or reproduced before dying. In fact, a high percentage died at eclosion. The precocious adults produced by treatment for low or high temperatures attempted to feed but only one was able to engorge. It is unlikely that any new generation would have been able to function as efficient vectors of Trypanosoma cruzi.

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References

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For many years the specific identities of the human head louse (Dolichoptes capitifer) and the human body louse (P. humanus L.) have been questioned—that is, are they or are they not separate species? Infections of each occur often on the same human host, but interbreeds with the other in the laboratory; yet interbreeding has not been shown to occur in nature (i.e., on the host) and the two populations may, in fact, be quite separate.

In a recent discussion of this problem, Busvine (1978) presented additional data and showed that each population retains its morphometric identity. In this note I shall analyze another aspect of the data Busvine presents, and conclude, as he did, that the two populations are indeed separate species.

Busvine presented in his Table 1 the numbers of head and of body lice collected from 12 subjects. I have ranked the subjects from those having the most head lice to those having the least and, for each of these numbers, ranked the number and ranking of body lice that particular subject also bore (my Table 1). I tested the correlation between the possession of many head lice with the possession of many body lice, by Spearman's rank correlation test. I found no correlation, either positive or negative ($r = 0.16$)

One might believe a priori that a subject well suited as a host of head lice would be at the same time well suited as a host of body lice. Such a belief appears to be false, there being no positive correlation. The reverse is also untrue—the lack of negative correlation suggests a host well suited to one kind of louse is not necessarily unsuited for the other kind. In other words, a host with many head lice may have fewer, or the same number of body lice, and the reverse is true, with respect to body lice.

Of course, just as correlations do not explain anything, neither does the lack of correlation. But the lack of correlation here does suggest that the population of head lice on an individual is indeed quite separate from the population of body lice on the same individual. Conditions conducive to low or high populations of the one are not necessarily conducive to low or high populations of the other. Thus the two populations are not only spatially isolated (allopatric) but ecologically isolated. Moreover, if the two environments were somewhat similar, one might expect that migrants from a high population in one would become established in lower populations of the other. Were this to occur, the two populations would tend to become equal in size. Such an equalization of numbers has not occurred in the two populations on each of these subjects, further arguing that the two environments (head and body) are not alike.

This argument is supported by several of Busvine's (1978) observations: in his collections, some cross-mixing did occur—a few body lice occurred with the head lice, and vice versa. Moreover, the Ethiopian subjects from whom the insects were collected wear a single "boggo-like garment" wrapped around the body and frequently around the head. Clearly some cross-infection does occur, and clearly the opportunity for more exists. Yet the actual incidence of such cross-infection remains very low indeed (very much less than 1%). The lice appear not to take the opportunity for cross-infecting, and one explanation is the unsuitability of the one habitat for lice adapted to the other.

Since the two populations on a single host are allopatric, and since their habitats appear to differ enough to minimize cross-population, they are not adapted for life in the other habitat. Members of the two populations may therefore be considered separate species, separable on morphometric differences as Busvine (1978) has shown.

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Acknowledgement

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Reference


The effects of 5-benzamido-2-(4-thiazolyl) benzimidazole on Trichinella spiralis

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5-benzamido-2-(4-thiazolyl) benzimidazole (herein after BBZ), which was synthesized by Merck, Sharp and Dohme has anthelmintic properties against nematodes, intestinal and filarial nematodes (CAMPBELL et al., 1975, and Experiments, personal communication, DENHAM, unpublished) and this prompted us to examine its effects upon Trichinella spiralis in mice.

All the methods were described by DENHAM (1969). The BBZ was supplied by Merck, Sharp and Dohme through the kindness of Dr. W. C. Campbell and was administered in 0.5% Tween 80 in distilled water by stomach intubation in 0.25 ml volumes. The particle size of the compound was not determined.

The effect of BBZ on immature intestinal T. spiralis

35 mice were each infected with 400 larvae of T. spiralis by stomach intubation. Six hours later 30 but five mice were treated with a single dose of BBZ. Groups of five mice were treated with doubling concentrations from 4 to 128 mg/kg. Three days after infection, control untreated mice yielded a mean of 213 (SE 23) adult worms. Dose levels of 32 mg BBZ/kg and above removed all T. spiralis. At 16 mg BBZ/kg only one or two worms were found in each mouse (mean 1, SE 0.4). Mice treated with 8 mg BBZ/kg had a mean of 12 (SE 6) adult worms. Even at 4 mg/kg there was a large reduction in the number of adult worms in comparison with the untreated control mice but the variation in this group was extreme. The actual adult worm counts were 1, 17, 18, 112 and 253 (mean 80, SE 47).

The effect of BBZ on adult T. spiralis

35 mice were infected with 400 larvae each and randomized into seven groups. One group was left untreated and the others treated with 4 to 128 mg BBZ/kg three days after infection. There was no reduction in the number of adult worms three days after treatment even at 128 mg/kg, when a mean of 114 (SE 23) adult worms were recovered compared with the untreated control count of 86 (SE 21). In view of this result a further 30 mice were infected. Five mice were left untreated and the rest treated with BBZ at doubling concentrations from 100 to 1,600 mg/kg three days later. One day after treatment all these mice were killed and their adult worm counts. Even at 1,600 mg/kg there was no reduction in the number of adult worms recovered, i.e. a mean of 162 (SE 26) from treated 120 (SE 47) from control mice.

Effect of BBZ on developing muscle larvae

45 mice were infected with 400 larvae each and seven days later 40 were treated twice by subcutaneous injection of methadrene at 500 mg/kg. These mice would have had their adult population removed and be left with a population of developing muscle larvae from one to three days old on the day after treatment (DECEW & DENHAM, 1970). The day after methadrene treatment no adult worms were found in five treated mice. The remaining 35 methadrene-treated mice were randomly separated into seven groups, each of five mice. One was left untreated and the others treated five times over three days with 4 to 128 mg/kg BBZ. 28 days after infection all the mice were digested and their muscle larvae counted. Untreated control mice had a mean of 52,000 (SE 5,400) larvae and those treated with methadrene 31,200 (SE 6,180). Treatment with BBZ had very little effect. For example, mice treated with 5 to 128 and 5 to 64 mg/kg had 23,900 (SE 5,900) and 20,300 (SE 3,950) larvae respectively. Comparison should be made with the methadrene treated group.

The effects of BBZ on encysted T. spiralis

35 mice were infected with 400 larvae and randomized into seven groups of five. One was left untreated and the others treated with 4 to 128 mg/kg five times over a period of three days, starting from 35 days after infection. The control mice and those given 5 to 128 mg/kg were digested 14 days after the end of treatment and their muscle larvae counted. The controls yielded 42,800 (SE 10,300) larvae and the treated mice 11,900 (SE 5,900). Virtually all the larvae from the treated mice were dead whereas nearly all those from the controls were alive. In view of this the remaining mice were left for another 14 days before digestion. The mice treated with 5 to 64 mg BBZ/kg had a mean of only 3,580 (SE 1,070) larvae, those given 5 to 32 mg BBZ/kg 22,300 (SE 13,000) and those given 5 to 16 mg BBZ/kg 50,100 (SE 16,000). BBZ is extremely active again pre-adult T. spiralis but under the conditions of these experiments had no lethal effect on adult worms at a single gauge dose of 1,600 mg/kg. Its spectrum of activity against intestinal T. spiralis is, therefore, similar to that of its relatives thiabendazole (TBZ).