

DEVELOPMENT OF *BRUGIA MALAYI* IN MONGOLIAN GERBILS PREVIOUSLY EXPOSED TO *WUCHERERIA BANCROFTI*

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INTRODUCTION

In the past we reported on studies carried out with lymphatic filarid species which included reports on the development of *Wuchereria bancrofti* in monkeys (Cross *et al.*, 1979), the development of *W. bancrofti*, *Brugia malayi* and *B. pahangi* in *Toxorhynchites* sp. (Cross *et al.*, 1980), the development of *W. bancrofti* in Mongolian gerbils (Cross *et al.*, 1981), and hybridization experiments between *B. malayi* and *B. pahangi* (Cross *et al.*, 1984). During the course of these studies we also carried out a preliminary experiment to determine whether previous exposure to infection of *W. bancrofti* would influence the development of a challenging infection of *B. malayi* in the same animals. The paper presents the results of this study.

MATERIALS AND METHODS

The strain of *W. bancrofti* was from Kinmen, China, and the strain of *B. malayi* was from a cat collected during a field trip to South Kalimantan (Borneo), Indonesia. The strain had been maintained in Mongolian gerbils

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in the NAMRU-2 laboratory in Taipei, Taiwan, for several years. Laboratory raised *Aedes togoi* (Formosan strain) were permitted to feed on a human volunteer with *W. bancrofti* microfilaremia on the island of Kinmen, and the mosquitoes transported by air to Taipei. *Aedes togoi* also were fed on *B. malayi* infected gerbils in the laboratory to obtain infective stage larvae. Methods of infecting the mosquitoes, obtaining the third-stage larvae and infecting and necropsing the animals were similar to methods used in earlier studies (Cross *et al.*, 1979; 1981).

The Mongolian gerbils (*Meriones unguiculatus*) were from a colony maintained at the NAMRU-2 laboratory in Taipei, Taiwan. Only adult males were used.

Each of 12 animals was given 100 third-stage larvae of *W. bancrofti* in saline by syringe inoculation subcutaneously into the groin. Approximately one month later the animals were given a challenging infection of 100 third-stage larvae of *B. malayi* by the same route. Four gerbils served as controls for the challenging *B. malayi* infection. The blood or the animals were examined for microfilariae at 3 months post-infection, and all were killed and examined for parasites 6 months after infection.

RESULTS AND DISCUSSION

Eleven of the 12 *B. malayi*-challenged animals and the 4 controls survived the experiments, and were necropsied at 6 months post-infection. Eight of the challenging infections produced microfilariae as well as

Table 1

Development of *Brugia malayi* in Mongolian gerbils previously infected with 100 third-stage larvae of *Wuchereria bancrofti*.

| No. gerbils infected | Number of worms recovered, sex and location | | | | | | |
|----------------------|---|-----------|------|--------|--------|--------------|---------|
| | Range | Total No. | Male | Female | Testes | Pelt/Carcass | Viscera |
| Experimental 11 | 2-33 (Av. 15) | 169 | 72 | 97 | 116 | 2 | 51 |
| Control 4 | 24-50 (Av. 38) | 152 | 72 | 90 | 102 | 2 | 48 |

the 4 control animals. The microfilariae-negative experimental animals were found to harbor single sex infections at necropsy. No *W. bancrofti* microfilariae were found, and at necropsy one fourth-stage larvae was recovered from one of the experimental animals.

Adult *B. malayi* were recovered from all experimental and control animals (Table 1). The recovery rates ranged from 2% to 33% (average 15%) for those gerbils previously infected with *W. bancrofti*, and ranged from 24% to 50% (average 38%) in the control animals only given *B. malayi* infections. Forty-three percent of the worms recovered from the experimental animals were males and 57% females; most (69%) were found in testes, while 30% were recovered from the heart, lungs, and intestine. Two worms were found in the carcass. In the single sex infections involving females, most of the worms were in the viscera, and in one animal two male worms were in the testes. A total of 152 worms were recovered from the control gerbils. Forty-seven percent were males and 58% females. Sixty-seven percent were found in the testes, 32% in the viscera and one worm each in the pelt and carcass.

The results of this preliminary study suggest that a previous infection with *W. bancrofti* has influence on the development of a challenging infection of *B. malayi* in Mongolian gerbils. Only 15% of the *B. malayi* given to previously *W. bancrofti*-infected gerbils developed, compared to 38% in control gerbils not previously infected with *W. bancrofti*. Although measurements were not made, the *B. malayi* recovered from the experimental animals were noticeably smaller than those from the control animals. There was little difference in the recovery rates by sex of the worms and in the location of development in the animals. Most of the worms in both groups of animals were found in the testes followed by the heart, liver, lung, intestines, carcass and pelt.

One wonders whether this cross resistance also occurs in nature. In some areas of Asia, both *B. malayi* and *W. bancrofti* are known to be endemic with microfilariae of both species found in the peripheral blood of humans. In gerbils, *B. malayi* was able to complete development in animals first infected with *W. bancrofti*, and while microfilariae of *B. malayi* were produced, the number of adult worms recovered were less than the number of worms recovered from the controls. It

seems tenable that similar results could occur in humans. It would be difficult to determine this in man, however. Unfortunately, the effect of *B. malayi* on the development of *W. bancrofti* cannot be tested in gerbils since it is only on rare occasions that *W. bancrofti* will complete development in this host (Cross *et al.*, 1981). On the other hand, this too could possibly happen in nature.

SUMMARY

Twelve Mongolian gerbils, *Meriones unguiculatus*, were infected with 100 third-stage larvae of *Wuchereria bancrofti*. One month later these animals, along with 4 control animals, were given 100 third-stage larvae of *Brugia malayi*. Eleven of the 12 experimental animals and the 4 controls survived, and 8 of the experimental animals and all of the controls demonstrated microfilaremia after 3 months. The animals were killed at 6-months post-infection and examined for parasites. One *W. bancrofti* larva was found in one of the experimental animals, and 15% of the *B. malayi* given were recovered as adults from the testes, viscera, and carcass. Thirty-eight percent of the worms given to the controls were recovered from the testes, viscera, and pelt. The worms from the

experimental animals also appeared to be smaller. This study suggests that gerbils are able to develop partial resistance to *Brugia malayi* following a previous infection with *Wuchereria bancrofti*.

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