Delayed Expulsion of Adult *Trichinella spiralis* by Mast Cell-Deficient W/Wv Mice

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Mast cell-deficient W/Wv mice and their mast cell-sufficient littermates were given infections of *Trichinella spiralis*. W/Wv mice were slower than their littermates to expel adult *T. spiralis*. Repair of the mast cell deficiency of W/Wv mice by bone marrow grafting was accompanied by accelerated expulsion of *T. spiralis* worms, and fixing and staining MMC are given elsewhere (4, 14).

Thirty-five W/Wv and 35 LM mice each were given by esophageal intubation 300 *T. spiralis* infective muscle larvae prepared by acid-pepsin digestion of infected LM mice. Five mice from each group were killed at 8, 11, 14, 17, 20, 23, and 28 days postinfection (p.i.), and the number of adult *T. spiralis* worms in the small intestines was determined. A 2-cm piece of small intestine from each of the 10 mice killed on day 11 p.i. was fixed, stained, and examined for MMC. The number of worms was significantly higher in mast cell-deficient W/Wv mice than in mast cell-sufficient LM mice at days 14, 17, 20, and 23 p.i.; LM mice had expelled their intestinal worm burden by day 17 p.i., but worms were present in W/Wv mice as late as day 23 p.i. MMC were abundant in LM but not W/Wv small intestine (Table 1, experiment 1).

A second experiment had these groups: 24 W/Wv, 24 LM, 4 BALB/c-nu/nu, and 24 W/Wv mice which had been given an intravenous injection of 3 × 10⁷ LM bone marrow cells 60 days before infection (W/Wv-BM). Again, all mice were infected with 300 *T. spiralis* larvae. Four W/Wv, LM, and W/Wv-BM mice were killed at 8, 11, 14, 17, 20, and 23 days p.i. for worm counts; the four BALB/c-nu/nu mice were killed on day 23 p.i. for worm counts. A 2-cm piece of small intestine from each of the 16 mice killed on day 23 p.i. was fixed, stained, and examined for MMC. In this experiment also (Table 1, experiment 2), the number of worms was significantly higher in W/Wv than in LM mice at days 14, 17, 20, and 23 p.i. Intestinal MMC were frequently seen in sections of LM but not W/Wv intestine. W/Wv-BM mice were effectively repaired not only to develop intestinal MMC but also to expel normally adult *T. spiralis* (Table 1, experiment 2). As reported by others (11), the athymic mice

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Although intestinal mastocytosis regularly accompanies many intestinal nematode infections (1, 2), the role, if any, of mast cells in expulsion of nematodes is unclear (2, 5). To evaluate the role of mast cells in expulsion from the intestines of mice of adult *Trichinella spiralis*, a nematode which causes prominent intestinal mastocytosis (11), we used mast cell-deficient W/Wv mice, their mast cell-sufficient littermates, and W/Wv mice made mast cell sufficient by bone marrow grafts. We report here that mast-cell-deficient mice expel adult *T. spiralis* worms more rapidly than do mast-cell-deficient mice.

Mice of the W/Wv genotype have macrocytic anemia and have been used often in experimental hematology (12). In 1978, Kitamura and co-workers (6) reported their important observation that W/Wv mice are mast cell deficient; however, their study was limited to connective tissue mast cells. Others later showed that W/Wv mice are deficient not only in connective tissue mast cells but also in thymus-dependent (9) intestinal mucosal mast cells (MMC) (4, 13). The anemia (12) and the deficiency of W/Wv mice in both connective tissue mast cells (7) and MMC (3) can be corrected by giving these mice grafts of normal bone marrow or spleen cells.

We purchased from the Jackson Laboratory, Bar Harbor, Maine, WBB6 F₁-W/Wv mast cell-deficient mice and their mast cell-sufficient littermates (LM: WBB6F₁-W/+ or +/+). BALB/c-nu/nu athymic mice from our colony were used in one experiment as a control for larval viability and mouse intestinal histology. The *T. spiralis* strain used was obtained from Donald L. Wassom, Cornell University, Ithaca, N.Y. Details about maintaining the parasite, infecting mice, recovering and counting adult worms, and fixing and staining MMC are given elsewhere (4, 14).

Thirty-five W/Wv and 35 LM mice each were given by esophageal intubation 300 *T. spiralis* infective muscle larvae prepared by acid-pepsin digestion of infected LM mice. Five mice from each group were killed at 8, 11, 14, 17, 20, 23, and 28 days postinfection (p.i.), and the number of adult *T. spiralis* worms in the small intestines was determined. A 2-cm piece of small intestine from each of the 10 mice killed on day 11 p.i. was fixed, stained, and examined for MMC. The number of worms was significantly higher in mast cell-deficient W/Wv mice than in mast cell-sufficient LM mice at days 14, 17, 20, and 23 p.i.; LM mice had expelled their intestinal worm burden by day 17 p.i., but worms were present in W/Wv mice as late as day 23 p.i. MMC were abundant in LM but not W/Wv small intestine (Table 1, experiment 1).

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had prolonged infections (day 23 p.i. median, 52 worms) and lacked intestinal MMC.

The experiments described here show (i) that mast cell-deficient W/W' mice are slower than their mast cell-sufficient littermates to expel intestinal *T. spiralis* and (ii) that bone marrow repair of the mast cell deficiency of W/W' mice is accompanied by accelerated expulsion of *T. spiralis*. It is possible that delayed expulsion of *T. spiralis* results from some deficiency of W/W' mice other than the mast cell deficiency and that the accelerated expulsion of *T. spiralis* by W/W' mice given bone marrow is due to some effect of the marrow graft other than repair of mast cell deficiency. However, we have shown that W/W' mice are normal or elevated in ability to produce antigen-specific immunoglobulin M, G, and E antibody responses and delayed-type hypersensitivity and contact sensitivity reactions (10). Others (15) also failed to detect any major defect in the immune system of W/W' mice.

It is important to note that in three of four reported studies, *Nippostrongylus brasiliensis* infections were prolonged in W/W' mice (3, 4, 8, 13). Although W/W' mice given normal bone marrow or spleen cells and infected with *N. brasiliensis* show marked accumulation of intestinal MMC, they are still slow to expel their *N. brasiliensis* worm burdens (3).

It appears, therefore, that delayed expulsion of *T. spiralis* from W/W' mice is due to their lack of mast cells, but defects other than mast cell deficiency that are not corrected by marrow or spleen cell grafts must account for delayed expulsion of *N. brasiliensis* from W/W' mice. This apparent difference in the involvement of mast cells in parasite expulsion is perhaps the result of the different association of the nematodes with the intestinal tissues of the host—*N. brasiliensis* is a lumen dweller whereas *T. spiralis* worms lie within the cytoplasm of cells of the intestinal mucosa (16).

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