ani. Husb.* Vol. XX, Part II.

Ghee samples prepared on the farm from the milk of different breeds of animals had good keeping quality. Acidity did not exceed 0.50 per cent oleic even after seven months storage, and the average keeping quality as judged by the peroxide values was well over seven months.

The effect of feeding tender grass; *neem*, tamarind and mango leaves; and oil cakes, on the keeping quality of the butter fat secreted were studied. These feed do not seem to influence the keeping quality of ghee in any way.

The effect of feeding stored oil cakes was also investigated. Though the oil in such cakes had very high acid value; the butter fat obtained from animals receiving such cakes in their diet had low acid value, and good keeping quality.

The keeping quality of *ghee* samples collected from different centres was studied. All the samples studied did not develop high acidity even after storage of one year. The rate of peroxide development varied considerably.

From the results obtained it is stressed that the proper method for the manufacture and storage of *ghee* are of much greater importance in obtaining *ghee* of good keeping quality than such factors as breed of animals or feed.

The effect of Tincture of Tobacco in the Treatment of Mange in Rabbits.—By Paramjit R. PABRAI, K. VENKATACHALAM and K. N. OJHA, *Ind. Jl. Vet. Sc. Ani. Husb.* Vol. XX. Part 1.

Parasitic infection due to *Sarcoptes scabiei cuniculi* (*Sarcoptic mange*) and *Notoedres minor cuniculi* (*Notoedric mange*) is not so rare as reported. The condition has been frequently observed in rabbits kept for experimental purposes in the departments of Pharmacology and Pathology of the Orissa Medical College, Cuttack,

The presence of both kinds of mites on the same animal has been recorded. The mites, which are less than 1/50 inch in length, burrow into the skin and produce an exudate which forms and sets up an intense itching. The rabbits scratch at these parts which may result in open sores with secondary bacterial infection. The condition is very contagious in rabbits, spreading rapidly through the rabbitry, if not checked, and in the course of several weeks killing the affected animals through exhaustion, emaciation and resulting starvation. A microscopical examination is, therefore, necessary for a correct early diagnosis (Schwartz and Shook, 1928). The following symptoms have been observed.

The lips, chin, nose, face and head and roots of the ears and circles around the eyelids are affected in succession. It gives the animal a bespectacled appearance. When around the nose, the nose tip has a proboscis-like aspect. The animal scratches at these parts very often. Yellowish or greyish crusts appear when the fur falls off. Besides the above symptoms commonly noticed, the animal under our observation showed lesions at the back, round the nails of the legs and drooping of the ears as well.

A 1 in 10 tincture of tobacco leaves in methylated spirit was prepared and painted on the affected areas twice a week on 17 suffering rabbits. Observation of the rabbits treated next morning after application revealed signs of disintegration of the crusts and less of itching. On the second day, the crusts showed

falling off from all the lesions and the animals showed an improvement in their general outlook. They were more active and took interest in their food. On the third day their skin was visible at places where the crust had fallen off. A smear examination of skin scrapings at this stage showed the presence of mites in fewer numbers. The observations being encouraging after the very first application, it was thought desirable to give another application on the lesions on the fourth day. The improvement was much quicker on the fifth, sixth and seventh days and by the end of the week nearly all the crusts had fallen down and there were signs of hair growth. One more application was given and about 40 per cent of the rabbits completely recovered with almost normal growth of hairs and resumed their normal life. The examination of skin scrapings under the microscope showed complete absence of mites in most of the rabbits and presence of a few in some. Rabbits which were not cured after the third application required one or two more applications for complete recovery.

During the course of treatment, the surroundings were disinfected with lysol lotion and cleaned daily in order to remove the dead or dying mites which had fallen off with the crusts from the suffering rabbits.

All the seventeen rabbits without exception proved amenable to this treatment and local application did not produce any toxic symptoms except signs of mild irritation for not more than a minute after the application is made possibly due to irritation caused by diffusion of some spirit into the eyes and the nasal mucous membrane.

As a control, four affected rabbits, diagnosed microscopically to be suffering from the same disease, were painted with plain methylated spirit. No change in the condition of the lesions was observed proving that some active principles in tobacco are responsible for the parasitocidal action of tobacco when dissolved in methylated spirit and not the latter alone.

A watery infusion of tobacco (1 in 10) was also tried on another four suffering rabbits but it was not found to be satisfactory.

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[The views and opinions expressed in correspondence are those of the writers themselves. Ed. I.V.J.]

"Benzene Hexachloride Poisoning in Cattle"

The above article by Messrs. Y. Ramanujam, G.M.V.C., V. Gurumurti, G.M.V.C., and J. Venkatanarayana, B.V.Sc., published in the I.V.J. Vol. XXVIII, No. 5 (March, 1952) reports toxicity in a cow and calf treated with a thick emulsion of 'Lindane', a product containing 99% pure gamma isomer of BHC. Similar toxic effects have been reported in calves sprayed with a strong solution of 'Lindane'. It is unfortunate that no precise information is given of the actual emulsion strength used in these cases. 'Lindane' is an American product, and not a German one as stated.

In this connection we wish to point out that a strength of 0.1% pure gamma isomer of BHC is most suitable for use in veterinary practice. This concentration is lethal to all ectoparasites, but is quite harmless to the host even when there is some danger of calves licking each other after treatment. This solution may be obtained by diluting 1 part of 'Lorexane' Solution in Miscible Oil (5%) in 49 parts of water (3 oz/gal.), and is also the officially recommended treatment for bovine mange in Britain. It is therefore essential that all users of BHC should conform to the strength recommended to obtain the best results and eliminate toxicity.

Calcutta, }
16th April 1952 }

Yours faithfully,
For I. C. I. (INDIA) LIMITED,
G. V. SHORT,
For Director.

"Acute Theileriosis in a Calf."

The article in "The Indian Veterinary Journal" (March, 1952) by Mr. G. K. Sharma and Mr. Dharam Sarup Kalra is most interesting, and we would offer the following observations to prevent possible toxicity in future cases.

'Atebrin' is identical with mepacrine hydrochloride B. P. The combined use of mepacrine and pamaquin is dangerous as each drug reinforces the other's toxicity, leading to haemolysis. In man, where these two drugs are used successively for the treatment of benign tertian malaria, an interval of 5-7 days is required between stopping the mepacrine and starting the pamaquin.

In 1946-47, pamaquin hydrochloride solution 1% was used by the army to control an outbreak of bovine anaplasmosis/theileriosis in Bannu. Partition prevented the evaluation of this work though a favourable response was reported. This formulation was specially made for intravenous injection in this outbreak and is not now available, but equivalent treatment may be given by oral

administration of Pamaquin B. P. tablets, each containing 0.018 Gm. pamaquin naphthoate. We suggest a dose of pamaquin at 1-2 mg./kg. per day, so that 2-6 tablets per day orally should suffice for calves.

Yours faithfully,
For I. C. I. (INDIA) LIMITED,
G. V. SHORT, M.R.C.V.S.,
Veterinary Service Department.

Calcutta, }
26th April 1952 }

Referring to the article on Contagious Otorrhoea in cattle published in the I.V.J. for November 1951, I request you to publish the following few points through your esteemed journal which may add further interest on the subject.

(1) I have found in my experience that the complaint is prevalent during winter and summer season also. (2) I have not come across any cattle being affected. (3) 30% of the buffaloes affected showed udder lesions.

Yours faithfully,
K. NARAYANA RAO,
Veterinary Asst. Surgeon,
H/o M.V.D., Challapalli.

Challapalli, }
22-4-1952 }

College News

BENGAL VETERINARY COLLEGE

List of students who have passed the Diploma (G.V.Sc.) Examination for the session 1951-52.

(In order of merits)

- | | |
|--------------------------------------|---------------------------------------|
| 1. Yeo Chwee Kim | 15. { Clement Leonard Wisidagama |
| 2. Arumugan Mahendra | 16. { Monorajan Kundu |
| 3. Nihar Kumar Bir | 17. { Shyamal Beharur Bhaduri |
| 4. D. Ramiah | 18. { Ghulam Abbas |
| 5. Anuwar Bin Mahmud | 19. { Setlore Biligiri Iyenger |
| 6. Kumarasingham Maheswaran | 20. { Mohamed Zahiruddin |
| 7. Nityananda Pati | 21. { Benoy Ranjan Paul |
| 8. Navasivayam Balasubramaniam | 22. { M.P. Gurusiddiah |
| 9. Thillyampalam Mahendranathan | 23. { Shaikh Fazlar Rahman |
| 10. Bhut Nath Basu | 24. { Thoompunkal Koshy Nainan |
| 11. Rex Valentine Yogendiran | 25. { Gandasi Marulappa Shivalingappa |
| Arasaratnam | 26. { Bagivalu Thimmegowd |
| 12. { Shyamala Kanta Chakrabarty | 27. { Dyavaralli Gowda |
| 13. { Thadikvagal Ramaiah Krishnaiah | 28. { Chiraranjan Bhattacharjee |
| 14. { Hari Krishan Sharma | 29. { Rajamannarpillay Kamalanathan |
| 15. { Kispotta Augustine | 30. { Jagadish Sahay Saxena |
| | 31. { Sunil Kumar Chakrabarty |

9th April 1952, }
Calcutta 37, }

K. C. MUKERJEE,
For Principal.

BIHAR VETERINARY COLLEGE, PATNA

List of successful candidates in Diploma Examination of 1951-52
with their position and particulars of stipend.

NAME.	NAME of STATE
1. Mahendra Prasad Verma	Bihar Private
2. Jagdeo Prasad	Bihar Private
3. Gajendra Nath Samal	Orissa
4. Md Istikhar Hussain	Bihar Private
5. Kedar Nath Maik	Bihar Private
6. Sidheshwar Prasad Sinha	Bihar Private
7. Prafulla Chandra Baliar Sinha	Orissa
8. Abdul Majeed	Bihar Private
9. Kailash Narain Purchit	Jodhpur
10. Chittaranjan Patnaik	Orissa
11. Abrar Ahmad	Bihar Private

Patna,
1st May 1952.

H. R. KAPUR, M.R.C.V.S.,
Principal.

PUNJAB VETERINARY COLLEGE

Result of Final B.V.Sc., examination held in February 1952.

1. Ranbir Singh Bagga
2. Raghbir Singh Rana
3. Amolak Ram Puri

Hissar,
2nd May 1952.

SARDAR MOHAN SINGH MALHI,
Principal.

AN APPEAL

Mysore Serum Institute of the Department of Animal Husbandry
in Mysore, Bangalore

SILVER JUBILEE CELEBRATIONS

It is a matter of no small gratification that the Mysore Serum Institute, Hebbal, of the Animal Husbandry Department in Mysore has just completed its 25 years of useful service to the State. From its very humble beginning 25 years ago, this Institute has devoted itself to the production of various types of biological products—Sera and Vaccines—required for combating most of the deadly contagious diseases which threatened the livestock population of the State, year after year. It has also built up a very efficient Research Organisation staffed by a large number of experts trained in foreign Countries and who are striving to investigate the nature, cause, prevention and treatment of a host of other diseases which still remain obscure. This Institute is, in fact, admittedly one of the few of its type in India, being next only to the Indian Veterinary Research Institute at Izatnagar.

We in Mysore should, therefore, feel proud to celebrate the quarter centennial of this Institute in a manner befitting the occasion. With this object in view, a Committee has been set up with the Director of Animal Husbandry Services as its President, to concert measures for the celebration of the Silver Jubilee of this Institute.

The Committee feels that any measures that may be planned for commemorating the occasion suitably should have as their objective, the enhancing of the usefulness of this Institute by enabling the latter to serve the country more efficiently than here-to-fore. This is possible only by extending the amenities of this Institution to the remotest corners of the State more expeditiously and effectively than at present. For this purpose it is proposed to equip the Institute with a mobile Research Laboratory Van with a view to provide facilities for undertaking field investigations into the host of obscure diseases befalling the livestock population of the State and to extend relief measures to them with the least possible delay. Such a mobile laboratory unit is estimated to cost at least Rs. 50,000/-.

I am therefore sending this appeal to you on behalf of this Department, as also the Committee constituted in connection with the ensuing Silver Jubilee Celebration of the Mysore Serum Institute, to contribute liberally towards equipping the Institute with a mobile field Research Van.

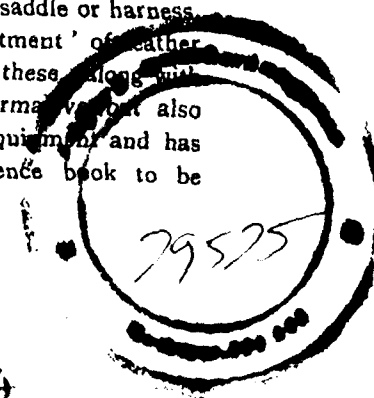
The contributions may kindly be sent either to the President or the Secretary of the Committee, care of the Director of Animal Husbandry Service in Mysore, Bangalore.

Review

Pipe Dreams about Leather and Saddles by Leonard K. Mason.
Price 8/6. Wholesale Distributors: Simpkin Marshall, Ltd., London.

This is a handy publication, very interesting and pleasing to read, in which the author portrays 'the whys and wherefores' of that important ancient British Leather and Saddle industry. In a way he justifies the slogan 'nothing.....like leather'.

Written in a very homely style, free from technicalities, the book gives, in brief, the various processes through which the skin of the animal goes before it becomes a finished product for the building up of a saddle or harness. Hints of a valuable and useful nature are given for 'fair treatment' of leather so as to 'ensure lasting satisfaction' and we are sure that these along with other 'facts' about leather, would be found not only informative but also educational. The book contains excellent illustrations of equipment and has a very comprehensive index. A small informative reference book to be recommended for every library, private or public.



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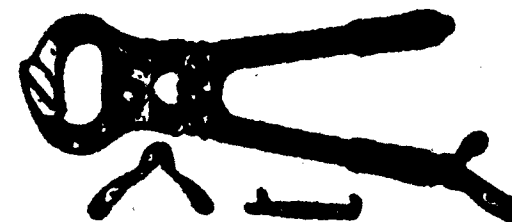
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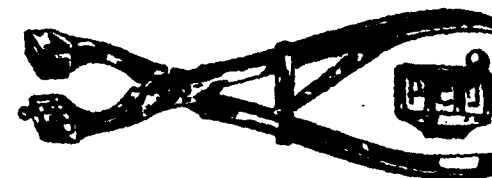
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