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TRANSMISSION OF *TRYPANOSOMA EVANSI* IN RATS AND CATS

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Abstract

The usual route of transmission of *Trypanosoma evansi* is through blood sucking arthropods. However, transmission without a vector has been also demonstrated. Experimental transmission of *Trypanosoma evansi* through unusual ways using expermental animals has been carried out.

The results showed that *Trypanosoma evansi* could penetrate the mucous membrane of the buccal cavity of rats and cats. When these hosts were fed on the flesh of infected mouse, they developed trypanosomiasis. Transmission through a very lightly abraded skin of rats was also achieved. There was no evidence of transplacental and transmammary transmission of *Trypanosoma evansi.*

INTRODUCTION

To date, there are no available reports on the routes of *Trypanosoma evansi* other than through the usual vector route by blood sucking flies such as *Tabanus* and *Stomoxys.* Transmission without a vector has also been tried as early as 1897 by Bruce who showed that an animal could contract trypanosomiasis by eating the flesh

of infected carcasses . Soltys (1971) reported that cats, rats and mice when fed on blood infected with *Trypanosoma brucei* and *Trypanosoma rhodesiense,* they developed trypanosomiasis. Soltys *et al.* (1973) stated that *Trypanosoma evensi* could be transmitted to rats through the conjunctiva, mouth and rectum. Moolo *et al.* (1973) were able to transmit *Trypanosoma brucei* to cats and dogs by feeding them on infected goats. Abdel Latif (1959) mentioned that suckling youngs born from *Trypanosoma evansi* experimentally infected bitches, goats, guinea pigs and white rats did not contract trypanosomiasis and no trypanosomomes could be demonstrated in the milk of infected mothers.

Griffin (1983) stated that *Trypanosoma congolense* could cross the placental barrier of mice and infect the faetus, but suckling youngs from infected mothers might be protected from infection.

The purpose of this work is to study the transmission of *Trypanosoma evansi* by penetrating the various intact mucous membranes of white rats and cats.

Trials on the transplacental and transmammary transmission were also conducted.

MATERIALS AND METHODS

Trypanosoma evansi strain used in the present study was obtained from a naturally infected native camel, and maintained in the laboratory through frequent passage in rats. Suspension of *Trypanosoma evansi* was obtained at the peak of parasitaemia through the orbital plexus route as described by Riley (1960) into phosphate-buffered saline - Glucose (PSG) pH 8.0. The trypanosomes were separated form the blood on a column of Diethylaminoethyl (DEAE) cellulose (Serva DE52) according to Lanham *et al.* (1972). The trypansomes in the suspension were counted using haemocytometer technique (Lumseden *et al.* (1973). The inoculum dosage consisted of 3 x 10^6 trypanosomes in PSG pH 8.0 and the animals were anaethesized prior to administration.

Chosen ways for experimental transmission of *Trypansosoma evansi* :

1. Intact mucous members of the buccal cavity of rats kittens:

A group of five white rats and two kittens proved to be free from any infection was fasted 24 hours before being fasted and fed the flesh and organs of infected mice that showed intense parasitaemia. The blood of the white rats and cats was examined daily by collecting blood samples from the tail and examining them by wet preparations. The cats were examined by taking blood samples from the ear vein. Trypanosomes not seen by wet smears were checked by the haematocrit centrifuge technique (Woo 1969).

2. Intact mucous membrane of the conjunctiva of rats:

Live *Trypanosoma evansi* inoculum was dropped into each eye of a group of five white rats proved to be free from infection.

3. Mucous membrane of the rectum of rats:

A similar procedure was used in introducting the trypanosomes into the rectum of a group of five white rats proved to be free from infection.

4. Shaved and very lightly abraded skin of mice:

Tow groups of mice (each of 4 proved to be free from any infection), were used. The dorsal area of the tail of the first group was shaved, while in the second group abrasions were induced until capillary bleeding occurred. The fresh trypanosomes in the inoculum were dropped on the shaved part of the first group as well as on the very lightly abraded skin in the second group.

Wet blood smears from rats and mice were examined daily post-infection for the presence of trypanosomes. The negative samples were checked by haematocrit centifuge technique (Woo 1969).

5. Transplacental and transmammary transmission of *Trypanosoma evansi*:

Trypanosoma evansi inoculum was inoculated subcutaneously into each of ten female white rats (proved to be free from infection) which had been mated ten days previ-

ously. All the infected pregnant rats showed parasitaemia within two days. Two days before the expected date of delivery, five rats were killed after ether anaesthesia, the uterus was then removed from each rat and the faetuses were taken out of the amniotic sac. The umbillical cord was cut near the faetus and all the faetuses were dipped in alcohol to destroy any trypanosomes from the maternal circulation which may have contaminated the surface of the faetus. The heart and liver of the faetus of each litter were removed and ground in approximately 3 ml of PSG pH 8.0. One millilitre of this material was intraperitoneally inoculated into each of three clean mice which were then examimed by thick smears from tail snips one month after inoculation. Two of the youngs from each of these litters were killed the day after birth; the heart and liver were ground in saline and 2 ml were inoculated into a group of three male mice for each litter. The litters obtained from the three left females that have given birth naturally remained with their mothers until weaning or until the mother died of infection. Afterwards, the youngs were examined for the presence of trypanosomes by thick smears from the tail.

RESULTS AND DISCUSSION

Rats and cats fed on the flesh of infected mice with *Trypanosoma evansi* showed parasitaemia after 2 - 12 days and 25 - 35 days post-infection respectively.

No *Trypanosoma evansi* could be detected in rats that received infection through conjunctiva or rectum.

Experiments carried out on transmission of *Trypanosoma evansi* through shaved skin failed, but when the parasites were dropped on a very lightly abraded skin, transmission was achieved. The parasites appeared in the recipient mouse after 2 - 4 days post - infcttion.

All mice inoculated from the faetuses of infected mothers did not reveal any trypanosomes and remained healthy for at least 6 weeks after inoculation. In addition, the offsprings produced from *Trypanosoma evansi* experimentally infected rats and suckled milk from their mothers, were apparently healthy and their blood was free from trypanosomes.

It is well known that, the route of transmission of *Trypanosoma evansi* is through the bite of infected flies, however, in certain circumstances, trypansomes may be transmitted through penetration of the mucous membranes of certain laboratory animals as rats and cats.

The present investigation showed that these laboratory animals could be infected through penetration of *Trypanosoma evansi* of the intact mucous membrance of the buccal cavity. These results confirmed the previous finings of Solty *et al.* (1973) and Moolo *et al.* (1973) on *Trypanosoma brucei* and *Trypanpsoma rhodesiense.*

Attempts of transmission of *Trypanosoma evansi* through a very lighlty abraded skin produced 100% infcetion which was in agreement with that of Soltys *et al.* (1973), but infection through conjunctival route failed, a result which is in contrast with the findings of same author. These results gave presumptive evidence that rats and cats fed on the infected carcasses could contract infecion, consequently, they might act as reservoir hosts to this type of trypanosomes. In addition, transmission of *Trypanosoma evansi* through the very lightly abraded skin might also play an additional route to the disease epidemiology.

Failure of trasplacental and transmammary transmission of *Trypanosoma evansi* was in agrrement with Latif (1959). The offsprings are protected from a fluminating infection through suckling milk from their infected mothers. This suggests that some protection may be conferred to the youngs by feeding from the infected mothers. If this is the case in domesticated livestock particularly camels, some trypanocidal factors or antibodies may be transmitted in the colostum or milk which protects the youngs from being infected. These findings also are correlated with the lower incidence of infection with *Trypanoosoma evansi* detected in the young ages rather than in the older ones (Nessiem 1987). However, such way of transmission warrant more detailed studies.

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REFERENCES

1. Abdl Latif, K. 1959. Studies on the possibility of trypanosoma treansmission through milk. J. Arab. Vet. Med. Assoc., 24:167-170.

2. Bruce, D. 1987. Further report on the *Tse tse* fly disease or Nagana in Zululand, Umbobo. London: Harrison and Sons.

3. Duke, H. L., R.W.M. Mettam and J.M. Wallacem. 1934. Observation on the direct passage from vertebrate of recently isolated strains of *Trypanosoma brucei* and *Trypanosoma rhodesiense*. Trans. Roy. Soc. Trop. Med. & Hyg., 28:77 - 84.

4. Griffin, L. 1983. Congenital transmission of *Trypanosoma congolense* in mice. J. Comp. Path., 93 (3) : 489 - 492.

5. Lanham, S. M., J. E. Williams and D. G. Godfrey. 1972. Detection of low concentrations of Trypanosomes in blood by column-separation and membrane-filtration. Trans. Roy. Soc. Trop. Med. & Hyg., 66: 624 - 627.

6. Lumsden, W. H. R., W. J. Herbert and G. J. C. McNeliage. 1973. Techniques with trypanosomes. Churichill livingstone. London, pp. 95 - 103.

7. Moolo, S. K., G. J. Losos and S. B. Kutuza. 1973. Transmission of *Trypanosoma brucei* to cats and dogs by feeding of infected goats. Am. Trop. Med Parasit., 67 (3) : 331 - 334.

8. Nessiem, M. G. 1987. Survey studies on the incidence of *Trypanosoma evansi* infection among native and imported camels using serological and blood film examinations. M. V.Sc. Thesis, Fac. Vet. Med., Cairo Univ.

9. Riley, V. 1960. Adaptation of orbital technique to rapid serial blood studies. Proc. Soc. Exp. Biol. Med., 104: 751.

10. Soltys, M. A. 1971. Epidemiology of trypanosomiasis in man. Zeitschrift fur Tropenmedizin and Parasitiologie, 22 : 120- 130.

11. Soltys, M. A., S. M. R. Thompson and P.T.K. Woo. 1973. Experimental transmission of *Trypanosoma brucei* and *Trypanosoma congolense* in rats and guinea pigs through skin and intact mucous membranes.

12. Woo, P.T.K. 1969. The haematocrit centrifuge for the detection of trypanosomes in blood. Canad. J. Zool., 47: 921 - 923.

النقل التجريبى للتريبانوسوما إفانزاى فى الفئران والقطط

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لم ينجح نقل الطفيل عن طريق المشيمة من الفئران المصابه الى أجنتها أو عن طريق اللبن.