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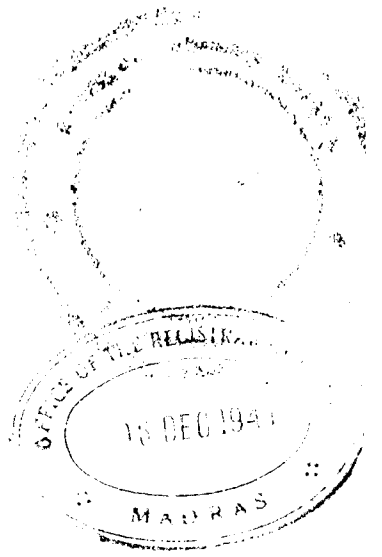
(The Journal of the All-India Veterinary Association)

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# NOTICE

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# The Indian Veterinary Journal

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THE

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THE

# Indian Veterinary Journal

Vol. XVIII SEPTEMBER 1941 No. 2


## General Articles

### EXPERIMENT IN TRYPANOSOMA EVANSI

BY


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In 1841 Valentine of Berne discovered a Trypanosoma in the blood of a trout, and since then innumerable species of these flagellates have been encountered in the blood and tissues of birds, beasts and fishes. As a rule these parasites are specific to a particular host, but inocuous to it. There are others, however, which are pathogenic but apparently harmless to their usual host, which in course of time have developed a tolerance to them. When, however, these Trypanosomes are transferred to unusual hosts they may become exalted in virulence and give rise to serious disease. Animals which are suffering from this latent form of infection, being apparently healthy and able to travel, are a source of danger when moved from an area where Trypanosomiasis is endemic to another, where infection may be transmitted to more susceptible hosts. In this way, during recent years Trypanosomiasis has been widely disseminated.

Surra having been introduced from French Indo-China to Thailand, is threatening over 3 million cattle and buffaloes with extermination. (Bevan, Veterinary Journal – October, 1937).

Up to 1931 British Malaya had been importing, in unrestricted numbers, oxen and buffaloes for the vast meat-consuming population from Thailand. The writer is of opinion that Trypanosomiasis was introduced into Malaya by these Thailand cattle. The first case of Trypanosomiasis (in a pony) was reported in 1903 by Ford. The death of 43 ponies investigated by Moir (1905), was attributed to Surra. In 1907, cases of Trypanosomiasis occurred in horses at Penang and Province Wellesley. Fraser and

Symonds have also come across in Malaya, Thailand cattle naturally affected with *T. evansi* (imported animals). At present cattle from Thailand are imported under restriction, and these animals are required only for meat. Such imported animals are kept in the Government Cattle Quarantine Station, until required for slaughter, from where they are taken direct to the slaughter houses.

In 1934, six cases of Trypanosomiasis (*T. evansi*) in horses were detected in Pahang and one case in dog in Perak.

In 1935, Trypanosomiasis was seen in four dogs at Taiping. In Selangor a solitary case of canine Trypanosomiasis was reported, and seven cases were reported in Pahang in dogs.

During 1937, canine Trypanosomiasis occurred in Pahang. In Perak there were two sporadic cases. Trypanosomiasis in Kedah was diagnosed in six buffaloes and three dogs. The peripheral circulation of a Thailand buffalo in Penang showed *T. evansi*.

In 1938, five cases of Trypanosomiasis in dogs and two cattle were found in Perak. Three cases (in buffaloes) were detected in Kedah and one case in an imported Sindhi bull in Seremban.

Wenyon is of opinion that the goats usually shake off the infection in about six months' time, by which time auto-sterilisation is said to have taken place.

The writer experimentally infected various animals with the object of determining (1) the period when auto-sterilisation takes place in the goat, and (2) the species of animals that are susceptible to infection, and (3) the species that succumb to it.

A batch of 42 buffaloes and 24 oxen from Siam were imported into Penang on 5-10-1937 for slaughter. Blood smears were prepared from all animals which showed any rise in temperature.

On 9-10-1937 *T. evansi* were found in blood taken from one of these buffaloes (Micro-photo No. 1). This buffalo (No. 25) showed only a slight rise of temperature (102·2° F.). *T. evansi* could not be seen in its blood on subsequent examinations.

On 26-10-1937 although no *T. evansi* were actually seen in smears, 4 c.cs. of blood from the auricular vein of this buffalo together with 1 c.c. of Sodium Citrate solution were injected into guinea pig (No. 1). The buffalo showed no sign of ill-health and fed normally until eventually sent for slaughter. Smears from the lungs, heart, liver, spleen and kidneys of the buffalo all proved negative.

On 19-11-1937 an apparently healthy local goat was inoculated with 4 c.cs. of heart blood from guinea pig No. 1, while the latter was showing *T. evansi* in its blood The goat became infected, *T. evansi* appearing in its blood three days after inoculation.



On 12-9-1938 a healthy calf was inoculated with the blood from the infected goat.

The blood from the goat and the calf was later used in a series of experiments in inoculating 14 guinea pigs, 2 cats, 10 dogs and 2 pigs.

The attached Table I shows the dates upon which infection could be seen on microscopic examination, and the results therefrom.

The results of the experiments are as follows :—

One pig became emaciated and eventually died without showing infection ; 14 guinea pigs, one calf and eight dogs contracted the disease, and all became emaciated and died.

Dog No. 9 failed to be infected and was destroyed on 3-1-1940.

The experimental goat is still alive and kept under observation.

Dog No. 10 was not infected and was destroyed on 18-3-1940.

Cat No. 2 which was inoculated with blood taken from the dead calf failed to take the infection.

Pig. No. 2 has not taken the infection and was under observation until 1-6-1940 when it was sold for breeding purposes.

Although *T. evansi* could not be seen in smears prepared from peripheral blood, yet when the blood was injected into these experimental animals the condition was set up, and *T. evansi* demonstrated in blood smears prepared from them, due to the low concentration of trypanosomes in the blood of the infected animals.

Blood smears prepared at post-mortem examinations showed *T. evansi* only when the terminal condition was septicaemia.

When trypanosomes were not seen in the peripheral blood, blood smears prepared from the internal organs also proved negative.

### Morphology of Trypanosoma evansi

These were stained with Giemsa, Leishman's and Panoptic. The last named stain gave the best results. The Trypanosomes possessed a long free flagellum which is said to be characteristic of *T. evansi*, and also the centrally placed nucleus. The Kinetoplast was quite distinct. The posterior extremity is like a drawn out tube and the Kinetoplast is situated in this tube. The flagellum starts from this Kinetoplast and ends in a long free flagellum after developing a marked undulating membrane with manifolds.

Trypanosoma evansi has a large centrally placed nucleus which plays a vital part and can be compared to the brain of vertebrates as it controls all the functions of the organism. There is also a small mass of shining chromatin called the Kinetoplast or centrosome situated in the drawn out tube

of the posterior end of the parasite. This is mainly concerned with the reproduction and locomotion of the parasite.

The long flagellum which takes its origin from the Kinetoplast and ends anteriorly into a whip-like process is called the axoneme when bordering the undulating membrane. The free flagellum and the undulating membrane could be compared in function to the fins of the fish and it is to these that the snake-like movements of the parasites are due.

In the protoplasm of the body are granules called "Volutin materials" which have the function of food materials.

Dividing and Giant Trypanosomes were seen from the blood smears of the following animals :—

Buffalo No. 26, Guinea pigs No. 1 and No. 5.

The measurements of 50 Trypanosomes showed the following :—

| | | | |
|---|---|---|---|
| Longest : | 25·2 microns | X 2 | microns. |
| Shortest : | 18·0 „ | X 1·5 | „ |
| Average : | 24·2 „ | X 1·8 | „ |

**Adhesion of Platelets and Agglomeration of Trypanosomes**

This phenomenon was successfully demonstrated on guinea pig No. 1 on 10-12-1937 (Micro-photo No. 2). The serum used was drawn from the experimental goat on 8-12-1937. This test was carried out with success on the blood of guinea pig No. 5 on 17-12-1937. (Micro-photo No. 3).

Another test was made on 26-4-1938 from the blood of guinea pig No. 9 (Antigen), and serum from the experimental goat drawn on 2-12-1937 (Micro-photo No. 5). The same phenomenon was carried out from the blood of the experimental dog No. 1 (Micro-photo No. 4).

Also same test was performed on 30-1-1939 from the blood of the experimental dog No. 3 and serum (anti-sera) from the experimental goat drawn on 21-1-1939 (Micro-photo No. 6).

On 21st, 22nd, 23rd and 25th of May, 1939, Agglomeration Tests with the blood of Dog No. 6 (Antigen) and the serum of the experimental goat (Anti-serum) were again carried out successfully (Micro-photo No. 7).

Hanging drop method was adopted on all these occasions, and perfect Rosette formation of live trips were seen formed within a minute after mixture of the serum and blood.

The posterior parts of the trips were found together in regular formation with the anterior and radiating free in the serum.

The phenomenon can only be demonstrated when there are about 60 trips to the field. (Oil immersion lens 1/12″ in wet blood smears).




Fig. 1. Photo of Thailand Buffalo.


Fig. 2. Photo of Experimental Goat.

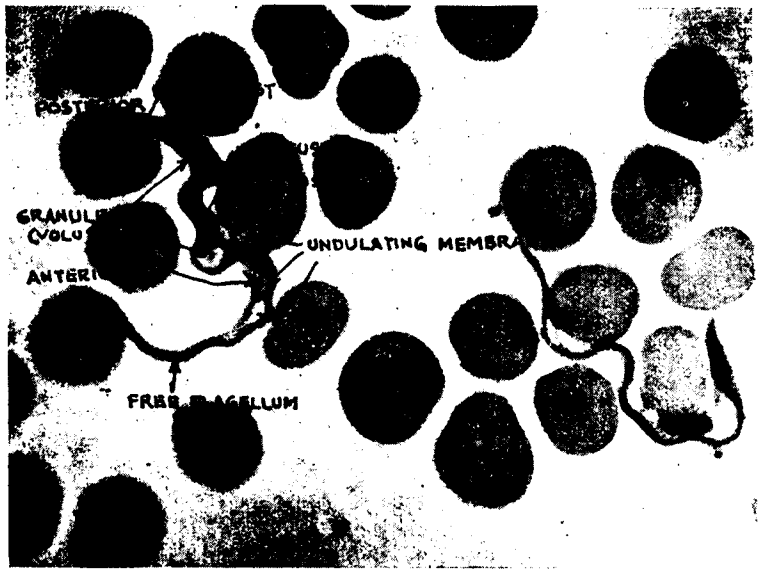


Fig. 3. Micro-photo of *T. evansi*.

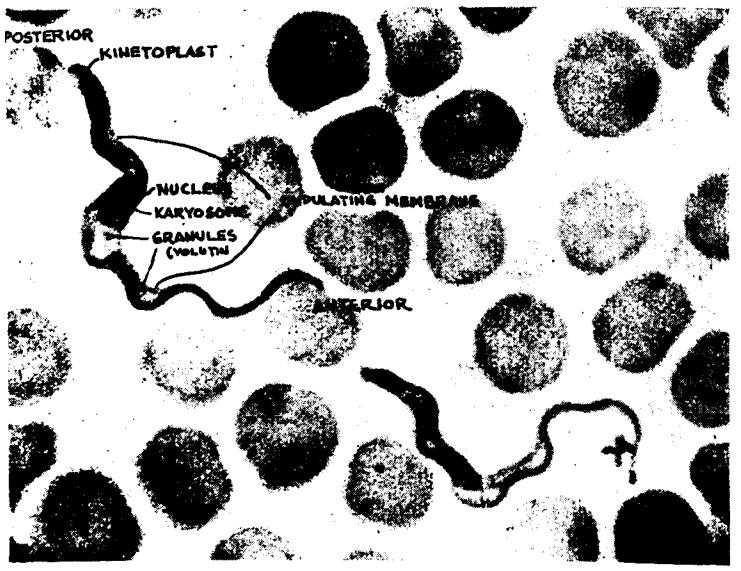


Fig. 4. Micro-photo of *T. evansi*.



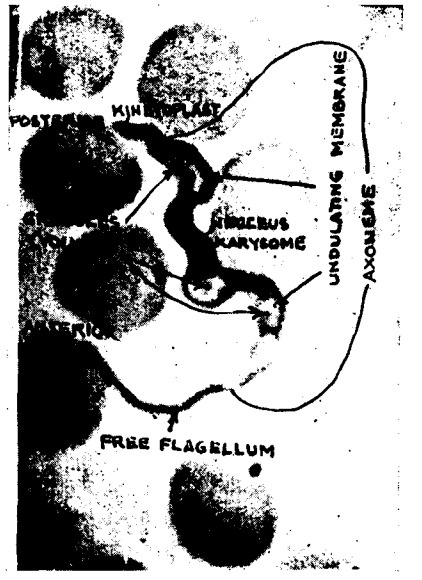


Fig. 5. Micro-photo of *T. evansi*.

Fig. 6. Micro-photo No. 1.
Blood smears from Thailand Buffalo No. 25. 9-10-37 ($1\frac{1}{2}$" Oil Immersion Lens)

Fig. 7. Micro-photo No. 2. Agglomeration test (Blood containing *T. evansi* from Experimental Guinea-Pig No. 1, mixed with Anti-Serum from Experimental Goat). 10-12-1937. (1/12" Oil Immersion Lens).

Fig. 8. Micro-photo No. 3. Agglomeration test (Blood containing *T. evansi* from Guinea Pig No. 5, mixed with Anti-Serum from Experimental Goat) 17-12-1937. (1/12" Oil Immersion Lens).



### Mercuric Chloride Test

This test was carried out on several occasions on the experimental animals. One drop of serum was added to 1 c.c. of a solution of 1/25,000 Perchloride of Mercury.

The Mercuric Chloride Test was found to be of doubtful value, as at times positive results were obtained and at times negative, when successful blood inoculations were made into susceptible animals. (Please vide Table II).

The Mercuric Chloride Test was tried with the serum of the experimentally infected goat on 6-2-1938 and on 8-3-1938 with positive results; and on the 1st, 9th, 14th and 22nd April, 1938, with negative results.

Since February 1938, positive results were obtained up to March 1938, after which the results have been negative; yet the blood from each of these animals proved infective when inoculated into other susceptible animals: hence the Mercuric Chloride Test appears to be of doubtful value.

Serum from the affected guinea pigs were all negative to this test.

### Formal-Gul Test

Formal-Gul Test was also carried out and this too failed to give satisfactory results, as in the case of the Mercuric Chloride Test. (Please vide Table III).

On 22-11-1938 blood was drawn from the infected goat and calf, and the serum obtained was kept in two small sterile bottles and placed in an ice chest. The test was applied on 13th December 1938 to the serum of both animals. A positive result was obtained with the serum of the goat, while a negative result was obtained with the serum of the calf. The strength of the dilution was 1 c.c. of serum to 1 drop (0·05 c.c.) of commercial formalin.

On 17-12-1938 blood was again drawn from the goat and calf. A similar test was applied to the sera of these animals on the same day; but this time the calf's serum was positive while that of the goat was negative, yet the blood from each of these animals proved infective when inoculated into other susceptible animals; hence the Formal-Gul Test appears to be of doubtful value.

### Viability of Trips

Some wet smears (unstained) were sealed in vasaline and compared with unsealed (unstained) smears, and it was noted that in the sealed films the parasites lived for about 5½ hours as against 3½ hours in the case of the unsealed. (Room temperature from 79° to 81°F.)

### Culture

Efforts to grow *T. evansi* in N.N.D. media in an incubator as well as in refrigerator did not meet with success.

### Treatment

Several drugs as Naganol, Antimosan, Tartar Emetic, Atoxyl, Mercuric Chloride, Tryparsamide, etc., are being tried in several countries in the treatment and control of Trypanosomiasis. Excellent results are claimed by the use of Naganol (Bayer 205) and varying results with the other above-mentioned drugs.

A batch of 26 oxen and 64 buffaloes arrived from Thailand on 4-6-1940 for slaughter in Penang. At 7 a. m. on 11-6-1940 one of the buffaloes (age 6 years) No. 26 was seen lying on the floor with all the visible mucous membranes injected, locked jaw, eyes blood shot, stiff legs which could be bent with difficulty, dyspnoea and it was salivating. Temperature was 99·8° F. At no time did the temperature exceed 102·4°F. The bowels were costive and covered with blood and mucus. Wet blood films showed heavy infection with Trypanosomes. Intravenous injection of Tartar emetic (40 c. cs of a 10% solution) was given to this animal on 11th, 12th, 17th, 20th, and 25th June, 1940. Few Trypanosomes were seen on 17th, 24th, and 25th. On 12th June, the animal was in a state of stupor, eyes half-closed and salivating profusely. On 13th, the animal was able to stand, but was constantly moving its head from side to side. On 14th the animal was going round and round in a circle and stumbled over obstacles as if the animal was blind. All these days the animal was watered and fed by force. From 17th onwards the animal started masticating and drinking water of its own accord.

As no Trypanosomes were seen from the 26th June onwards and the animal picked up condition rapidly, it was sent for slaughter for meat on 1st July, 1940

Wet and dry smears taken from the spleen, brain vessels, liver, lungs, kidneys and heart of the animal failed to reveal Trypanosomes.

All the organs appeared normal except there was a good deal of pericardial fluid and the flesh was of a darker colour than normal.

### Conclusion

(1) The passage of *T. evansi* through a goat does not seem to attenuate its virulence as inoculations with this passaged strain produced fatal results in 8 dogs, 14 guinea pigs, 1 calf and 1 cat, only the last 2 dogs out of the 10 inoculated surviving.



Fig. 9. Micro-photo No. 4. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 1, mixed with Anti-Serum from Experimental Goat). 17-12-1937. (1/12 Oil Immersion Lens).

Fig. 10. Micro-photo No. 5. Agglomeration test (Blood containing *T. evansi* from Experimental Guinea Pig. No. 9, mixed with Anti-Serum from Experimental Goat). 26-4-1938 (1/12″ Oil Immersion Lens).

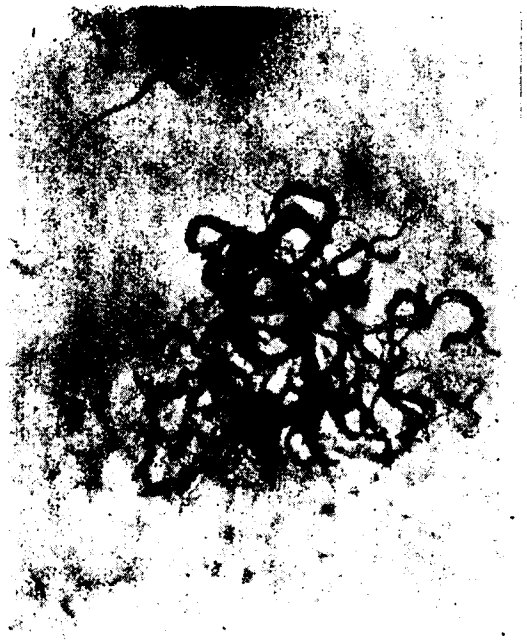

Fig. 11. Micro-photo No. 6. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 3, mixed with Anti-Serum from Experimental Goat) 30-1-1939. (1/19" Oil Immersion Lens).

Fig. 12. Micro-photo No. 7. Agglomeration test (Blood containing *T. evansi* from Experimental Dog No. 6, mixed with Anti-Serum from Experimental Goat). 23-5-1939. (1/12" Oil Immersion Lens).



(2) The Goat in this experiment has remained infective for a year, 8 months and 20 days; hence auto-sterilisation does not take place at least in every case in 6 months time as is generally believed to be and supported by Wenyon.

Since only one goat was experimented with, the results cannot be said to be conclusive.

(3) In addition to cattle, goats must also be considered reservoirs of *Trypanosoma evansi.*

(4) The writer failed to infect 2 pigs although Baldry (1910) says that pigs are susceptible and may be infective to other animals.

(5) Mercuric Chloride and Formal-Gul Tests, are of doubtful value when applied to the goat and calf, at least that has been our experience in this series of experiments.

**Acknowledgements**

1. I am greatly indebted to Captain D.P. White, M.R.C.V.S., Veterinary Officer, Penang, for correcting and permitting to publish this paper. Thanks are also due to Mr. R. A. B. Stanhope, M.R.C.V.S., B.V.SC., for originally permitting to carry out this experiment.
2. I am also indebted to the Government Pathologist, Penang, and his staff for assistance rendered in this experiment.
3. I acknowledge with pleasure the assistance rendered by Mr. Yeoh Hoe Peng, Chinese Livestock Inspector, Penang.

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1. Protozoology by C. M. Wenyon.
2. Surra in the Federated Malay States by Fraser, H and Symonds, S. K,
3. Trypanosomes and Trypanosomiasis by Lavern and Mesnil,
4. Some Observations on the Trypanesomes of Cattle in South India by M. Anant Narayan Rao and S. Vaidyanatha Mudaliar,

## TABLE I. EXPERIMENT IN TRYPANOSOMA EVANSI SHOWING The Mode of Transmission and Results on Various Animals Used.

| Donors | Recipients | Inoculated on | How Inoculated | Amount of blood | From | When Infected after Inoculation | Remarks | Duration of Disease |
|---|---|---|---|---|---|---|---|---|
| A. Buff. No. 25 | G. Pig No. 1 | 26-10-37 | Intra-peritoneally | 4 c.cs. | Auricular vein | 6-11-37 (11 days) | Died on 11-12-37 | 47 days |
| B. G. Pig No. 1 | Goat No. 1 | 19-11-37 | Subcutaneously | 4 c.cs. | Heart blood | 22-11-37 (3 days) | Still kept under observation | |
| do | G. Pig No. 4 | 28-11-37 | Intra-peritoneally | 5 c.cs. | do | 1-12-37 (3 days) | Developed paraplegia Destroyed on 31-12-37 | 34 days |
| C. Goat No. 1 | G. Pig No. 5 | 8-12-37 | do | 3 c.cs. | Jugular vein | 15-12-37 (7 days) | Died on 31-12-37 | 24 ,, |
| do | G. Pig No. 8 | 29-1-37 | do | 3 c.cs. | do | 28-2-38 (30 days) | Died on 29-3-38 | 60 ,, |
| do | G. Pig No. 9 | 7-3-38 | do | 3 c.cs. | do | 15-3-38 (8 days) | Died on 11-5-38 | 66 ,, |
| do | G. Pig No. 10 | 26-4-38 | do | 5 c.cs. | do | 7-7-38 (72 days) | Developed paraplegia on 15-7-38. Died on 16-7-38 | 82 ,, |
| do | G. Pig No. 11 | 9-7-38 | do | 3 c.cs. | do | Not infected | Died of pneumonia on 16-7-38 | — |
| do | G. Pig No. 12 | 6-8-38 | do | 3 c.cs. | do | 18-8-38 (12 days) | Died on 9-9-38 | 35 ,, |
| do | G. Pig No. 13 | 12-9-38 | do | 3 c.cs. | do | Not infected | Died of pneumonia on 26-9-38 | — |
| do | Calf No. 1 | 12-9-38 | Subcutaneously | 7 c.cs. | do | 26-9-38 (14 days) | Died on 30-12-38 | 110 ,, |
| do | Dog No. 1 | 24-10-38 | do | 3 c.cs. | do | 9-11-38 (16 days) | Died on 5-12-38 | 43 ,, |
| do | Pig No. 1 | 1-11-38 | do | 10 c.cs. | do | Not infected | Died of pneumonia on 28-11-38 | — |
| do | Dog No. 2 | 1-11-38 | do | 5 c.cs. | do | 10-11-38 (9 days) | Died on 2-12-38 | 32 ,, |
| do | G. Pig No. 14 | 7-11-38 | Intra-peritoneally | 3 c.cs. | do | 18-11-38 (11 days) | Died on 21-11-38 | 15 days |
| do | Cat No. 1 | 22-11-38 | Subcutaneously | 5 c.cs. | do | 12-12-38 (19 days) | Died of Septicaemia on 4-4-39 | 134 ,, |
| do | G. Pig No. 15 | 13-12-38 | Intra-peritoneally | 5 c.cs. | do | 25-12-38 (12 days) | Died on 7-1-39 | 26 days |
| do | Dog No. 3 | 17-12-38 | Subcutaneously | 5 c.cs. | do | 27-12-38 (10 days) | Died on 29-1-39 | 44 ,, |
| do | Pig No. 2 | 6-2-39 | do | 5 c.cs. | do | Not infected | Discharged and sold on 1-6-40 | — |
| do | Dog No. 5 | 6-2-39 | do | 5 c.cs. | do | 23-2-39 (17 days) | Died of Septicaemia on 10-4-39 | 64 days |
| do | Dog No. 6 | 15-4-39 | do | 5 c.cs. | do | 29-4-39 (14 days) | Died on 27-5-39 | 43 ,, |
| do | Dog No. 7 | 23-6-39 | do | 5 c.cs. | do | 6-7-39 (13 days) | Died of Septicaemia. Found dead on 6-8-39 | 45 ,, |
| do | Dog No. 8 | 26-8-39 | do | 5 c.cs. | do | 15-9-39 (14 days) | Died of Septicaemia. Found dead on 23-10-39 | 59 ,, |
| do | Dog No. 9 | 26-10-39 | do | 5 c.cs. | do | Not infected | Destroyed on 3-1-40 | — |
| do | Dog No. 10 | 3-1-40 | do | 10 c.cs. | do | Not infected up to 6-3-40. | Kept under observation until 18-3-40, when it was destroyed. | |
| D. Calf No. 1 | G. Pig No. 16 | 13-12-38 | Intra-peritoneally | 5 c.cs. | do | 30-12-38 (17 days) | Died on 4-1-39 | 23 ,, |
| — do | Dog No. 4 | 17-12-38 | Subcutaneously | 5 c.cs. | do | 30-12-38 (13 days) | Died on 21-1-39 | 36 ,, |
| — do | Cat No. 2 | 31-12-38 | do | 3 c.cs. | Heart blood | Not infected | Destroyed on 2-3-39 | |
| E. G. Pig No. 5 | G. Pig No. 6 | 30-12-37 | do | ½ c.cs. | do | 1-12-38 (2 days) | Developed paraplegia Destroyed on 20-1-38 | 22 ,, |
| F. G. Pig No. 6 | G. Pig No. 7 | 20-1-38 | do | 4 c.cs. | do | 8-2-38 (19 days) | Developed paraplegia Destroyed on 28-3-38 | 68 ,, |

**RECORD OF MERCURIC CHLORIDE TEST**

**Table II**

| Date of Test. | Species of Animals Tested. | *Undiluted.* 1 drop to 1 c.c. Mercuric Chloride Solution. | *Diluted in normal Saline.* 1—10 | 1—20 | 1—40 | 1—80 | Remarks. |
|---|---|---|---|---|---|---|---|
| 6—2—38 | Experimental Goat | + | + | + | + | + | 1 drop serum = 0·05 c.c. Strength of Mercuric Chloride Solution used was 1—25,000. |
| 8—3—38 | do | + | + | | | | do |
| 1—4—38 | do | — | | | | | do |
| 9—4—38 | do | — | | | | | do |
| 14—4—38 | | | | | | | |
| 22—4—38 | | | | | | | |
| 6—2—38 | Guinea pig No. 4 | — | | | | | do |
| 28—3—38 | Guinea pig No. 7 | — | | | | | |
| 29—3—38 | Guinea pig No. 8 | — | | | | | |

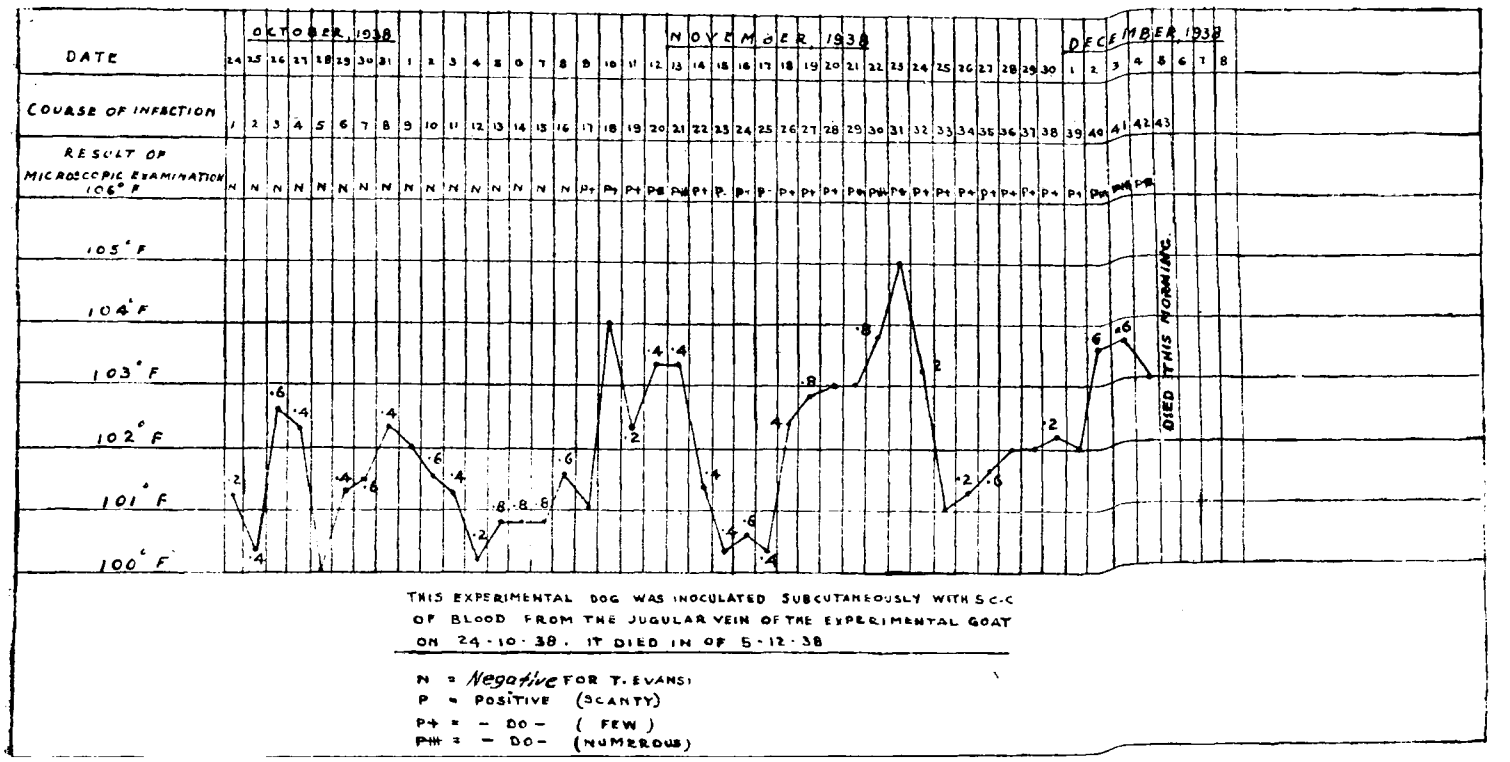


**RECORD OF FORMAL-GUL TEST**

**Table III**

| Blood drawn on | From | Test appiled on | Results | Remarks |
|---|---|---|---|---|
| 22—11—38 | Experimental Calf | 13—12—38 | — | Strength of dilution was 1 c.c. of Serum to 1 drop (0·05 c.c. of Commercial Formalin. |
| do | Experimental Goat | do | + | do |
| 13—12—38 | Experimental Calf | 17—12—38 | + | do |
| do | Experimental Goat | do | — | do |

## TRYPANOSOMA EVANSI EXPERIMENT
### DOG NO. 1

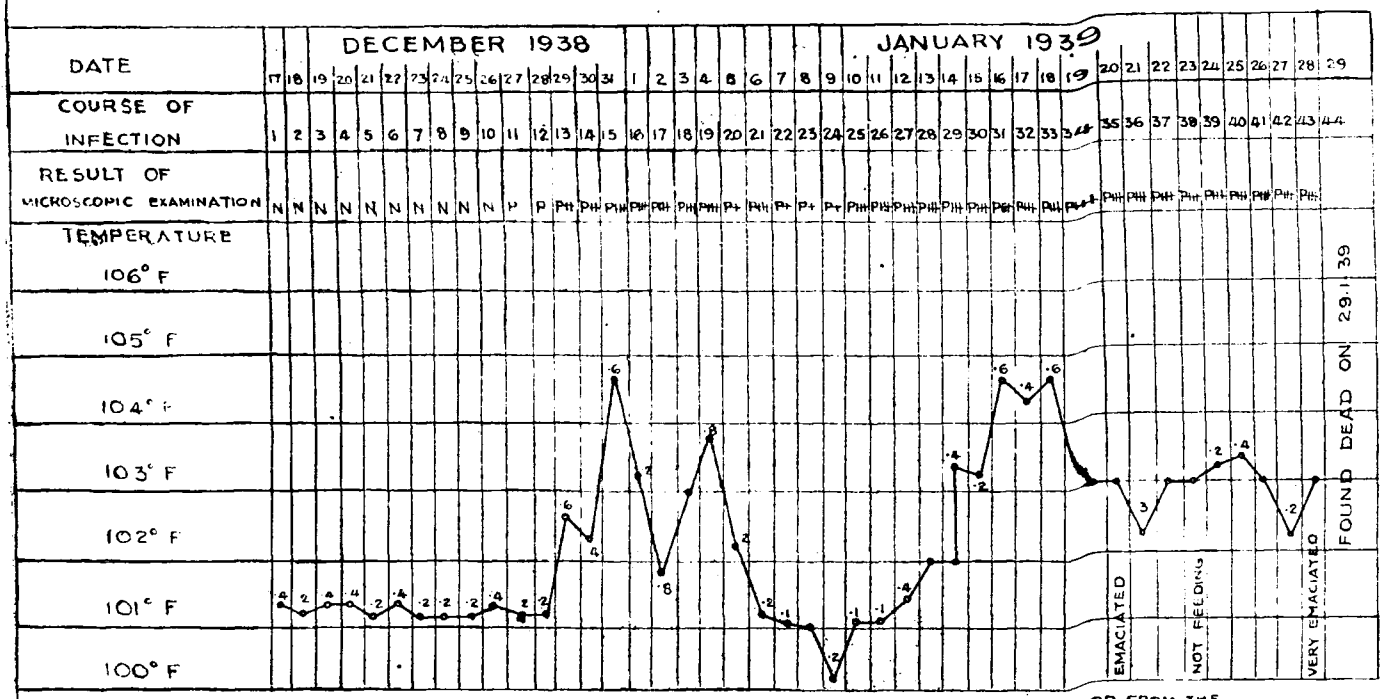



THIS EXPERIMENTAL DOG WAS INOCULATED SUBCUTANEOUSLY WITH 5 C.C OF BLOOD FROM THE JUGULAR VEIN OF THE EXPERIMENTAL GOAT ON 24·10·38. IT DIED IN OF 5·12·38

N = *Negative* FOR T. EVANSI
P = POSITIVE (SCANTY)
P+ = — DO — ( FEW )
P## = — DO — (NUMEROUS)



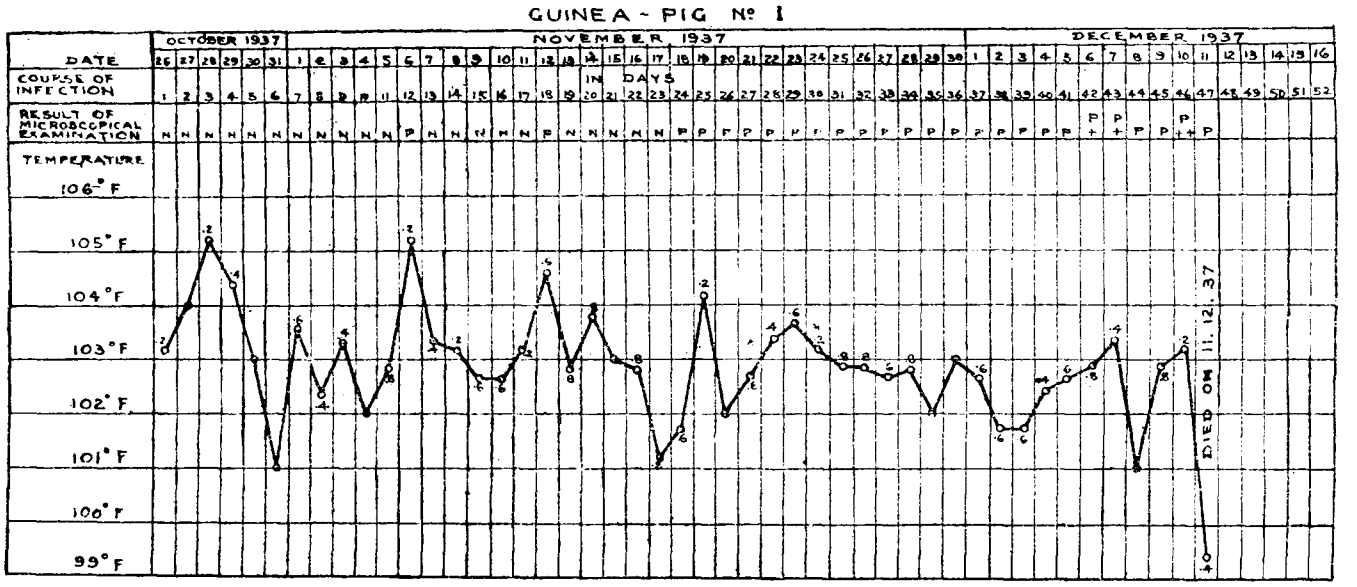
## TRYPANOSOMA EVANSI EXPERIMENT
### DOG Nº 3




THIS EXPERIMENTAL DOG WAS INOCULATED SUB-CUTANEOUSLY WITH 5 C.cs OF BLOOD FROM THE JUGULAR VEIN OF THE EXPERIMENTAL GOAT ON 17·12·38.

N = *Negative for* T. EVANSI P = POSITIVE FOR T. EVANSI. (SCANTY) P+ = POSITIVE FOR T. EVANSI. (FEW)
P## = POSITIVE FOR T. EVANSI. (NUMEROUS) P## = POSITIVE FOR T. EVANSI. (SWARMING.)

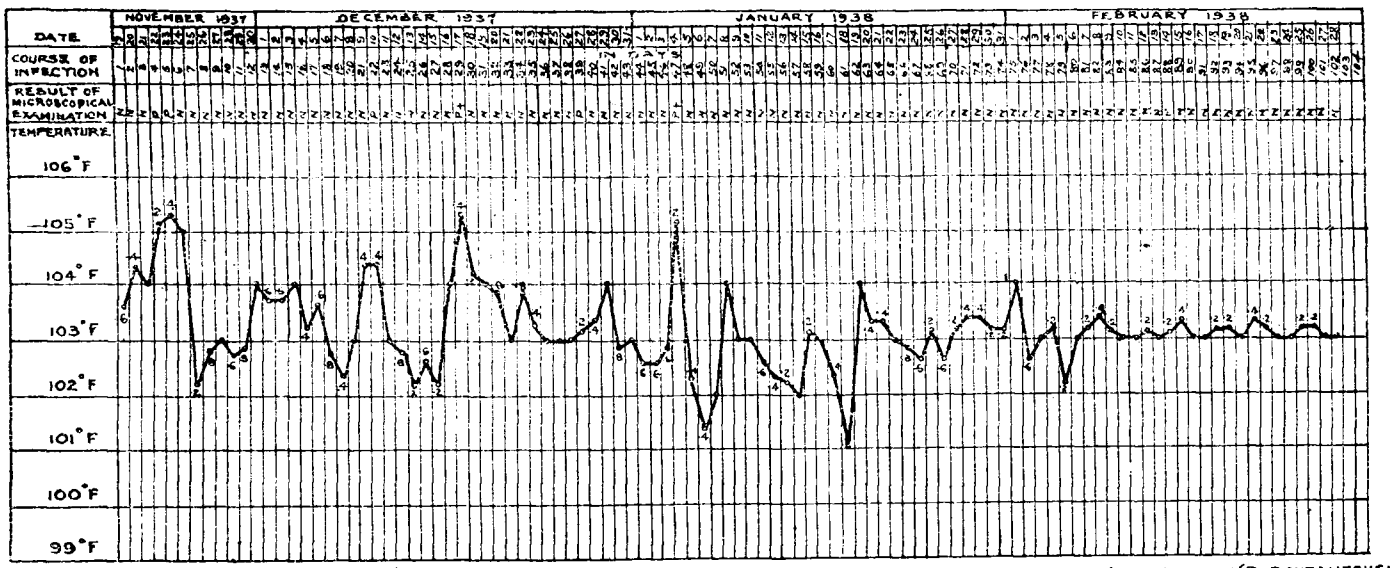
## TRYPANOSOMA *evansi* EXPERIMENT
### GUINEA-PIG Nº 1



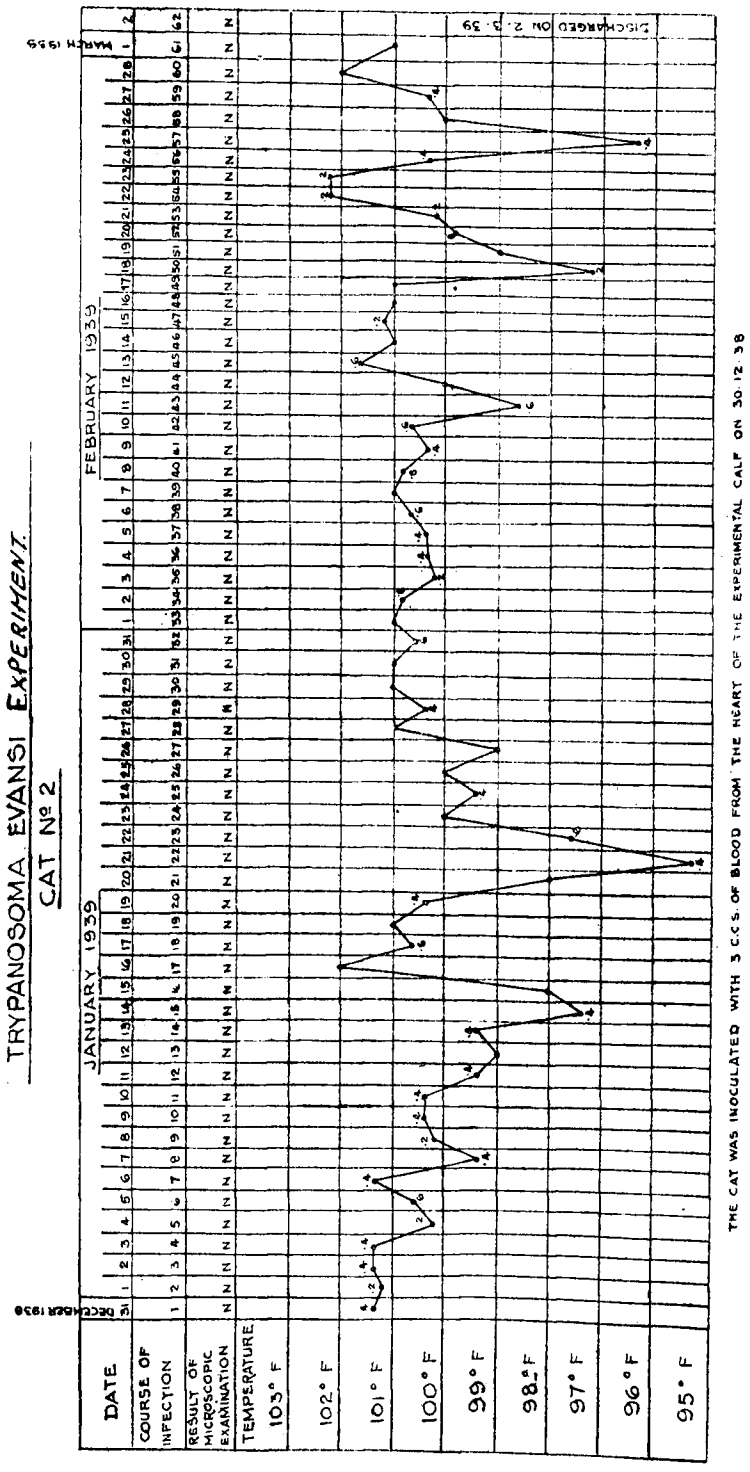

THIS GUINEA-PIG WAS INOCULATED WITH 4 C.CS. OF BLOOD FROM A SIAMESE BUFFALO (Nº 25) IN 1 C.C SODIUM CITRATE SOLUTION ON 26. 10. 37. (INTRA-PERITONEALLY)
IT WAS FOUND DEAD ON 11. 12 37 AT NOON.
N = NEGATIVE FOR *T. evansi*; P = POSITIVE FOR *T. evansi* (scanty), P+ = POSITIVE FOR *T. evansi* (FEW);
P++ = POSITIVE FOR *T. evansi* (numerous). THE MICROSCOPICAL EXAMINATION WAS DONE ON WET BLOOD FILMS UNDER THE $\frac{1}{6}$ DRY LENS



## TRYPANOSOMA *evansi* EXPERIMENT
### EXPERIMENTAL GOAT




THIS EXPERIMENTAL GOAT WAS INOCULATED WITH 4 c.cs. OF HEART BLOOD FROM GUINEA-PIG Nº 1 IN 1 C.C OF (SUBCUTANEOUSLY) SODIUM CITRATE SOLUTION ON 19. 11. 37 WHEN *T. evansi* WAS PRESENT IN BLOOD OF THE LATTER (GUINEA-PIG Nº 1)
IT WAS DISCHARGED ON 26. 4. 38. AS FREE FROM *T. evansi*
N = NEGATIVE FOR *T. evansi* (scanty), P = POSITIVE FOR *T. evansi* (SCANTY), P+ = POSITIVE FOR *T. evansi* (FEW).
THE MICROSCOPICAL EXAMINATION WAS DONE ON WET BLOOD FILMS UNDER THE $\frac{1}{6}$ DRY LENS




## FLIES AND THEIR CONTROL IN CATTLE FARMS AND DAIRIES

BY

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Until the year 1888, the fly was known merely as a source of annoyance to animals and men and was popularly called the 'harmless fly'. It is reported, however, that during the Spanish American War, flies, by the transmission of typhoid fever caused greater losses among the American soldiers than did the whole of the Spanish army. This discovery has, perhaps in no small measure, been responsible for the advances in preventive medicine that have been made subsequently and many out-breaks of diseases have since been traced to the agency of these insects.

There are several ways in which the fly plays a part in the dissemination of disease. In the case of Nagana for instance, the trypanosome undergoes developmental changes in the guts of the 'tsetse' fly, whence it is transmitted through the salivary secretion of these insects. In other cases, biting flies suck the blood from a diseased animal and, by the act of biting healthy animals, simply inoculate into them the infective material. In the case of non-blood sucking flies, such as the common house fly, the method of transmission is usually through direct contamination of food. Few flies are entirely free from germs for one reason because they habitually frequent manure heaps and other exposed excreta. When, thereafter, they settle upon clean food prepared for human or animal consumption, the food is naturally infected. In the same way, they alight upon and infect open wounds. Further, while pupating, the larvae of flies are known to imbibe large numbers of bacteria which eventually pass on into the intestines of the adults (Glaser, 1923). Gussow (1908) allowed a fly to pass over sterile media. Later he found 116 colonies of bacteria and 10 colonies of fungi in the culture. Among these were acid-fast bacillae, B. coli and pyogenous cocci. Parker (1916) estimated that a fly originating from the slums of a city, carries from 800,000 to 500,000,000 bacteria, mostly of the enteric type, though he showed that it is unlikely to pick up more than 21,000 to 100,000 germs from cleaner areas. Further more he found that 75 per cent of flies frequenting dwelling houses are infected with intestinal germs.

### Distribution of flies

Flies of one sort or another are found everywhere. They occur in equatorial regions, as well as near the poles. They are, however, most numerous in tropical regions; while, the prevalence of insanitary conditions

favours their multiplication. In certain southern states of the United States of America, the fly nuisance has seriously impeded the livestock industry. In Australia, it is a source of considerable annoyance to sheep breeders. In Africa, the tsetse fly by spreading trypanosomiasis among both humans and cattle has been responsible for the depopulation of wide tracts. In India outbreaks of cholera and rinderpest are known to occur during the fly season and these insects have been incriminated in the rapid transmission of these diseases.

### Flies as transmitter of Disease

The body of the fly is well adapted to the transmission of disease organisms, as it is covered with hairs resembling bottle brushes from which germs are not easily removed. While feeding on excreta or other discharges, flies readily ingest disease organisms, which they later pass out either in the course of defecation or by regurgitation. Consequently the possibility of food materials being contaminated in this manner is considerable. Typhoid fever is spread among human beings in this way by the common house fly. Tuberculosis, ophthalmia, anthrax, cholera, plague and myiasis are only a few among a host of other dangerous diseases which are similarly disseminated or are mechanically transmitted. Mitzman (1914) succeeded in transmitting anthrax to animals through the bites of *Stomaxys calcitrans* and *Tabanus striatus*. Wollman (1927), experimenting in Tunis, found that the common house fly was infective for 24 hours after coming into contact with *Brucella abortus* and *Brucella melitensis*. It is, therefore, little wonder that these diseases and others such as black-quarter, tuberculosis, Johne's disease and haemorrhagic septicaemia spread so rapidly. Besides these diseases, it has been proved that almost 90 per cent of cattle and sheep are affected with various forms of helminthiasis. Here again the fly is largely responsible. It has been shown that the fly is able to ingest eggs of the tape worms, *Diplidium caninum*, *Tenia Marginata* and *Tenia serrata* and later to infect food materials with them. Podyapols Kaya and Gnednia (1934) working in Moscow found helminth eggs in specks or 'vomits' deposited by flies upon the window panes of slaughter houses and restaurants. Patton (1932) and a number of other workers have shown that in several parts of the world the common house fly is the carrier of Habronema to equines, while *Musca crassirostris* is the probable transmitter in India.

### Description of a Fly

All flies belong to the order Diptera or two winged insects. The body of a fly consists of the head, the thorax and the abdomen. The larger part of the head, is occupied by a pair of compound eyes. Between these two compound eyes, there sometimes occurs a group of single eyes. In the female of certain species such as the house fly, the space between the eyes is wider than that in the males. In the case of some Diptera, such as the



house fly, the mouth parts are provided with a pair of oral lobes and are adapted for sucking; whereas in others, such as the stable fly, the proboscis is pointed and adapted for piercing.

(*a*) *Anatomy.* The mouth leads to the pharynx. From the pharynx the gullet runs through a set of nerve ganglion into the thoracic cavity entering the proventriculus. The nerve ganglion mentioned above represents the brains of the fly. The proventriculus, after giving out a branch to the crop, opens into the stomach and continues, as the intestines, inside the abdomen. At the posterior end of the body, the intestines open into the rectum which terminates in the anus. The crop acts as a reservoir, similar to the rumen of cattle, and, like cattle, flies require a large quantity of fluid for regurgitation. Liquid food from the crop passes to the proventriculus and thence to the stomach for digestion.

The respiratory system is represented by breathing pores, situated on the sides of the body, which supply air to the air-sacs in the head and thorax and at the anterior end of the abdomen. The air-sacs give off trachea to the muscles and viscera. The vascular system of the higher animals is absent in the fly but there is a muscular tube at the dorsal part of the abdomen representing the heart. The whole body cavity is filled with a colourless fluid containing fat corpuscles. This corresponds to the blood of higher animals. During the fly season, the abdomen of the female fly is nearly filled with white cylindrical eggs. These are packed in the two ovaries, each of which may contain some 60-70 eggs. The ovaries open into the ovipositor, which can be made to shoot out by gently pressing the abdomen of the fly. Eggs are deposited through this tube-like ovipositor. The male reproductive organs consist of a pair of testes and a chitinous penis.

### Different kinds of flies

There are about sixty families of Diptera, of which the family Muscidae, a large assemblage of flies, is divided into numerous minor groups which have been accredited by several authorities with family rank. Few of the species included in these families are blood suckers.

(*a*) *The Common House Fly – Musca domestica.* Of the several species in the family, the common house fly *Musca domestica* is a cosmopolitan species as is illustrated by the fact that, in a collection of flies made from different parts of America, 90 - 98 percent proved to be *Musca domestica*, (Hewitt — 1914). The true *Musca domestica*, however, is found only in temperate regions and Patton (1933), after years of study, says that he has no proof that it has established itself on the plains of India. However, this review is intended only for the benefit

of husbandmen and is not intended to deal with problems which are primarily of entomological interest.

The house fly is not capable of biting as its mouth parts of proboscis is blunt and broad but it is a source of persistent annoyance to cattle, by reason of the determined manner in which it settles upon them. *Musca domestica* can be distinguished from other flies of similar appearance by the following peculiarities :—The dorsal region of the thorax is dusty-gray in colour with four equally broad longitudinal stripes, the light region of the abdomen is yellowish and transparent. The dorsal line is blackish brown. The eggs are blackish brown and the wings, though mainly tinged with pale gray, have a yellowish base. The broad frontal stripe of the female is not wider at the anterior end than at the bases of the Antennae. This stripe though usually velvety black, may often be reddish and shimmering. The abdomen gradually becomes darker as it nears the posterior part of the body.

(*b*) *The Stable fly — Stomaxys calcitrans.* This fly, though smaller than the house fly, is sometimes called the biting house fly owing to its close resemblance to the latter. The main difference is in the proboscis which, in the case of the stable fly, is pointed and thus adapted to piercing and sucking blood. Being provided with a blood sucking apparatus, its feeding differs from that of the house fly in that it does not feed upon filth. For the same reason, it does not frequent human habitations. Both sexes attack cattle, upon which they inflict painful bites. They usually choose that part of the animal's body, which is beyond the reach of the animal, such as the back, hump, neck, belly and legs. As a blood sucker, the stable fly is capable of spreading bacterial diseases such as Anthrax. Apart from carrying diseases among cattle, they cause considerable annoyance to them when the cattle are grazing, feeding or being milked. Many a cow gets into the habit of kicking when being milked, because of the constant irritation caused by these flies. The milk yield may also be affected and the once glossy coats of the flies' victims, become rough aud patchy, while the 'bald' parts render them progressively exposed to bites. Riley and Johannsen (1932) describe the fly as follows :—The frontal stripe is black, the cheeks white, the antenae black slender and adapted for piercing. They project forward in front of the head. The thorax is grayish, marked by black stripes. The abdomen is gray dorsally and legs are black.

There is another fly known as the horn fly, *Lyperosia exigua* rather like the stable fly. It is, however, smaller in size and usually goes about in small swarms. These swarms are generally found on the backs and humps of animals. In the genus Musca, Patton (1932) has recorded a number of the species Haematophagus, which feed on blood, although



they are devoid of piercing mouth parts. They suck this blood from wounds made by true biting flies whom they usually follow.

(*c*) *Tabanidae or Gad flies.* The Tabanidae are large, sturdy flies with broad abdomens and large hemispherical heads with large eyes. The eyes are sometimes hairy, sometimes banded and frequently have a metallic gleam. The antennae are short. The proboscis is short with broad cutting blades. The females are blood suckers, while the males are flower feeders. This species is very widely distributed in India. Gad flies inflict extremely irritating bite upon cattle and horses and are capable of accompanying a trotting horse for a considerable distance. Several species of Tabanidae have been shown experimentally to be capable of transmitting surra (*Trypanosoma evansi* infection).

(*d*) *Sarcophagidae or Flesh flies.* There are many species and they are mostly carrion feeders. Their maggots not infrequently occur in wounds. Many species are viviporous producing maggots at birth. The larvae of this fly are sometimes found in the nasal passages and intestines of men and animals producing internal myiasis.

(*e*) *Calliphoridae or Blow flies.* Broadly speaking, there are two varieties of these flies commonly found in India, namely blue and green flies. They are chiefly responsible for the production of maggots in wounds and are known as 'Myiasis-producing' flies. They are frequently seen in garbage, cattle yard refuse, carcases and, as already mentioned, in wounds and ulcers. They are easily distinguished by distinctive colours of the thorax and abdomen.

(*f*) *Hippoboscidae.* These flies are flat with small heads and legs. Their broad thorax gives them the appearance of bloated ticks. They use their wings infrequently but are capable of running swiftly over an animal's body. They have the peculiar habit of progressing sideways instead of straight. They persistently suck blood from their hosts and the sites they commonly prefer are the thighs, neck and hump, or wherever there is a hairy growth in which they can hide. Their skin is so leathery that it is difficult to kill them in the ordinary way and it is usually necessary to wring their necks. Fletcher and Sen (1929-30) have recorded four genera of these flies in India.

### Life History of Flies.

Most flies have four stages in their life cycle, egg, larva, pupa and adult. They lay eggs in a medium suitable for the development of the larva. Some species, however, retain their eggs in the abdomen till they have hatched into maggots. (e. g. flesh flies and tsetse flies). The eggs are laid singly or in clusters and are frequently white and cylindrical, more or less tapering at the extremities. Under favourable conditions of temperature

(about 35°C), the larva of the house fly may hatch out within a day. The larva is thin and tapering towards the head and moults, as it develops. When full grown, it is yellowish-white and may frequent moist faeces or decaying matter. It now burrows under loose earth and assumes the resting or pupal stage with a cylindrical body and round ends. During summer weather, the adult fly emerges from the pupa within 2 or 3 days. It takes a few hours for its wings to straighten out and stengthen sufficiently for flight.

Flies grow to maturity in about a fortnight. Four days after mating they are able to deposit eggs. A single fly is capable of laying about 1,000 eggs in its life time at the rate of about 150 eggs at a time. Parker (Loc. cit) in estimating their potential reproductive capacity states that a single fly under favourable conditions is capable of producing 5,589,720,000 descendants from April to September. Exact information is not available concerning the longevity of an average fly in natural surroundings but according to Graham Smith (1914), a fly cannot live for more than three weeks in summer in captivity. At the end of the summer a large proportion of flies are attacked by a fly fungus known as *Empusa muscae*. Those that remain, hibernate during the winter and reappear in the spring. By summer the fly population is again at its maximum.

## Breeding.

Most of the flies found in cattle farms breed in decaying organic matter, especially cattle yard manure, human excreta or garbage. Hewitt (Loc. cit) found larva feeding upon human excrement, straw, textile fabrics, mushrooms, decaying vegetables, grains and in spittoons. The adults besides depositing eggs upon the materials mentioned above, frequently feed upon them. Cattle yard manure is the breeding ground of most species of flies of the Muscidae family and this is why flies are particularly a nuisance in farms. It is worthy of note, however that *Musca domestica* prefers pig and horse manure and to a lesser extent calf manure for breeding and that it does not breed at all in fresh cow manure. Thomsen (1934) covered a heap of pig manure with fresh cow dung and found that no larva developed. Even the stable fly breeds in cow-dung only when it is mixed with straw and urine.

Open straw stacks are another breeding ground for flies. When the stacks are exposed to rain, *Stomaxys calcitrans* find the damp straw suitable for breeding. It also breeds in the following materials:—open silage pits, chaffed straw bits removed from troughs and thrown in heaps, heaps of straw left after thrashing and moist rice straw stacks. It has been found that the stable fly is not attracted to garbage.

Tabanidae usually deposit their eggs on vegetation over-hanging water, the larvae being aquatic by nature. The eggs may sometimes be found sticking to the stems and blades of rice, in rice fields containing water.



'Blow flies' the so-called green and blue bottle flies, breed in decaying organic matter and also in the wounds and ulcers of living animals. Gray flesh flies being larviparous, do not require a medium for depositing their eggs.

## Control and Prevention

The question of the so-called fly nuisance has engaged the attention of numerous workers. While it is hardly possible to keep farms completely free from flies, they may be kept under control and their number may be very appreciably reduced, if proper measures are taken in time. It is true that organised community efforts are always necessary to successfully combat this nuisance but much may be done in this respect by individual farms, particularly by those situated at a distance from cities. Howard (1917) even considers that a flyless farm is possible and has prepared a model exhibit of such a farm, showing how the various farm buildings may be made fly proof. It is noteworthy that in certain military Dairy Farms in India, the fly nuisance is to a great extent kept under control.

The practices of many Indian farmers and gowallas, however, favour fly breeding. The custom of allowing manure to accumulate inside and outside cattle sheds leads to the multiplication of flies on the premises. In rural areas, the floors of cattle sheds owned by gowallas are often full of cracks filled with decaying manure and these afford excellent breeding places for flies. It is usual to find numerous maggots in such cracks all the year round. The only method of cleaning of cattle sheds practised by these gowallas is to sweep the floor with a rough broom stump and throw the sweepings outside the sheds. This merely transfers the breeding ground and in no way lessens the nuisance. Again it is the practice of farmers to thrash grain in the field and scatter the straw in loose piles, which, when soaked with rain, make a suitable medium for the breeding of stable flies. In the rotten straw, not only stable flies but also house flies breed abundantly. Cow-dung cakes, which are made in every village in India provide another suitable medium for fly breeding and under every cake may be seen myriads of wriggling maggots. By the time the cakes dry up, the maggots have developed into pupae.

Although a favourable breeding ground for flies, farm yard manure is essential for successful farming and cannot, therefore, be destroyed. It is, consequently, desirable that the manure should be stored in a manner that will prevent the development of fly larvae. All open manure pits should be covered. They should be constructed on hard ground with concrete sides to prevent larva from reaching the soil to pupae. The sides of the pile should be clean cut and vertical or slightly sloping towards the centre. As fresh manure is added, it should be tightly packed. This helps fermentation and the heat produced by this fermentation destroys the fly eggs, larvae and

pupae. Lefroy (1916) recommends spraying the surface of the pile with a solution of 1 pound borax in 6 gallons of water, this being sufficient to treat 30 square feet of surface area ; or the scattering of powdered borax over the manure. One pound of borax mixed well with 16 cubic feet of manure and the mixture scattered over the pile and sprinkled with water destroys all larva. The United States Department of Agriculture experimented upon the manure so treated and found that the manurial value is retained, if 15 tons of the manure is used per acre of field. (U. S. Farmer's Bull. 1408.)

Rouband (1918) found that horse manure kept for as short a time as 24 hours in a stable, produced in warm months an average of 10 to 20 thousands larvae per cubic metre. (It is estimated that a horse in warm months is capable of aiding the development of 200,000 flies per month). Where fermentation has been allowed to proceed for 24 hours, it protects the manure from further production of larvae. A heap of six days old manure no longer contains fly larvae, the latter having migrated for pupation. Anti fly measures must, therefore, be taken within 5 days of the removal of the manure from the stable. A complete stirring up of the manure on the day after deposition, repeated on the two following days, destroys 90 per cent. of the larvae since they are then exposed to a temperature of over 50°C. It is a good plan to bury the new manure at least one foot deep inside the old heap, instead of dumping it on the surface.

In New Zealand special instructions are issued to farmers for the treatment of manure. An area of hard level ground at least 3 × 4 feet, greater in extent each way than the ultimate size of the intended dump, is prepared. This is cemented or, if not, top dressing of one part by volume of mineral oil or wood preserving oil mixed with 40 parts of fine soil applied to the bottom of the pit and beaten down, at the rate of one gallon of oil for 100 square feet. Upon this each day's manure is dumped to form a rectangular block. Each load of manure added, must be pressed down with a shovel and, if the weather be dry, the surface of the pits should be sprinkled with water. It was found that at 4 inches beneath the surface of the pits thus treated, the temperature was 169°F. No maggot can remain alive at this temperature. The fertility value of the closely packed manure is also found to be greater. If maggots are discovered at the sides of the block it is advisable to close the sides with gunny bags soaked in kerosene oil. The sacking should only be allowed to remain for a week, for by that time, all the maggots will have been destroyed. In addition the day's dump may be turned over on the two following days, so as to bury the maggots deep and expose them to the heat and gases inside.

In the experiments conducted by Howard (Loc. cit), it was found that if a shovelful of chloride of lime be scattered daily over the fresh manure in the pit at one pound to 8 quarts of manure, the breeding of flies can be



effectively controlled. Forbes (quoted by Howard 1911), experimenting in Illinois, found that a solution of one pound of iron sulphate in a gallon of water, sprayed over the manure pit, prevented fly breeding. Iron sulphate kills fly larvae and deodorizes the manure, but does not interfere with its value. Poisoning the manure with sodium arsenite before removal from the yard to the pit is recommended by the Department of Health in England. One pound of sodium arsenite is mixed with 12 pounds of treacle and dissolved in two pints of water and sprayed over the floors of cattle sheds before cleaning. A watering can can be conveniently used instead of a sprayer. This mixture is useful for spraying open drains, dust bins and garbage trenches, as well as open manure pits. The value of the manure is not in any way altered by the use of this spray. The only precaution necessary is to see that cattle, young stock, dogs and other animals are not allowed to stray in the vicinity lest they pick up the poison accidentally.

Sergent's (1934) method of providing fly free manure heaps is worth adopting on farms. This consists in the construction of a concrete floor 3 yards square fenced with 5 ft high wire surrounded by a masonry gutter. The manure is heaped upon the square flooring and tightly packed. The maggots from the upper layer when they migrate fall into the gutter.

It is a good principle to have some distance away from the cattle yard, a well built and well kept manure pit, where the daily accumulation of manure can be dumped. In the absence of a concrete manure pit, it is better to spread every day's manure in the field exposed to the sun, the drying effect of which will prevent the breeding of flies.

It should be remembered that sources of fly breeding are many, some of which one is inclined to overlook. In order to attract flies, it is a good plan to put up maggot traps here and there in the cattle yard. The United States Department of Agriculture has recommended (Bull. 1408) a trap consisting of a shallow concrete basin sloping slightly and connected with a cistern by means of a drain, which is fitted with a stopper. Over this basin is erected a wooden platform of strips of wood, nailed on a frame, one foot high, the strips being 1½ inches apart. On this platform the manure is placed and water is kept in the basin. Flies are attracted to the manure to deposit their eggs. The maggots that are produced, migrating in search of soil for pupation, fall into the water and are drowned. Ramakrishna Iyer (1935) describes four types of maggot traps based on the knowledge that mature larva migrates from moist manure to seek dry soil for pupation. One such trap consists of wire netting containers filled with manure and hung over water troughs from trees or the like or surrounded water. Such traps are in use at the Government Cattle Farm, Hosur. They prove handy and cheap. In order that such traps should be effective it is, of course, necessary to prevent manure collecting in other places.

Biting flies can be kept down by the proper disposal of stable refuse and cattle yard manure and the proper stacking of straw. In the absence of a shed or barn, the straw should be stacked with vertical sides and top rounded to prevent rain water wetting the stack. After stacking, the base should be cleaned and small bits, which cannot be utilized as fodder, should be burnt in the field. In places where there is a heavy rainfall, as in Bengal and on the west coast of India, it is advisible to protect the stack from rain, particularly when the stack is of rice straw. When a stack is found to have produced numerous flies, it is an indication that the straw is moist and rotten and, therefore, unfit for fodder.

Human excreta is another dangerous medium for fly breeding. In private farms and villages in India, little or no care is taken about the hygienic disposal of night soil. In villages almost any place that provides some degree of privacy is used as a latrine. In cattle farms, gowallas and other farm servants should be taught the seriousness of leaving night soil exposed in this manner. It is also desirable that the authorities in charge of all Government Farms should give due consideration to the necessity for providing sufficient, properly constructed latrines for their menial staff and arranging for the daily incineration of night soil. Jolly (1923) has designed an automatic fly proof latrine seat which is claimed to be specially adapted to Indian conditions, as it meets all objections that might arise from prejudices. Covering the excrement with earth is found to be unsatisfactory as flies have been known to force their way to the surface from pupa, buried 6 feet deep in sandy soil. In open privies, spraying with kerosene oil will do much to check the breeding of flies.

### Other Breeding Places

In combating the fly pest, due attention should be paid to such sources of fly breeding as dust bins, kitchen refuse, vegetable refuse and marshy places containing decaying vegetable matter. Even paper and rags under suitable conditions of moisture and heat may afford such breeding places. The keeping of refuse in fly proof receptacles and its incineration later are the only satisfactory means of coping with this danger. The proper disposal of cases is another important consideration in the campaign against flies, for, as has been pointed out earlier, blow flies and even house flies breed in putrid flesh. It is estimated that a million flies may be produced from a single carcase (W.S.A. Bull 85.) Foreman and Graham Smith (1917) recommend the application of creosote oil to dead bodies, particularly to the skin and openings before burial. This will prevent putrefaction and a subsequent fly pest. Incineration is by far the most efficient method of disposing of carcases. Hurley and Krishnamurthy's (1932) field incinerator is cheap and economical in use and is suitable for small farms. Burial is cheaper than



incineration and equally safe but, when this method is resorted to, it is essential that the carcase is buried deep with layers of lime both below and above. The United States Department of Agriculture in Bulletin 857 recommends the cutting up of carcases and the exposing of the pieces to the hot sun as one of the methods of disposing carcases. This operation would, however, be unpleasant to perform and its safety is open to doubt.

### The Prevention and Destruction of Flies.

(a) *Poisons.* The actual destruction of flies on a farm is difficult and of little value unless it is accompanied by measures directed against their breeding. For the destruction of flies various devices are available such as poisoning, trapping and swatting. Unfortunately a large majority of the poisons which can be used against flies are also toxic for cattle and men. 40 per cent. formalin is a notable exception to this, for, while it is harmless to men and animals, it is an effective insecticide when baited with sugar, jaggery or milk and placed in cups or saucers. Stevenson and Phelps (1916) found the following mixture effective :— two tea spoonfuls of 40 per cent. formalin mixed with ½ a pint of clear lime water and one or two-spoonfuls of sugar ; the solution made up to one pint by the addition of water and the mixture is placed in a vessel, covered by a perforated tin lid through which absorbant wicks are passed. In the absence of any other food materials nearby, the flies are attracted towards this mixture. A sip at this, it is said, usually kills them in a few minutes. In dry weather, this mixture can also be employed near manure pits.

Howard (1911) successfully used a mixture against flies, consisting of one tea spoonful of cream, one tea spoonful of brown sugar and half tea spoonful of powdered pepper.

Fumes of burning pyrethrum, camphor and benzoin are said to have a stupefying effect on flies and are recommended by many people. The New Zealand Department of Agriculture (1938) gives the following instructions ' Dissolve 1 gm. of sodium arsenate and two spoonfuls of sugar in 3½ ounces of water.' Cotton pads soaked in this solution and kept on trays are said to attract flies and destroy them'. Kerosene oil, phenyle, petrol, turpentine, neem oil etc. are also used as repellents against flies but their effects are not lasting.

(b) *Traps.* Tangle-foot papers may be used effectively for trapping and destroying flies. These are obtainable from dealers or can be made as follows :—Ordinary paper is glazed by applyiug a thin layer of a solution of 1 ounce of glue in 3 ounces of water. This is then dried. Five parts of castor oil and 8 parts of resin are heated together till the resin dissolves. This is applied hot over the glazed paper. Fly papers of a superior quality may be made by the method recommended by Jack (1916) : —12 parts by ounce weight of resin and 5 parts by fluid ounce

measure of ground nut-oil and one part of fluid ounce measure of crude vaseline are well mixed and heated together without boiling, till the resin is dissolved. This is then spread over paper for use. It is claimed that this mixture when kept in closed vessels or tins remains effective for a long time.

Various methods have been suggested for trapping flies when they are about to enter a building. Thus, Hitchins (1933) describes a cheap and effective window screen fly trap which can be used in stables and dairy buildings. A trap designed by Hodge (W. S. A. Farmers Bull. 1897) is said to be very effective if fitted closely into one window, while all other entrances are kept shut.

An interesting method of trapping flies on farms by the use of a Decoy and Bourgaults Fly trap is described by Loughman (1930). A black tailless bullock is used as a decoy and is slowly driven through the cattle yard. Flies settle on the bullock which being tailess is unable to drive them away and the animal is then driven through a Bourgaults trap. The trap consists of a darkened building of rectangular shape with two longitudinal partitions leaving gaps at opposite ends inside. Entrance and exit are provided at diagonally opposite ends, so that from the entrance to the exit animals have to pass through an **S** shaped passage, in the middle of the **S** shaped passage are two brushing devices which are made of a rectangular frame to which are tied, bunches of palm leaves. The free ends of the broom shaped leaf bunches meet in the middle line of the frame allowing passage to cattle through the frame work while the leaf bunches brush off the flies on them. Animals are driven through this darkened buildings to free them from flies. The flies which are brushed off make for the nearest source of light at the hole at one end of the building. From there they are led to a trap where they are destroyed. The building and the trap can profitably be made use of for ridding the cattle of flies by driving the whole herd through the trap. It is said that cattle like this operation so much that they run to the building of their own accord as soon as they are let off. This method has been tried in Mauritious and is said to be effecient.

(c) *Repellents.* Lefroy (1916) controlled fly pests in Military Camps in Mesopotamia by using a mixture of half a pound of sodium arsenate and two and a half pounds of jaggery in two and a half gallons of water. Strips of cloth kept on a tin like a roller towel dipped in this mixture and hung up with one end kept soaking in the mixture attracted flies even from a distance of 200 yards. James (1935) modified this trap and made it simpler by using an empty ghee tin and the following mixture :—

| | | |
|---|---|---|
| Sugar, molasses or jaggery. | ... | 1 lb. |
| Sodium arsenate | ... | 1 lb. |
| Water ... | ... | 10 gallons. |



This he found effective in Military Hospitals.

Foreman and Graham Smith (1917) used creosote oil for spraying inside mess halls and hung a piece of cloth soaked in this oil over the entrance. This they found was an efficient repellent and kept the hall practically free from flies.

(d) *Insecticide Sprays and Powders.* Concurrently with the adoption of measures designed to control the pest outside the cattle sheds, due attention should also be paid to conditions inside these premises. The floors of these sheds should be made of non-absorbent materials, care should be taken to see that they are free from cracks. It is economical in the long run to have a fly-proof milking shed, for such a shed to be effective, it is necessary to ensure that the animals are free from flies before entering. This can be effected by spraying the animals with insecticides which will also protect them outside. For spraying and dusting various solutions and powders have been found efficient. Of these the cheapest and most easily obtainable is kerosene oil emulsion. This is prepared by dissolving 1 pound of any ordinary cheap soap in 1 gallon of water and boiling the solution. The kerosene oil is then added slowly while the mixture is stirred vigorously with a bundle of twigs or an old cocoanut broom. One part of the emulsion dissolved in 10 parts of water is used for spraying the animals. In the Military Dairy Farm Kirkee, this is a daily operation. It takes only about 15-20 minutes to treat a herd of 300 milch cattle and the time so spent is well repaid in the relief afforded to the animals. However, Melvin (1932) studying the physiological effects of oil sprays on animals, found that all petroleum oil sprays cause a measurable rise of temperature and increase the respiratory rate of both heifers and cows, particularly when the atmospheric temperature is high. Freeborn and his collaborators (1934) explain this as resulting from the interference of the oil with the cooling function of the skin. Such interference, they suggest, can be overcome by the addition of Pyrethrum extract to the solution in the following quantities :—

| | | |
|---|---|---|
| Petroleum | ... | 84 c.c. |
| Pyrethrum extract | ... | 48 c.c. |
| Steam distilled pine oil | ... | 48 c.c. |
| Triethanolamine Oleate | ... | 16 gms. |
| Water | ... | 100 c.c. |

The solution to be diluted with $4\frac{1}{2}$ parts of water.

Baber (1933) substituted citronella oil to Pyrethrum extract in kerosene instead of the pine oil and Triethanolamine oleate in the mixture and found it equally efficient. His formula is :—

| | |
|---|---|
| Pyrethrum extract | 1 part. |
| Kerosene oil | 64 parts. |

| | |
|---|---|
| Citronella oil | 5 per cent. |
| Petrol | 15 „ „ |

Twin and Herman (1927) used a simple solution of Pyrethrum in kerosene oil, shaken well and kept for 24 hours and filtered. This spray is cheap and has not been observed to have any deleterious effects.

Cory (1917) tried coal tar products for spraying but found that they are inclined to flavour the butter from animals sprayed with the solution. He used 2-3 lbs of caustic soda (98%) dissolved in a quantity of water sufficient to dissolve a gallon of pine tar creosote. When the cows were sprayed with this solution before morning milking, they were found to remain free from flies, particularly from *Stomaxys calcitrans* and other biting flies throughout the day.

Cross (1916) used a series of fly sprays for camels in Lahore; and found, one gallon of kerosene oil with powdered naphthalene 4 ounces, soap 1 pound and water 4 gallons very effective against *Stomaxys calcitrans*. He claims that cows are protected from biting flies for a week after a single spraying with this solution.

Cory and his co-workers (1916) experimented with 16 powders and one spray against cattle flies and found a mixture of pyrethrum and Derris most efficient, applied with a pump gun.

### Dairy Buildings

For the clean collection and distribution of milk, it is essential that the Dairy buildings, milk record rooms, etc. should be made fly-proof. In very progressive countries attention is even paid to the kind of paint used inside Dairy buildings. Freeborn and Berry (1923) found that white or other pale colours are more repellant to flies than dark ones. A similar observation has been made by Haseman (1927). Indeed, as a proof of this, it has been observed that black cows attract more flies than white ones.

All buildings should be protected by wire netting. Blacklock (1935) recommends nettings of 14 meshes to a linear inch of wire No. 30 Imperial standard gauge for rooms and 18 of No. 28 for other purposes, since the latter will keep out even mosquitoes. For nettings, Barronia metal shown in Sierraleone to stand up well to all conditions of weather, is cheaper than Monel metal and is equally efficient. Fly proof netting can be further improved by Collins' (1931) method of electrification. This consists in the installation in dairy buildings of electric screens of woven copper wire along an insulated frame work. The screens are supplied by 3,500 volts of high tension electricity, 60 cycle lighting current, drawing a charge harmless to



man and cattle but fatal to insects. As many as 20,000 flies are reported to have been killed daily in one Dairy by this means during the fly season.

### Feeds and Feedings.

It has been observed that places, where silage is fed to cattle, become fly infested till the silo is emptied. As a silage is a summer fodder in India the feeding period coincides with the fly season. Little can be done to prevent this particular nuisance but scrupulous care should be taken to prevent the silage from being spilt in transit from the pit to the feeding trough. Concentrate foods, particularly oil cakes, when fed soaked, attract swarms of flies. In Military Dairy Farms, dry concentrates are fed and this has gone a long way to control the fly pest. During recent years, molasses has been recommended as a cattle feed. It has, however, been found by nutrition experiments conducted at Bangalore, that molasses while contributing little to the food value of the concentrates attracts swarms of flies to the yard.

### Natural enemies.

Destroying insect pests by the introduction of their natural enemies into the field is a well known entomological method of waging war against them and may well be adopted as a supplement to other methods of control. Birds and poultry are capable of destroying the larvae and pupae of flies and also ticks. They dig up old manure piles, droppings or moist straw heaps and devour the maggots breeding in them. It is, therefore, a good plan to keep poultry on cattle farms. Schuurmans Stekhoven (1925) examined the stomach of birds of the species *Bubuculus Coromandus* which sometimes occur in flocks in rice field and found in one bird 40 tabanids, 5 Musca and 1 locust and in another 17 tabanids, 8 Musca and 4 locusts. These findings suggest that these birds might profitably be introduced into areas where they are unknown to assist in combating insect pests. The method of controlling house flies through the agency of birds has been adopted by Simmonds (1925 and 29) in Fiji as a supplement to other control measures against these pests. Dung beetles of the species *Copris incertus Var Prociduus* and *Spalangia Cameroni* have been imported to Fiji in the hope that, by breaking up cow droppings, they will reduce the amount of material suitable for the breeding of maggots. For the same purpose ants of the species *Phiedole megacephala* have been made use of by Simmonds.

Coleman (1935) reports that the flowering shrub *Nereum oleander* traps thousands of blow flies during pollination. The growing of this shrub in cattle farms near manure pits may, therefore, prove useful as a control measure. It should, however, be mentioned that some of the species of Nereum are poisonous to cattle.

## Myiasis

Myiasis is a condition caused by the larvae of flies attacking tissues and organs of living animals. The common species causing myiasis are the house flies and blow flies, the latter being generally responsible. Rao and Pillay (1936), working in Madras, have recorded some varieties of blow flies responsible for producing myiasis in the wounds of domestic animals. They found the occurrence of this condition high on the west coast, since this area is subject to heavy rainfall. Myiasis may be internal or external. Internal myiasis is caused by maggots invading the intestines, the anal and urinogenital tracts and the nasal passages. In animals, myiasis frequently occurs in open wounds particularly in the fly season and it is very difficult to prevent this condition unless proper treatment is given. Blow flies, which cause myiasis, may be controlled to a great extent by ensuring the proper disposal of garbage and carcases, which are the two important media in which they breed. Repellants may be effectively used to prevent flies from ovipositing or larvipositing on prexisting wounds. The United States Department of Agriculture in Bulletin. 857 instructs farmers to apply tannic acid to fresh wounds, followed by coal tar. Tannic acid stops the bleeding and causes the tar to adhere to the affected parts. Howarth (1936) tried bone oil successfully on fresh wounds. Bone oil acts as a good repellant and at the same time hastens the healing of the wounds by promoting granulation. It is said to be useful as a dressing after minor surgical operations. Dressing oil consisting of any oil, which is used in veterinary hospitals, such as salad oil, turpentine, neem oil, tincture of iodine, camphor etc., promotes the healing of wounds as well as acting as a good repellent. Robinson (1935) recommends the application of Allantoin for the treatment of wounds. Allantoin is a substance prepared from maggots. It is harmless, soothing, tasteless, odourless and stimulates healing.

Before the year of the Spanish American war no attempt was made to study the common house fly and the serious role, which the house fly plays in our every day life, was not understood. It is astonishing therefore, to find in Kautilya's Artharsastra, dating back to 700 B.C. the fly being mentioned as one of the house pests along with rats, bugs, mosquitoes. He has even given the following prescription of a smoking powder against flies, rats, mosquitoes and poisonous germs.

" Ballatharka phalam Mustha
Kapikachupalam thada
Ralah siddartha aethaesham
Churna dooma prabhavathah
Mooshika, Masaka, Makkah
Makoona, Vishakeetakah



Palayanthaee griham mukthwa
Yadha yuddhethi katharah "

[Ballatha (seeds of *Semicarpus anacardium*), arkaphal (fruits of *Calatropis gigantia*), mustha (tuber of *Cyperus rotundus*), ralah (Bees wax), Siddartha (white mustard).].

The above six drugs are to be powdered and burnt in a place infested by rats, mosquitoes, flies, bugs and poisonous germs. The smoke will free the place from these pests ' like the battle field from a defeated army.'

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Is it because they are not alive to the needs of the country? Or is it because that they are not convinced of the truths of these pronouncements; or else, is there any other reason why there should be dearth of candidates for the study of Veterinary science? The simple and plain reason is that, in the conditions existing in this country, this technical education is practically of no use for a career in life unless it be for service under Government. And it is no use being blind to that fact. We will just illustrate this by what is taking place in the Province of Madras.

This province has got a well equipped Government Veterinary College, with a five years' course of study leading to the degree of B.V.Sc. of the Madras University which is probably the highest available qualification in Veterinary Science in India. The preliminary educational qualification necessary for admission into that College is the same as for Medicine or Engineering and the course itself is by no means easy. Now, what are the prospects of a successful candidate who has undergone this hard course of technical study? He cannot possibly expect to earn a living by setting up an Independent Private Practice, because such a thing is simply impossible in this country. The poverty of the ryots and the low value of his livestock simply preclude the possibility of his engaging the services of a Veterinary Doctor and paying him for it. Therefore the only course open to a Veterinary Graduate in this country is to enter the service of the Government or Local Board. And what does the Government pay for his services? A sum of Rs. 55/- per mensum rising by bi-annual increments of Rs. 5/- to Rs. 100, a sum which is even less than what an artisan or a skilled labourer can easily get in these days. Is this not a shameful state of affairs and wholly discouraging to the members of a scientific profession with high University and Technical education? Is it any wonder then, that the youths of the country do not care to go in numbers for that kind of education which does not promise them even a living wage? As a result of these depressingly low prospects, what do we find? The Madras Veterinary College could not get even the usual number of candidates for



admission this year, in spite of the fact that practically every one that applied for a seat was given one. We understand that even some of the candidates who first got admission later on failed to turn up. The gloomy outlook of the profession simply scared them away.

We have always contended that the Veterinary Graduate with his education and training in no way inferior to those of other services is entitled to an equal if not better rates of emoluments than similar services under the Government. We have also given in detail in a previous issue of this *Journal* the disparity in the rates of pay between the Veterinary Department and other Departments under the Government of Madras. But, unfortunately, the Government have been turning a deaf ear to all the pleadings and representations. It cannot be that the Administrative Head of the Department has not been keen in representing the case in proper perspective to the Government. Whatever the cause, we find that the Veterinary Service is the cindrella of the services and, as long as it continues to be so, there is no use blaming the people for not taking up Veterinary education.

We plead with all earnestness at our command that the authorities concerned be pleased to take up the question of improving the pay and prospects of the Veterinary Assistant Surgeons without any further delay.

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## THE PENSIONERS AND THE PROFESSION

The modern veterinary science and the veterinary departments in this country being yet young, there were very few or practically no superannuation retirements of the Indian veterinary surgeons until a few years ago. There have been, however in recent years, a few such retirements annually from the various branches of the veterinary departments in British and Indian India. These retired men being practically the earliest of the veterinary surgeons in the country, have rendered yeoman's service to the profession and the nation. The

presence of these pensioners is sure to enrich the public life of the locality—urban or rural—wherever they may settle down to live. The old veteran leaders in the country, when they urged for the early Indianisation of services—general, scientific and technical—advanced as one of the reasons for such a course, that the retired Government servants are great assets to the nation even in their retirement. They urged that the vast experience of these officers gained in the course of long service and practice of professions will be still available to the nation, which will not be the case when foreigners employed for periods of service, leave the country at the end of it. We shall be, no doubt, justified if we go a step further and point out that the profession and the nation expect and demand of these pensioners much greater service when they are free from the shackles of Government service. Their intimate knowledge of the country and her needs, their vast administrative and professional experience, and above all, the well desciplined life they have become used to have all well fitted them to render such service as free citizens of the State. The service rendered by them while in Government employment has been in return for the payment of salaries—no doubt in most cases illiberal and inadequate. But the service now expected of them is mostly honorary and in due discharge of duty to the land of their birth.

Expansion of the activities of the veterinary profession in its various aspects is a crying need of the country. The pensioners in the profession can take part in them and create and lead public opinion to good account. They can take initiative in many of the nation-building activities; in fact, they can be leaders of men, eradicating many existing undesirable and age-long prejudices and practices and introducing new and healthy activities. In this respect, they may do well to follow the good lead of the medical men—pensioners and practitioners—in and out of Government service, who all have been taking part in the various civic and professional activities for the benefit of the community. Each pensioner can specialise himself in some useful activity, in his locality, connectd with some aspect of his profession. Veterinary public health in Municipal and Rural



areas, S. P. C. A., Animal welfare league, Band of Mercy, First aid to animals, Dairying, Animal husbandry, inspection of animals used in public conveyance, Cow protection societies and Go-samrakshana salas, Pinjra poles, Cattle fairs, shows and exhibitions and propaganda on-modern lines, and demonstrations—these are some of the problems which demand the closer attention of the pensioners who can do some substantial justice to them all by virtue of their training and also time and freedom at their command. In all these and many other matters, their endeavour should be as far as possible altruistic and honorary and never with a view to grab. Opportunities created by such altruistic endeavours when they become remunerative, should be handed over to the unemployed needy man in the profession, the moment one such becomes available.

Above all, the moribund All-India Veterinary Association and its various provincial branches urgently deserve the attention of these pensioners. They are again best fitted up to shoulder this responsibility, as they are free from the care and anxieties of the men in service. If they revive the old useful activities of these organisations and meet often in Conferences and ordinary meetings, the many urgent problems can be usefully discussed and the initiative taken in the necessary directions. The men in active service cannot do this as effectively as the pensioners can. The reasons are obvious. In the absence of an organised independent veterinary profession in the country, it is the sacred duty of those who have retired, to take up the cause of these organisations. Prof. Dhakmarvala of Bombay has given a good lead in this matter. Inspite of his old age, he keeps in active touch with all the aspects of the profession and posts himself up with up-to-date knowledge of every advance and progress made in the science. It is our earnest desire that all the pensioners in the profession should undertake some form of altruistic endeavour in their respective areas and thus make their education and experience really beneficial to the community and the nation.

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# Clinical Articles

## BOVINE TRYPANASOMIASIS

BY

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*Subject.*—Bullock, cross Nellore, aged about 9 years was brought to the Rajampet Dispensary for treatment on 18-3-41.

*History.*—The animal was worked on the previous evening for baling out water from a well and was reported to be quite healthy in every respect, but suddenly during the early part of the night began to stagger, fall down, struggled for a few minutes and got up again. These symptoms were said to have been repeated 3 or 4 times during the remaining part of the night.

*Symptoms.*—When the animal was brought to the hospital on the next morning, the following symptoms were observed. The body was shivering, coat staring, pulse slightly accelerated, mucous membrane partially anaemic, head bent down with movements of the jaws as if the animal was making attempts to eat earth. Salivation marked. Rumination suspended with complete loss of appetite. Urine a little high coloured and the dung was normal. Temperature 103° F. Oedematous swellings which is a constant feature in the equines was conspicuous by its absence.

*Diagnosis.*—Blood smears were examined on the spot by the District Veterinary Officer, Nellore, who found them teaming with Trypanasomes.

*Differential Diagnosis.*—The symptoms in bovines stimulate those of epilepsy probably due to the Trypanasomes producing certain toxins which act upon the central nervous system and thus presenting a variety of symptoms such as going round and round which may be mistaken for *Coenuris cerebralis*. Sometimes this disease is likely to be mistaken for rabies from the presence of salivation, champing of the jaws, drooping of the head with a pretence to eat earth, but in rabies the look of the animal will be vacant and staring and drooping of the head will be absent.



*Source of infection.*—Infection spreads from an affected animal to a susceptible one by means of biting flies. Usually the incidence of this disease is greater during wet weather when the distribution of biting flies is widespread. In other seasons the infection is limited to the neighbourhood of rivers and other large water sources. Many animals of the local herds though they harbour the parasites in the system do not show any clinical symptoms. Calves born to such resistant mothers develop a resistance or premunition, which gets gradually increased as the calf grows into an adult in consequence of repeated infection until such time as it would be quite strong to resist the infection of the local strain. Such resistent animals may show a break-down of resistance if they are exposed to infection of a different strain of Trypanasomes and terminate fatally after showing acute symptoms or the resistance may be broken down through certain influences such as change of climate or environment, overwork, insufficient or bad food, intercurrent diseases etc., which have a tendency to lower their vitality. It is very difficult to detect the source of infection of an acute case unless the blood from all the incontact animals in an outbreak are examined and the carriers detected and eliminated by Trypanocidal treatment.

*Treatment.*—On 18·3·41, 5 grs. of Antimoni et. Potassii Tartaratum was given dissolved in 20 c.c. of distilled water intravenously under antiseptic precautions. Symptoms of coma were relieved by the application of cold swabs to the forehead. In about 15 minutes after this treatment, the animal looked greatly relieved and was inclined to take some interest in the surroundings. The quivering of the musculature stopped. After 3 hours, the animal ruminated, drank a small quantity of water and showed signs of returning appetite when it was taken home.

On 19.3.41, the temperature was 100° F. It was given one ounce of Pulvis Chirata as a decoction in a pint of water.

On 20·3·41, the temperature was 99.4° F. Chirata decoction was repeated.

On 21.3.41 the temperature was 101·4° F. Another injection of Antomoni et. Potassii Tartaratum was given after taking a couple of blood smears for examination. The result of the examination was that the blood was free from Tryps.

As the animal was considered to be quite healthy it was discharged cured.

Again on 1.4.41 about 12 noon, the owner of the above said animal came and reported that the animal fell down and was kicking his legs. One of us (K) went and saw the animal at his residence and found the patient almost exhausted as the result of violent struggling. Temperature was

103·4°F. Pulce accelerated. Blood smears sent were reported to contain Tryps. Injected 6 grs. of Antimoni et. Potassii Tartaratum in 20 c.c. distilled water intravenously. The animal had another attack of epilepsy after injection and the application of cold water was continued to the forehead for about 2 hours after which it got up and appeared to be improved in condition.

On 2.4.41, the temperature was 99·6°F when the animal attended the dispensary and it was given tonic powder.

From 3.4.41 to 6.4.41 the same treatment was continued.

On 7.4.41 another injection of 6 grs. of Antimoni et. Potassii Tartaratum was given intravenously.

From 8.4.41 to 12.4.41 tonic powder was continued. The Animal made an uneventful recovery and was seen on 24.4.41 to be quite healthy and doing its usual work.

From this it is concluded that relapses after one or two injections of Antimoni et. Pottassii Tartaratum are quite likely. Hence 3 or 4 injections appear to be necessary at an interval of 5 or 6 days to effect a cure.

It is absolutely necessary that iron and copper supplement should invariably be added to the feed or the medicament of animals, convelescing after an attack of Trypanasomiasis in order to relieve the severe anaemia present. It is also important to add necessary quantity of bone-meal to recovering animals to make up the loss of calcium which has been found to be highly deficient during and after an attack of Trypanasomiasis.

*Treatment of the herd.*—The duty of a Veterinary Assistant Surgeon does not rest with the treatment of such affected animals brought to the dispensary. He has to trace the source of infection and eliminate it as far as possible from the carriers among the incontacts. Unless this is done by suitable treatment, the carriers will remain a constant source of infection and be responsible for frequent outbreaks during the fly-season. In order to achieve this object and save further deaths, a course of treatment consisting of 2 or 3 injections of Tartar Emetic at an interval of a week is found to be effiicacious except in cases which have progressed to a state of emaciation. It should be remembered that buffaloes remain a potent source of infection without showing any clinical manifestation besides the other susceptible animals such as camels, sheep etc. But it is very unfortunate that treatment of the animals on a mass scale in a herd which are apparently healthy cannot be carried out owing to 2 to 3 per cent of deaths among these that are subjected to this treatment. Sometimes, the death is so sudden after injection that life is found to be extinct, soon after the ropes that were used for casting and keeping the animal under restraint for infection are released. Distressed breathing cyonotic condition of the mucous



membrane, rolling of the eye balls and a few spasmodic movements of the lower jaw followed by death are the symptoms noticed. The train of symptoms above described does not exceed ½ to one minute from the time the needle is removed from the vein. At other times deaths were recorded from 6 to 24 hours from the time of injection. After the first death no further treatment is possible in that village since the ryots are not pleased with its performance. These casualties though small offer serious obstacle towards eradication and successful control in dealing with herds in the village. The usual dose is 5 grs. in 20 c.c. of distilled water for animals varying from 500 to 600 lbs body weight.

*Toxicity of Potassii Antimonium Tartaratum.*—Various reasons were put forth by many workers regarding the deaths caused after treatment with this drug.

1. During certain experiments carried out in connection with Nasal Schistosomiasis, it is stated that cause of death was found to be due to blocking of the coronary artery by a large number of dead parasites, which are released into the circulation after being killed by the intravenous injection of Antimonium Tartaratum and thus bring about sudden collapse from syncope. This does not agree with the clinical experience. If death is due to blocking of the dead parasites, then all deaths should invariably happen immediately after the first injection, since it should kill almost all the parasites. But the experience of field workers does not lend support to the view above stated, since deaths have been recorded even after 2nd or 3rd injections given at an interval of 3 or 4 days. Again deaths met with during the treatment of apparently healthy animals for the eradication of carriers in an outbreak of Bovine Trypanosomiasis disproves the above findings. It cannot for a moment be imagined that dead Trypansomes, when killed block the coronary artery while they move about in large numbers in the minutest capillaries before being killed by injection of Antimonium Tartaratum. Further the dead schistosomes stand a better chance of being filtered or obstructed in their course in the minor ramifications of the lungs before they reach the arterial from the venous circulation. Another argument to refute the above theory is that when animal suffering from either Tryps or Nasal Schistosomes are treated with Antimosan, no deaths have so far been recorded inspite of its curative effect. Such massive doses as 8 to 10 c.c. of 3 to 5 per cent solution of Antimosan have not proved to be fatal, irrespective of the route through which it is administered whereas Antimonium Tartaratum can only be given intravenously which demonstrates its highly irritant nature. From the foregoing, it could easily be seen that it is the toxicity that is responsible for deaths acting upon the certain vital centres by combination of certain toxins rather than mechanical obstruction of the coronary artery.

2. Another reason attributed is that boiling of Antimonium Tartaratum during the process of preparation of solution before injection renders it highly toxic by formation of certain adverse chemical changes. It is also said that overheating antimony salts in a steam steriliser leads to decomposition. As a matter of safety, it is suggested that Antimonium Tartaratum should be added to recently distilled sterilised water to which 5 per cent Glucose is added. The solution should then be brought to boil, without being over-boiled for a prolonged period. But it is not clear how overboiling renders the drug highly toxic only to certain animals and in what manner deaths are caused. This theory is also at variance with the clinical experience of most field workers for the reason that deaths have occured even with the use of freshly made solutions prepared after first boiling distilled water to which the drug is added while hot enough to dissolve it.

3. "Old stock solutions of Antimonium Tartaratum must not be used because several fungi often develop in them and render such solution highly toxic. This explains in part, these cases of rapid death that often follow the injection of Antimonium Tartaratum." Nothing can be said either for or against this suggestion as the solution is not stocked but prepared then and there when required for use.

4. Some practitioners affirm that Potassii et Antimony Tartaratum is more toxic than Sodii Antimonium Tartaratum and is said to exert more depressent effect on the heart and the central nervous system than Sodium salt. Since the latter is not commonly supplied for use, the experience of its toxicity or otherwise cannot be definitely stated.

5. Another theory advanced by certain Veterinarians is that only a small percentage of animals present the toxic symptoms and succumb while a large number withstand the ordinary doses without any ill effects. This evidently makes them believe that certain pathological changes are produced as a result of certain intercurrent or latent diseases which render the drug more poisonous or cause a breakdown of the resistance to its toxic effect. But this explanation does not bring one very much nearer to the problem intended to be solved, since the authors of the above exposition have not stated anything in respect of the nature of the pathological changes and the manner in which such changes bring about death.

6. The following extract from the Annual Report (1938) of Tanganyika Territory will be of some interest with regard to the subject.

"It has long been known that the chief danger attending the use of Tartar emetic for the treatment of Trypanasomiasis is the narrow ratio between the toxic and therapeutic doses. The routine treatment adopted here and at many other places is a course of intravenous injections of tartar emetic at the rate of 0·2. gramme per hundredweight; a lower rate is ineffective, yet merely double this rate is very dangerous. The chief



manifestation of poisoning is acute parenchymatous degeneration of the liver.

2. The fact that the bounds of safety have been passed are quick ly seen following the administration of the overdose that precipitates the degeneration. The animal does not eat from the time of treatment the next day he is intensely constipated and visible mucous membranes are jaundiced. Death usually occurs during the second night after the overdose. Recovery sometimes takes place but at best is a slow process of several weeks.

It is obvious that once a beast has shown signs that his liver has been upset with tartar emetic, further treatment must be withheld until the organs most affected have recovered. Thus, many times in our experience we have had to stop treatment in the middle of a proposed course; frequently the animal has died a day or two later, but a few have recovered.

It was the fact that a high percentage of these recovered cases did not relapse to the trypanasomiasis for which they were being treated that made us wonder whether after all the liver degeneration might not of itself be detrimental to the trypanasomes or in some way favour the drugs' action."

It was subsequently proved that liver degeneration doses not in any way favour the trypanacidal action of the drug.

The cause of death recorded in the above extract does not offer any explanation for deaths that occur immediately after the first injection, among a few animals in a herd which receive the same dose like other resistant animals, though it may be a probable reason to account for deaths that occur after 12 to 36 hours after injection. Another important factor which remains unanswered is the predisposing causes for acute parenchymatuos liver necrosis only in a small number of animals.

*Resume.* Apart from the various theories and facts enumerated it is certain that Antimonium Tartaratum is very crude in its composition so much that if used subcutaneously, sets up a severe cellulitis being a powerful irritant. This irritant drug if injected directly into the vein may produce severe shock paralysing the vital centres in certain animals, whose natural powers of resistance have been broken down by certain chronic or intercurrent disease or diseases. This problem may be said to have been solved by the use of Antimosan, which is non-toxic. But its prohibitive cost precludes its extensive use. Unless and until a cheap and non-toxic preparation of Antimonium Tartaratum, similar to Antimosan is evolved out of Antimonium Tartaratum, the eradication and control of outbreaks of Bovine trypanasomiasis would continue to be as unsatisfactory as ever.

*Bibliography.*

1. Annual Report on the Veterinary Department, Nigeria for the year 1938.
2. Annual Report of Department of Veterinary Science and Animal Husbandry, Tanganyika Territory for the year 1938—Part II—Research.

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## SPIROCERCA SANGINOLENTA IN A BITCH

BY

A. V. De Croos, G. V. Sc.,
*Colombo.*

*Subject.*—A white Bull terrier bitch about 4 years old, in fairly good condition, suspected by the owner to be rabid, was brought to the Dog Pound on 31-3-41.

*History.*—The owner stated that the bitch was unable to retain any food. Had a cough and was continually retching. The animal was kept under observation at the Dog Pound — it could not retain any food, cough was slight and retching very pronounced. Temperature normal. Constipation marked. Rabies ruled out.

Faeces were examined very minutely. Ova of Spirocerca Sanguinolenta found in faeces together with Ankylostoma Caninum and Toxicara Canis. Blood films taken and examined, gave negative results for Piroplasms and Trypanasomes.

*Diagnosis.*— Spirocerca Sanginolenta infestation probably in the digestive tract with infestation of Ankylostoma Caninum and Toxicara Canis. The owner was advised that treatment would be of no avail and the best course would be to destroy the bitch. He, however, requested that experimental treatment be given with a view to finding whether it would be possible to affect a cure. Although it was known that the best treatment could only be palliative, treatment was undertaken, more with the purpose of watching the course of the disease and the effects of anthlemintics rather than with the hope of any permanent cure.

*Treatment.*—

*April 3rd* — Soap and warm water enema given. Ordinary worm oil administered. The bitch had several motions and appeared relieved.

*April 4th* — 2 c.c. Antimosan by intra-muscular injection. In the evening animal started taking food and retained a small portion of it.

*April 5th* — Animal passed no motion and refused food. Enema given. Sample of faeces examined. Ankylostoma Caninum and Toxicara Canis found, but no Spirocerca Sanguinolenta.



*April 6th* — 2 c.c. Antimosan intra-muscular with Anthelmintic mixture. Bitch began taking food retaining a fair quantity. Retching decreased.

*April 8th* — Continued treatment of the 6th. Dog vomited and could not retain any food.

*Vomit examined.*— A small portion of worm found but classification difficult. It was observed that the bitch was losing condition.

*April 9th.*— Antihelmintic mixture containing Carbon Tetrachlor given. Bitch had a few motions — loose and offensive.

*April 10th.*— 2 c.c. Antimosan given intramuscularly. Food taken but not retained.

*April 11th.*— 5 Minims Chlorotone was tried 15 minutes before feeding. Bitch did not vomit. Treatment was continued till April 24th — 2 c.c. Antimosan on alternate days and chlorotone daily. The bitch continued losing condition. Vomiting had practically ceased but there were occasions when retching was marked. Constipated. Enemas given to relieve this condition.

*April 26th.*— Anthelmintics with Carbon Tetrachlor given.

*April 28th.*— Animal in a very weak condition and vomiting started again. Anaemia marked. Blood transfusion was tried. The dog showed slight improvment for two days after blood transfusion but lapsed into its weak condition on the third day, so blood transfusion was resorted to every fourth day. The bitch made no progress and continued to grow weaker and weaker. Respirations were difficult and painful and retching pronounced. On 21st June it died of exhaustion and severe anaemia. It was far too weak for anthelmintic treatment, stimulants only were given during the latter period.

*Post Mortem.*—Digestive tract was first examined. Oesophagus showed tumours in the anterior part from which the worms were protruding. One tumour opened and a nest of worms found. No worms found in the pyloric or cardiac orifices. The rest of the carcase was markedly anaemic. Diagnosis confirmed.

*Observations.*— In the early stages of the disease Antimosan caused some relief but later on had no effect. Carbon Tetrachlor had no effect. The same may be said of the other anthelmintics tried. The animal was probably kept alive for so long a period by the blood transfusion and the several injections of Antimosan. Noticeable features of the disease were, loss of condition, the desire for food and the inability to retain it. Temperature normal throughout. When diagonsis is confirmed by the finding of ova or worm in the faeces or vomit, the most humane course is destruction of the animal as no anthelmintics seem to have any effect on the worms.

It would be of interest to dog owners to know that the larval form of the worm exists in the stomach of the cockroach, mice and rats and is also found in fowl dung. These are probably the chief sources of infection.

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## FOWL POX

BY

H. K. Nag Choudhuri, G.B.V.C.,
*Veterinary Assistant Surgeon, Patharkandi, Assam.*

Recently I had an opportunity of attending an outbreak of Fowl pox in a small poultry farm containing 22 fowls. Four fowls were attacked and three died and subsequently the disease subsided.

*Symptoms.*— Two birds were the first victims. They showed typical skin lesions in the head and comb. The skin eruptions were small in size but abundant. They coalesced and appeared like scratches with scabs over them. Besides, mouth lesions in the form of diphtheritic membranes were present. They were diagnosed as clinical Fowl pox cases. The third fowl that contracted the infection showed no skin lesions at all but false membranes were observed in the mouth. The fourth and the last affected fowl showed only eruptive lesions in the head but no mouth lesions. This bird recovered after a short period of illness.

*Post-mortem findings.*— Buccal cavity contained whitish or dirty white cheesy deposit and pieces of false membrane. Rare minute ulcers were seen in the mucous membrane. Intestines showed small inflammatory patches A few Nematodes (Ascaris) and one Cestode (Davaines) were also found in the intestines. Otherwise there was nothing unusual in the vital organs.

*Conclusion.*— The points of interest in this outbreak are that :—

(1) The first two cases started with both comb and mouth lesions.
(2) The third one developed only mouth lesions.
(3) The fourth one manifested skin lesions only.
(4) Although all the fowls were in contact no further bird was affected.

The clinical manifestations were of a changing nature in the affected birds which latterly showed either comb or mouth lesions. It is held by some observers that the virus present in the false membranes in the mouth is in considerably lower concentration (due to the presence of secondary organisms) than in the skin lesions of the comb. It seems probable that the severity of the outbreak had become much reduced and hence the remaining birds escaped infection.

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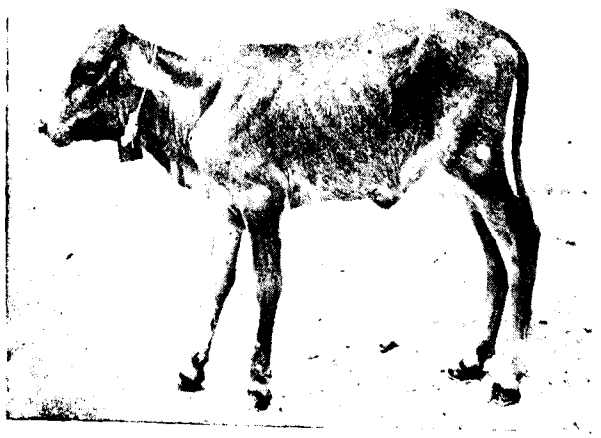
Fig. 1.
Photo of a calf suffering from dificiency of vitamin A and D.

Fig. 2.
Photo of the same calf after a month.



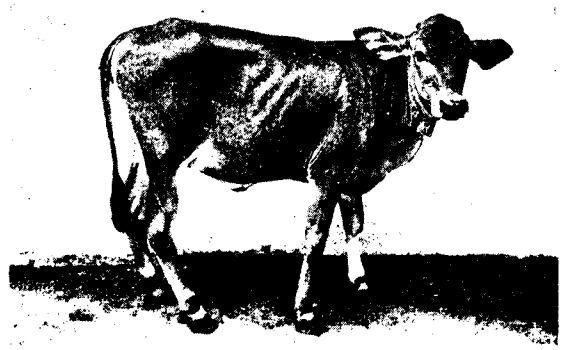


Fig. 3.
Photo of the calf after 6½ months after the treatment.

## SUCCESSFUL TREATMENT OF A NEWLY BORN HEIFER CALF WITH SHARK LIVER OIL FOR VITAMIN DEFICIENCY

BY

J. D. DAVID, G.M.V.C., (P. G. EDIN.)

AND

K. M. YAKUB SHAH, G.M.V.C.
*Coimbatore, Madras.*

On 23rd September 1940 a heifer calf (1/4 Ayrshire Scindhi calf) was born to Ayr. Sc. $F_1$, cow No. 348 of the Agricultural College Dairy, Coimbatore. The calf was delivered with help. The calf was unable to extend both the fore feet and hence supported the legs with the fetlocks on the ground and the other joints below in a completely flexed condition. The back tendons looked contracted and undeveloped and the joints bent and stiff. Being a heifer calf it was decided to try Cod-liver oil treatment suspecting that the animal had deficiency of vitamin A and D. (Please vide photo No. 1, Plate No. 8)

The calf weighed 46 lb. on 24th September 1940. Treatment began immediately as follows :—

Soft splints were applied to the joints below the fetlocks and the animal supported to stand on its feet ; but she was able to use only the toes, even with the supporting splints. The splints were removed daily and shark liver oil was rubbed on the joints. Internally a tablespoonful of the same was given. The legs gradually improved and by 21st October 1940 the animal was able to move about without splints. The calf now weighed 64 lb. (Please vide photo No. 2, Plate No. 8)

On 22nd October 1940 the calf developed tympanitis and was under treatment again till 31st October 1940. On 1st November 1940, the weight of the calf was 64 lb. The shark liver oil treatment was continued internally in half an ounce doses a day and increased to half an ounce twice a day. The calf improved immensely in condition and weight, and the weight of the calf was 164 lb. on 9th April 1941. (Please vide photo No. 3, Plate No. 8)

Shark liver oil contains a high percentage of vitamin A and hence this article is written to prove its efficacy. The cow of the calf concerned died and was proved to be suffering from Johne's disease. There is a possibility of a low supply of vitamin to the calf in its intra uterine existence as the cow had been low in vitality.

I am using shark liver oil on my canine patients with success and without any bad effects.

## SARCOSPORODIASIS IN CATTLE

BY

MUHAMMAD RAHIMUDDIN, G. M. V. C.,
*Veterinary Assistant Surgeon, Veterinary Hospital, Adoni.*

*Introductory Remarks :*—Out of 3300 postmortem examinations conducted on Bovine Carcases (2700 white cattle and 600 buffaloes) in the year 1940-41 in the Municipal Slaughter House Adoni, Sarcosporodiasis was noticed in two Bovines and 160 buffaloes. During life, the affected animals did not show any signs of ill health. During the year, 16000 carcases of sheep and goats were also axamined but this protozoa could not be found in them. This may be due to its smaller size and the predilection sites being the muscles of the thighs and the heart.

Sarcosporodiasis is a condition produced by a parasitic protozoa under class sporozoa affecting the muscular and connective tissues. It has no Cilia or Flagella, but the Flagella occurs in the adult male element. They ingest liquid food by osmosis and cause apparently no ill health to the hosts. Life cycle is still obscure. The Sarcocyst in the muscle is the only stage of the parasite known.

*Description of the Parasite :*—They are elongated parasites found in the muscular fibres of mammals, the average size and the colour of the cyst being about those of the seed of a cucumber. In the infested gullet they are easily visible to the naked eye during meat inspection below the Serous coat of the organ (not superficial) and there will be no difficulty to differenciate the affected organ from a normal one. Some gullets were heavily infected while in others the cysts were scattered here and there.

As per Wooldridge the disease may give rise to symptoms of aneamia, emaciation, general unthriftiness, sometimes difficulty in respiration and oedema of the glottis, but in many cases no symptoms whatever are exhibited. It occasionally occurs in the form of an epizootic :—

From the writers observation the following facts were noted.

(1) In white cattle a very small percentage was affected with this parasite.

(2) About 25% of buffaloes were found to be affected with this parasite. This fact gives rise to a querry if the aquatic living nature of these animals has some bearing on the percentage of infection.

(3) The parasites were noticed only in the muscular tissue of the oesophagus—probably the most favourable seat of its predilection.



(4) The object of recording this note is that the buffaloes appear to be susceptable and the seat of predilection of the parasite was found to be the gullet.

My humble thanks are due to the Principal of the Madras Veterinary College for kindly identifying the Parasite and to Mr. P. K. Devanayakam, G. M. V. C., District Veterinary Officer, Bellary, for his suggestions to write this note when he had come to this station for the inspection of the Hospital where a specimen of Sarcosporodiasis in buffalo is preserved. My respectful thanks are also due to the Director of Veterinary Services, Madras, for improving this article by giving further instructions.

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## FACIAL PARALYSIS IN A BULLOCK

BY

K. S. PRAKASA RAO, G.M.V.C.,
*Veterinary Asst. Surgeon, Bezwada.*

*History.*—One Ongole Bullock, aged 8 years, admitted as In-patient, case No. 1792, was brought from Vennemekala Agraharam of Gannavaram taluk with a history that cud had been accumulating at the right cheek and that there had been a wound in the ear on the same side which was fly-blown some 8 days previously.

*Predisposing factors.*—There were ticks thinly distributed all over the Body of the animal.

*Symptoms.*—The right ear was drooping down without movement. There was a wound in the ear which was fly-blown. The cheek on the right side was prominent wtth accumulation of cud at the cheek. The eye was semi-closed. There was no movement of the eye-lids. The cornea was without usual lustre. The haw of the eye was powerless. There was accumulation of mucous at the inner canthus. During the act of rumination the fluid portion of the cud was flowing out of the mouth. The right nostril appeared to be contracted. It was drawn to the left side presenting a deformed appearance. When water was oflered, the animal immersed its muzzle to the bottom of the bucket and attempted to sip in vain. Most of the water came out of the mouth.

*Diagnosis.*—It was diagnosed as facial paralysis.

*Treatment.*—2 per cent solution of Trypan blue was boiled and filtered. 40 c. c. of the filtrate was given as an intravenous injection. Liniment of ammonia was rubbed over the cheek and around the affected year. Eye ball was irrigated with 1 per cent solution of saline. Maggots were removed from the wound in the ear and fly repellent dressing applied.

From next day onwards, the above treatment was continued, except Trypan blue injection. On the 4th day, the animal began to shake the ear, move the eye-lids and chew the cud without allowing the fluid portion of the cud to escape. There has been gradual improvement ever since. The same treatment was repeated till 18-11-40, when, another 40 c. c. of 2 per cent solution of Trypan blue was given as an intravenous injection. The animal was given local treatment till 30-11-40, when, it was discharged cured.

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## A PECULIAR CASE OF CALCIUM DEFICIENCY IN A COW

BY

S. A. SASTRI, G.M.V.C.,

*Veterinary Asst. Surgeon, Ootacamund.*

*Subject.*—A cross-bred cow, six years old.

*History.*—Calved normally but had a uterine discharge for two weeks, which ceased after the usual antiseptic douches.

On 22-11-40, three weeks after calving, at the request of the owner, I saw the cow and noticed the following symptoms.

Every half an hour the cow was jerking forward its left hind leg and doing it continuously for 5 minutes. Simultaneously the whole body became rigid, back arched — eyes rolling and head dashed forward until it reached the wall. It was kept in that position for 2-3 minutes and then the animal threw itself down and began to stretch its body and limbs and grind its teeth with a groan. There was no discharge from the uterus and it had contracted well. Examination of blood smears and dung revealed nothing abnormal.

*Treatment.*—Gave an enema and a vaginal douche with potassi Permanganas lotion. Internally a pint of linseed oil with half an ounce of Chloral Hydras, and Pot. Bromide was administered.

23-11-40. The cow had two motions in the morning. But the symptoms were more severe and they appeared every 15 minutes. It occurred to me that calcium deficiency might be the cause of the complaint and therefore gave the following injection subcutaneously.

℞-

| | |
|---|---|
| Calcium Sandoz | ʒ VI |
| Acid boric | ʒ I |
| Aqua Distilata | ℥ VI |

The powders were mixed and boiled, cooled and filtered. After the injection, the animal did not have any of the nervous symptoms exhibited on the previous days. There was no recurrence of the symptoms and an enquiry about a month after elicited that the cow was quite fit and well.

## UNDIAGNOSED SKIN DISEASE IN HORSES

BY

V. D. RATNAM, G.M.V.C.,

*Veterinary Assistant Surgeon on Glanders Duty, Madras.*

Four horses belonging to H. E. the Governor's Bodyguard Madras, had the following skin lesions. The back and the saddle places were filled with small nodular formations ranging in size from that of an ordinary playing marble to that of a small pea. Each of them had a pin point ulcer-like lesion in its centre, with induration of the surrounding parts.

The nodules were only in the skin and they were not attached to the structures underneath. There were from 400 to 500 of these nodules.

The disease did not appear to be contagious as the animals which were in contact with these horses did not develop this trouble. As a rule, there was no pruritis nor was there any alopecia. When viewed from a distance, it looked as if a number of small marbles were imbedded under the skin. No saddle could be put on as it made the animals very uncomfortable.

The complaint was a long standing one. One animal had it for 3 years; another for 2 years, while the other two for one year. Scrapings, blood-smears from the serum-like material obtained from the squeezing of the nodules, and skin sections of the lesions were all negative for any organisms. The examination of these materials was conducted on several occasions with the same negative result. The Principal, Madras Veterinary College reported that the examination of the skin lesions revealed no microfilaria, but, however there was evidence of oedema cellular infiltration of the tissue. Many drugs were tried such as sulphur, arsenic, calcium, iron, iodum, iodides, Mag. Sulph, etc., in the form of injections and mixtures; externally dressings of Mercury, Sodium Hypo Sulphate, Glacial Acetic Acid, Sulphur, Olium Picis, etc., were tried. But none of them had any effect on the lesions. Finally the following dressing was used externally with excellent results:

| | |
|---|---|
| Kerosene Oil | 1 oz. |
| Sulphur Sublimatum | 1 ,, |
| Turpentine | 1 ,, |
| Cod-liver oil or Fish Oil | 2 ,, |

Internally Calcium Sulphide 30 gr. in feed daily was given for a month.

The animals improved marvellously, the skin became normal and the horses are now doing their normal work.

Since trying this preparation on these cases, it has been freely used for various other skin diseases in cattle and dogs and the results have always been very satisfactory. Incidently it may be mentioned that dressing was also found very effective in eradicating ticks and lice.

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## CAN THIS BE P. GIBSONI?

BY

K. S. SHETTY, G. M.V.C.,

*I/c Veterinary Dispensary, Narayanguda, Hyderabad-Dn.*

*Subject.*—Fox terrier dog, weighing about 30 pounds, aged four years admitted as outpatient on 20-5-1940.

*Previous History.*—Bleeding profusely from the left nostril on and off for about four months. Did not thrive inspite of good nourishment. Used to be exhausted with slight exertion. Never refused nourishment.

*Symptoms Observed,*—Faeces and blood were examined microscopically and found negative, but the urine was positive for albumen in fair amount, a few pus cells, epithelia and kidney cells. The dog was kept on non-meat diet and treated with Helmitol for nearly a month with no improvement. Epistaxis recurred now and then; urine showed even granular casts, R.B.C., bile and plenty of pus cells on further examination. In the first week of August, oedema appeared first in one of the hind limbs. In a day or two it appeared in the other limb gradually the fore limbs were involved and then the face. In the first two weeks the Oedema used to disappear temporarily from some parts and then appear again. But later on it persisted, and discharges were noticed from the oedematous swellings in the hind limbs. In the middle of August the chest on both sides became highly inflamed and after a few days an abscess was formed on the right side and burst out with profuse purulent discharge which continued for a long time and the wound had no tendency to heal at all. The dog's condition became poorer day by day. In the beginning of September suddenly tho dog became completely blind owing to exudate in the retina of both the eyes. (Albuminuric Neuroretinitis)—the cause attributed by the Opthalmist after acquainting himself with the urine reports was Nephritis. The dog began to sink day by day and on 17th September he was put off painlessly with chloroform as requested by the owner. Since the case was an interesting one some parts of the Viscera-Heart, pieces of Liver, Spleen, both the kidneys and Bladder were forwarded to the Imperial Veterinary Research Institute, Mukteswar, for Histo-Pathological examinations with a brief history of the case. But unfortunately I was informed that no Histo-Pathological examination could be conducted owing to the material not being in a fit state but the history of the case was typical of a P. Gibsoni infection.

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# Association News

## THE INDIAN VETERINARY JOURNAL

**(Vol. XVII)**

*Statement of Receipts and Payments for the year ending 30th June, 1941.*

| *Receipts.* | | Rs. | A. | P. |
|---|---|---|---|---|
| To Opening Balance | ... | 2,674 | 2 | 9 |
| ,, Subscriptions | ... | 4,395 | 5 | 0 |
| ,, Advertisement | ... | 498 | 15 | 0 |
| ,, Sale of Reprints | ... | 97 | 8 | 0 |
| ,, Interest | ... | 75 | 0 | 0 |
| ,, V. P. Postage recovered | ... | 48 | 15 | 0 |
| ,, Miscellaneous | ... | 6 | 8 | 3 |
| Total | ... | 7,796 | 6 | 0 |

| *Payments.* | | Rs. | A. | P. |
|---|---|---|---|---|
| By Rent | ... | 480 | 0 | 0 |
| ,, Salary | ... | 480 | 0 | 0 |
| ,, Honorarium | ... | 1,000 | 0 | 0 |
| ,, Journal printing charges | ... | 1,627 | 11 | 0 |
| ,, Railway freight | ... | 0 | 8 | 6 |
| ,, Binding Charges | ... | 26 | 4 | 0 |
| ,, Postages | ... | 910 | 10 | 0 |
| ,, Printing & Stationery | ... | 25 | 0 | 3 |
| ,, Repairs to Typewriter | ... | 34 | 4 | 0 |
| ,, Commission on Cheques | ... | 3 | 6 | 0 |
| ,, Audit Fee | ... | 25 | 0 | 0 |
| ,, *Closing Balance* | ... | 3,183 | 10 | 3 |
| Total | ... | 7,796 | 6 | 0 |

Examined and found correct.

20, Thambu Chetty St.,
Madras, 30th Aug. 1941.

K. GOPALKRISHNA RAO,
*Registered Accountant.*

# Extracts

## SHOULD CROSS-BRED BULLS BE USED FOR BREEDING?
### Examples from Other Countries

BY

M. CRAWFORD, M.R.C.V.S.,
*Colomco, Ceylon.*
(*Deputy Director of Agriculture, Animal Husbandry*)

To the orthodox cattle breeder in Great Britain the above question has only one answer and that is "No". To suggest the use of cross-bred bulls to cattle breeders in Great Britain or America would be to lay oneself open to a charge to heresy!

For the breeder who is dealing with any particular breed of cattle, be the Shorthorns, Freisians, Ayrshires, Scindis, Hissars, Sinhala, or any other, the cross-bred bull can have no place in his scheme of operations. The same applies to the breeder who is attempting to grade up an inferior herd to some predetermined standard. In both these cases pure bred bulls, and the best pure bred bulls obtainable, must be used. The reader at this stage will probably ask: "Why then is the question propounded?" It may be made clear that in this note I have in mind a particular type of cross-bred bull and that is a bull which is a cross between one or other of the improved breeds of cattle from the Temperate Zone and some breed or type of tropical cattle. I do not necessarily restrict consideration to a bull which is the first cross between these two types, but would include bulls which have in their make-up a combination in varying proportion of the characteristics which distinguish Temperate Zone cattle from Tropical cattle.

When improvement of cattle in India, Ceylon and other Tropical countries was first taken in hand by European workers, the most obvious method to try was crossing the cows with bulls of the best European breeds imported from Europe. In nearly all cases the first difficulty encountered was the problem of keeping the imported bulls alive long enough to leave any considerable number of progeny behind them. This was on account of the high degree of susceptibility of imported European cattle to diseases peculiar to Tropical countries. At that time very little knowledge was available of these Tropical cattle diseases and losses of bulls imported at considerable expense were heavy. The general experience was that the first generation of cattle produced by mating cows of the Tropical breeds to imported European bulls were a great improvement on their dams. So striking was the improvement that the earlier workers were encouraged to persist in spite of heavy losses from disease among the imported bulls.

### Hopes Not Fulfilled

As time went on and more knowledge was gained of Tropical cattle diseases European bulls could be imported with much greater certainty that they would survive. The bright hopes entertained by the earlier workers



based on the excellence of the first generation of cross-bred cattle were not fulfilled when the process was carried further and the second, third and fourth generations of cattle sired by imported European bulls became available. The natural expectation was that succeeding generations with increasing proportion of the blood of the better European breeds should show continued improvement and closer approximation to the standard which the improved breeds had attained in Europe. But the general experience was that as the proportion of European blood increased there was a progressive decrease in the stamina of the cattle.

The 2nd 3rd and 4th generations instead of showing improvement on the 1st generation proved to be inferior. Exceptions to this rule have occurred when the cattle are kept at high elevations, but speaking generally the evidence is convincing that in really Tropical areas grading up of local stock or some European breed is not advisable. Even in places where it has been possible to establish effective control of Tropical diseases results have been unsatisfactory on account of the high temperature and humidity.

The rebound from early expectations has in some countries led to the conclusion that European cattle cannot play any part in the improvement of Tropical cattle and that improvement must come as a result of selective breeding from the purely Tropical breeds. This view has, for example, been accepted in India and the policy of the Government of India is that bulls of European breeds shall not play any part in their schemes for improvement of cattle in India.

In other places and particularly in places where the introduction of cattle of European breeds had proceeded to a much greater extent than in India, it has been recognized that deterioration in the stamina of such European cattle was such a serious matter that the process could not be carried any further. The remedy for that state of affairs was sought by the introduction of the blood of one or other of the better breeds of Tropical cattle. Breeds for that purpose were sought in India and we have seen bulls of such breeds as Ongole, Sahiwal, etc., being purchased in India and transported to Brazil, Texas, the West Indies, and the Tropical parts of Australia. On account of the great expense and more especially because of obstacles raised by quarantine and other regulations the number of Indian bulls taken to these countries has been very small. Marked improvement in the stamina and resistance to Tropical conditions of cattle of European breeds was obtained by the introduction of the blood of Indian breeds.

The improvement of stamina was very satisfactory but as the proportion of Indian blood was increased there was naturally a closer and closer approximation to the characteristics of the pure Indian cattle. That often meant a lower standard of milk production and of beef qualities as compared with pure European breeds. On account of this and also on account of the expense and difficulty of getting sufficient numbers of bulls of pure Indian breeds some breeders were forced to experiment with bulls of mixed European and Indian ancestry. The object in view was to produce a type of cattle which would combine in a stable form the desirable qualities of both the Indian and the European types; in other words, to evolve a new breed which would breed pure and which would have the ability to withstand Tropical diseases and Tropical conditions of climate and would retain

the valuable economic qualities of the European breeds either as regards high milk production or beef characteristics, as the case might he. Theoretically it should be possible to develop a true breeding type starting with cattle of mixed European and Tropical ancestry on both sides.

Some evidence that the theoretical possibilities can be achieved in practice is beginning to accumulate. The evidence is not yet very extensive nor based on very long experience but is of very considerable interest to Ceylon.

### Limited Number In Ceylon

In Ceylon the number of pure bred bulls of either European or Indian breeds is still very limited. Crosses between these types are more plentiful and the question has been put to me not infrequently recently. Could such bulls be used in an effort to evolve a new type or breed? It is therefore, of value to consider here such evidence as does exist.

In the Year Book of the Cattle Breeders' Association for 1939 there is an article by Dr. Hammond of Cambridge in which he gives examples of how degenerate types of European cattle have been improved by crossing with bulls of Indian breed. The examples which he cites in that article come from Jamaica. From Jamaica also come examples of improvement of the same type of degenerate European cattle by crossing not with pure Indian bulls but with bulls of mixed European and Indian breeds.

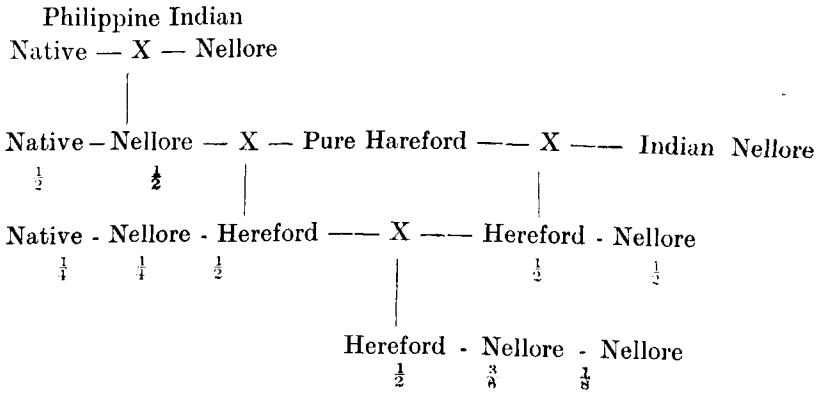
Further examples are given in an article in "The Philippine Agriculturist" by Miguel Manresa (Volume XXVIII, November. 1939 Number 6). He describes what has been named the Santa Gertrudis breed evolved on a ranch in Texas with a sub-Tropical climate. For 35 years the ranch had been stocked with pure Shorthorns and Herefords with frequent introductions of new bulls from North America and England. In spite of these frequent importations the size and type of the cattle degenerated and fertility declined steadily. The stock in the ranch numbered 50,000, a number sufficient to give a good chance of finding individuals which were adapted to the conditions, but none such came to light.

The mating of a cross-bred bull in which Nellore blood predominated with a herd of pure-bred Shorthorn cows gave such good results that it was decided to go further on these lines. One outstanding bull named "Monkey" was produced in the early stages and was extensively used in the herd. He was used on half bred Shorthorn-Nellore cows. Rigid selection was started among the progeny and as a result it is claimed that a distinctive breed named the Santa Gertrudis has been evolved and is now being bred in many parts of the Southern States of America where pure European cattle had proved unsuitable.

He also cites experience at "Glen Prairie" in the Northern Territory of Australia which has a Tropical climate. At this place results with pure European breeds were so disappointing that Indian bulls and also bulls of the Santa Gertrudis breed from Texas were imported. The object at "Glen Prairie" was to establish a type which would have more than $\frac{1}{4}$ Indian blood but rather less than $\frac{1}{2}$.



Another example quoted is the formation of what has been named the Philamin breed in the Philippine Islands. In the production of this breed cross-bred Nellore Hereford bulls were used. The scheme of breeding used is of interest and is reproduced.




Having reached that stage no pure Hereford, Nellore nor native bulls were used again.

### A Distinctive Type

The best bull of that breeding was mated to selected cows of the same type. The process was continued and it was claimed a distinctive and useful type has been evolved.

These examples will be of interest to Ceylon cattle breeders and indicate the possibility of combining in one breed the characteristics of such widely differing types as Tropical and European breeds.

To come back then to the question asked at the head of the article: Should cross-bred bulls be used for breeding? The answer one would give would be a very decided "No," in so far as breeding a herd of any definite pure breed or grading up a mixed herd was concerned.

The breeder who is interested in an attempt to evolve or manufacture a new breed of cattle combining the qualities of Tropical and European cattle could begin operations using a selected bull of mixed ancestry.