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Studies On the Possible Transmission of *Trichopyton Equinum* by the Common Stable Fly

JOHN L. RICHARD[1]

Abstract. *Stomoxys calcitrans* failed to transmit *Trichophyton equinum* from infected to uninfected susceptible ponies and from infected to uninfected guinea pigs. Flies that had fed on lesions caused by this strain of *T. equinum* could not be demonstrated to carry the fungus. *T. equinum* was shown to be viable in the skin lesions by cultural methods and tissues of the lesions were shown to be infectious for guinea pigs.

Equine ringworm was described in 1896 by Matruchot and Dassonville (1); the pathogenic agent named *Trichophyton equinum* by Gedoelst in 1902 (2). This disease is known to occur in many parts of Europe and South America (3). In a survey of organisms isolated from ringworm lesions caused by species of *Trichophyton* in horses in the United States and Canada, 57.7 percent were due to *T. equinum* (4).

The incubation period of *T. equinum* on horses varies from ten days (5) to "some three weeks" (6). Transmission of *T. equinum* is chiefly by contact of healthy with infected horses (7). Severity of the disease increases in stables where one man attends to several horses using the same tools on all (5). Contaminated brushes, saddles, blankets, and stables are potential sources of inoculum (8).

Studies have shown that *Stomoxys,* a blood-sucking Muscid, is capable of transmitting causative agents of such disease as tryanosomiases, filarial disease, poliomyelitis, and infectious anemia (9, 10). Bloodsucking flies may be considered as potential transmission agents of the causative entities of infectious diseases of animals and man (11).

The purpose of this study was to determine if *T. equinum* on horses could be transmitted by the common stable fly, *Stomoxys calcitrans* Linneaus.

The single strain of *T. equinum* used throughout these experiments was maintained on Sabouraud dextrose agar at room temperature. Flies *(Stomoxys calcitrans)* were reared in the laboratory by a method modified from that described by Doty (12). They were fed citrated bovine blood. An oviposit medium formulated by H. H. Richardson according to Doty (12) was used. The experimental animals, five 2-year-old Shetland stallions and

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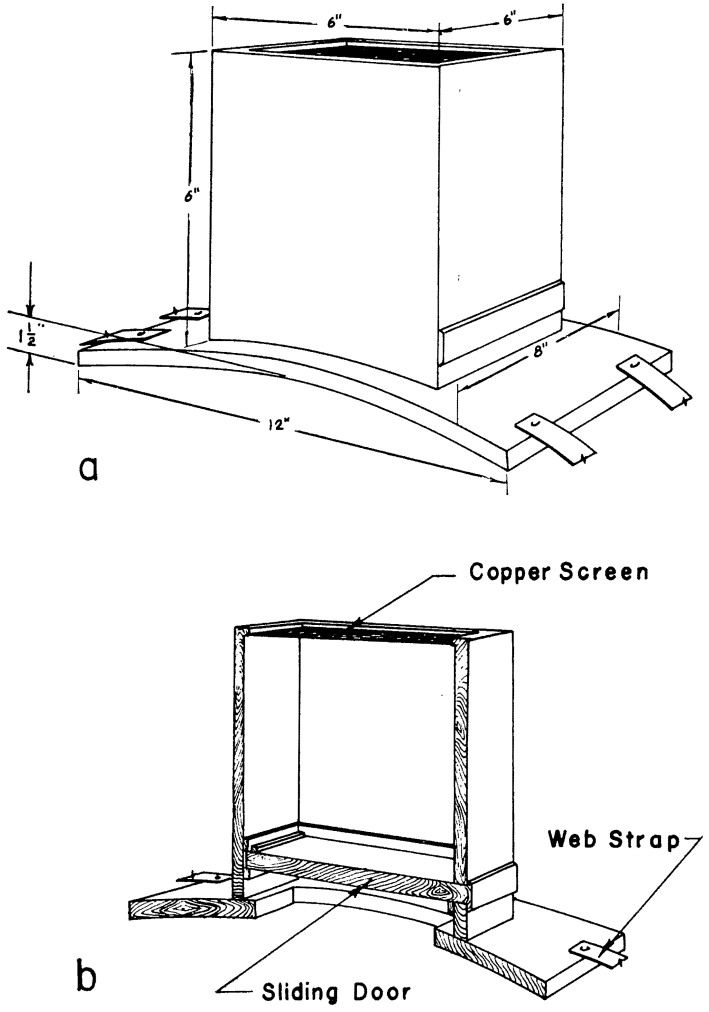

Figure 1. A. Transmission cage used in Experiment 1. B. Cross-section of the transmission cage used in Experiment 1

seventeen guinea pigs, were apparently healthy and free of dermatophytic diseases.

The two types of transmission cages used to hold the flies on the ponies while feeding are illustrated in Figures 1 and 2. Details of experimental methods and materials are presented in a thesis (13) available in the Iowa State University library.

In experiment 1, flies were allowed to feed on a lesion on Pony I for 15 minutes then were transferred to a shaved, scarified site on Pony II. Six days later a second transmission attempt was made to an unshaved site on the other side of Pony II. There

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Figure 2. Transmission cage used in Experiments 2 and 3 in position on animal

was no visible or microscopic evidence of infection on either site on Pony II at the end of 21 days.

In Experiment 2, groups of five flies that had fed on a lesion on Pony III for five minutes were caged on twelve sites on side A of Ponies IV and V (Figure 3a). Sites 1, 2, and 3 were treated first, the area covered with cheesecloth, and the ponies exercised vigorously for five minutes. Sites 6, 9, 10, 11, and 12 were covered with moistened cheesecloth for 48 hours. Sites 4, 5, 7, and 8 remained uncovered.

On the second day following these transmission attempts to sides A, five areas on sides B (Figure 3b) of these ponies were inoculated with aqueous suspensions from colonies of *T. equinum*. Suspensions of 7.2×10^5 (Pony IV) and 9.2×10^5 (Pony V) viable units per milliliter were used to make dilutions of 1:10, 1:100, 1:1,000, and 1:10,000. Cheesecloth pads moistened with 8 milliliters of the suspension were held on sites 1, 2, 3, and 4 respectively for 48 hours. A 7-day old colony of *T. equinum* was held under moistened cheesecloth on site 5 for 48 hours.

The transmission attempts to all of the sites on side A of Ponies IV and V, to sites 1, 2, 3, and 4 on side B of Pony IV and to sites 3 and 4 on side B of Pony V failed to show visible or microscopic evidence of infection after two months. Site 5 on side B of Pony IV and sites 1, 2, and 5 on side B of Pony V showed evidence of lesion development by 18 days after inoculation (Table 1). Attempts to isolate *T. equinum* directly or from a wash from flies used in the transmission attempts in Experiment 2 were unsuccessful.

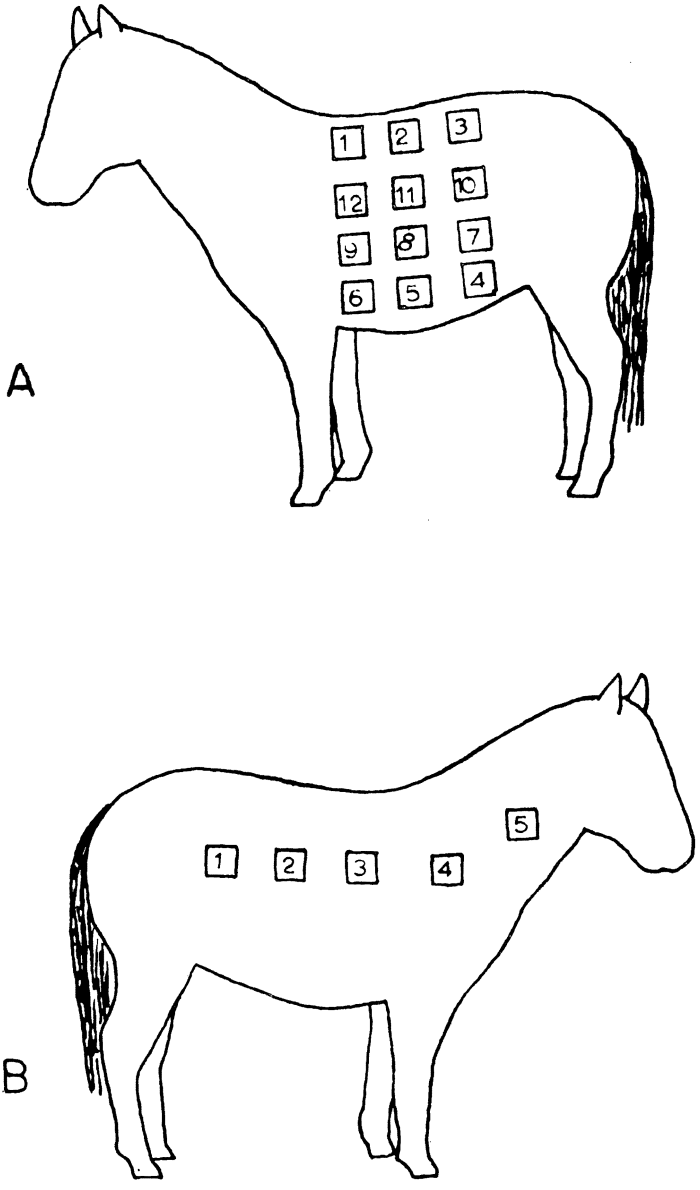

Figure 3. A. Location of twelve sites of inoculation with *T. equinum* by S. *calcitrans* an Sides A of Ponies IV and V. B. Location of five sites of inoculation with dilutions of *T. equinum* on Sides B of Ponies IV and V

In Experiment 3, transmissions by flies were attempted from 6-day-old lesions on two guinea pigs to four cortisone-treated[1] and five untreated guinea pigs. A fifth cortisone-treated guinea

[1] Cortone, Sharp and Dohme Co., Philadelphia, Pennsylvania

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Table 1. Inoculations of two Shetland ponies with dilutions of a suspension of *T. equinum* (Experiment 2, October-December, 1962)

Site	Side B 1	2	3	4	5[a]
Pony IV	–[b]	–	–	–	+
Pony V	+	+	–	–	+

[a] Inoculated with a 7-day-old colony of *T. equinum*.
[b] – = no infection.
+ = infection.

pig was inoculated directly with a 7-day-old colony of *T. equinum*. At the end of one and one-half months after the attempted transmissions no lesion development had occurred on any of the nine guinea pigs. The cortisone-treated guinea pig inoculated directly with the colony developed a lesion by the sixth day following inoculation.

In Experiment 4, two guinea pigs were each inoculated with 0.1 milliliters of a suspension containing 3×10^4 viable units of *T. equinum* per milliliter obtained by grinding 100 milligrams of infected equine hair and tissue in 3 milliliters of sterile saline solution. Three guinea pigs were each inoculated directly with 50 milligrams of infected equine tissue and hair. All five guinea pigs (Table 2) showed lesions six days after inoculation.

Table 2. Inoculation of five guinea pigs with two different suspensions of *T. equinum* (Experiment 4, January, 1963).

	Guinea pig number 1	2	3
Saline suspension of ground infected equine hair and tissue	+[a]	+	
Infected equine hair and tissue	+	+	+

[a] – = no infection.
+ = infection.

Discussion

The incubation period for this strain of *T. equinum* on horses in these studies was between 11 and 21 days. The same infection time has been previously reported (6, 5). The incubation period for this strain on guinea pigs changed from eight to six days by injection with cortisone. However, only one cortisone-treated guinea pig was inoculated with a colony of this strain of *T. equinum* and is an insufficient number for evaluation. Enhancement of experimental infection with a variety of microbes through the use of cortinsone has been reported (14).

No indication of transmission of *T. equinum* was found although four of the five ponies were shown to be susceptible and infected equine hair from these animals was infectious for guinea pigs. The fungus may be intimately associated with infected tissue and not readily picked up by feeding flies. Thus, transmission of the pathogen could not be successful unless portions

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of infected hair or tissue were carried by the flies. The number of viable units in the portion of infected tissue carried by the flies may have to be relatively high, even on a highly susceptible animal. The lowest number of viable units successful in establishing an infection on horses in these studies was approximately 9.2×10^3 per milliliter using 8 milliliters of inoculum. Pony IV did not become infected when inoculated with 8 milliliters of a suspension containing approximately 7.2×10^4 viable units. This result was undoubtedly affected by a low temperature of 4°C. in the stables the second and third nights following inoculation and possibly also by the low susceptibility of this pony.

Guinea pigs were infected with 50 milligrams of infected equine tissue and hair when 100 miligrams of this tissue contained approximately 3×10^4 viable units. Infected guinea pig hair appeared much the same as infected equine hair (Figure 4).

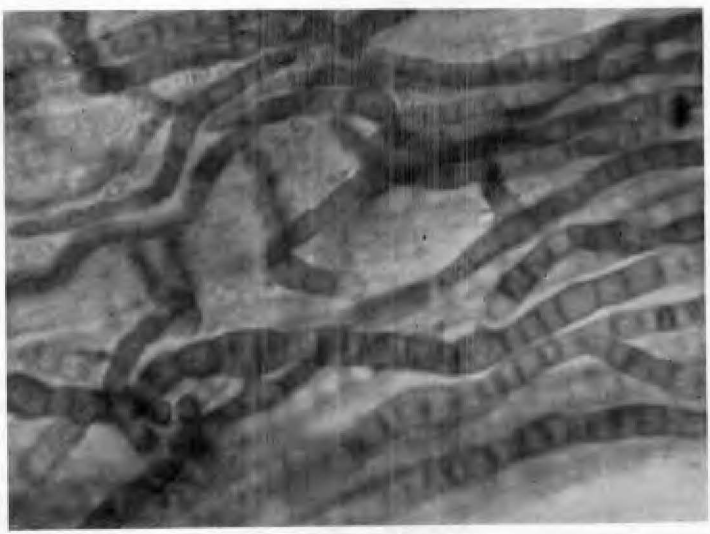

Figure 4. Arthrospores of *T. equinum* on hair from infected quinea pig (Experiment 4)

Moisture seemed to be necessary for successful infection. A perspiring horse would probably satisfy such a moisture requirement. Also skin type may be a factor, as a dry type of skin which sheds its keratin rapidly is more resistant to fungus infections than one which is moist and oily (15).

Literature Cited

1. Matruchot, L. and C. Dassonville. 1898. Academie des Sciences Paris 127:279-281.
2. Gedoelst, L. 1902. Les champignons parasites. H. Lamartine, Ed. J. Van In and Co. Brussels.
3. Batte, E. G. and W. S. Miller. 1953. Journal of the American Veterinary Medical Association 123:111-114.

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4. Georg, L. K., W. Kaplan, and L. B. Camp. 1957. American Journal of Veterinary Research 18:798-810.
5. Lomas, H. 1939. British Veterinary Journal. 95:290-292.
6. Ainsworth, G. C. and P.K.C. Austwick. 1955. Veterinary Record 67: 88-97.
7. ———— and ————. c1959. Fungal Diseases of Animals. Commonwealth Agricultural Bureau of Animal Health Review Series No. 6. Great Britain.
8. Kral, F. c1960. Compendium of veterinary dermatology. Chas. Pfizer and Co., Inc. New York.
9. Hindle, E. c1914. Flies in relation to disease. Cambridge University Press. Cambridge, Eng.
10. Scott, J. W. 1922. Wyoming Agriculture Experiment Station Bulletin No. 133.
11. Herms, W. B., and M. T. James. c1961. Medical entomology. 5th ed. The Macmillan Co., New York.
12. Doty, A. C. 1937. Journal of Economic Entomology. 30:367-369.
13. Richard, J. L. 1963. Unpublished M.S. Thesis. Iowa State University.
14. Louria, D. B. and H. G. Brown. 1960. Annals of the New York Academy of Sciences 89 (1):39-46.
15. Wilson, J. W. c1957. Clinical and immunologic aspects of fungus diseases. Charles C. Thomas. Springfield, Ill.

Teaching and Applying the Gene-for-Gene Hypothesis for Interactions in Host:Parasite Systems[1]

J. A. Browning[2]

Abstract. A "lock-for-key" method of teaching the gene-for-gene hypothesis for interactions in host:parasite systems, and an example of the application of the hypothesis to an "unknown" disease, stem rust of oats, are presented.

Many plant pathogenic fungi are specific, not only for a given host genus or species, but also for a given agronomic or horticultural variety. In some cases, a disease resistant variety may differ from a susceptible variety by a single gene which conditions disease expression. Teachers of plant pathology are challenged frequently to explain the specificity displayed by such interacting organisms. The gene-for-gene hypothesis provides a basis for understanding the genetic interactions of host and pathogen.

Flor (1) stated: "A simple explanation for the high degree of physiologic specialization of the rust fungi is the hypothesis that during their parallel evolution host and parasite developed complementary genic systems. For each gene conditioning rust reaction in the host there is a specific gene conditioning pathogenicity in the parasite. Pustule type, the criterion both of re-

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