

# pH as a Factor in Parasitism of Mosquito Larvae by the Mermithid *Romanomermis culicivorax*

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The effects of a number of environmental factors on the parasitism of mosquito larvae by *Romanomermis culicivorax* Ross and Smith (= *Reesimermis nielseni*, auct. partim.) have been studied (1-6). However, the only two reports of the effects of hydrogen-ion concentrations on the infective stage (preparasite) of this nematode give dissimilar results. Brown and Platzer (2) observed infections to occur over a pH range of 3.6-8.6, whereas Chen (3) reported that optimum pH for infection by *R. culicivorax* was 6.7-7.2, that no infection was observed below pH 5.7 and above 8.7, and that a sharp drop in infection occurred below pH 6.2 and above 7.7. Results of research reported here are pertinent.

One hundred first-instar *Culex pipiens quinquefasciatus* Say were exposed in 100-ml beakers to 300 16-hr-old preparasites of *R. culicivorax* in 50 ml of solution ranging in pH from 4.81 to 8.48. After 24 h, mosquito larvae were transferred to rearing pans and held until the extent of infection could be determined. Test solutions consisted of distilled water containing 0.005 M  $\text{NaH}_2\text{PO}_4$  and/or 0.005 M  $\text{NaH}_2\text{PO}_3$ . The specific pH values were obtained by varying the percentage of the two salt solutions.

Since pH values moderated slightly during the 24-hr exposure period (i.e., 4.81 to 5.54, 8.48 to 7.93), means were determined for each test container and recorded as the pH for the given container. The test was conducted at ambient temperatures (26-27 C) and conducted five times.

Results indicate that *R. culicivorax* remains infective over a wide range of pH values and that infectivity is enhanced by acid pH values (Table 1). A significant negative correlation ( $r = -0.83, -0.98, -0.80, \text{ and } -0.86$ ) between pH value and infection was obtained for four of the five tests. The relation was negative in the fifth test also, but was not significant ( $r = -0.32$ ). The pooled data gave a highly significant negative correlation ( $r = -0.97$ ).

These data differ from data of Chen (3) and indicate that pH, under normal conditions, is not a limiting factor in obtaining infections in most mosquito habitats. Perhaps the difference results from Chen's use of high concentrations of the same salts (0.1 M). Those salt concentrations probably caused toxic or osmoregulatory problems for both nematodes and mosquitoes, as shown by the low host survival rate

TABLE 1. Effect of pH on infectivity of *Romanomermis culicivorax* when exposed to *Culex pipiens quinquefasciatus*.<sup>a</sup>

Log mean pH	No. of larvae examined	Mean % parasitism
5.39	449	70.4
5.80	432	66.6
6.08	447	67.2
6.32	457	65.6
6.54	430	61.6
6.84	462	58.6
7.14	457	57.0
7.32	432	51.4
7.64	452	44.0
7.92	433	45.0

<sup>a</sup>Values are totals and means for five replications of 100 hosts each exposed to 300 preparasites.

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(75% at pH 7.2 and 0 at pH 5.7 and 8.7). In our tests at 0.005 M concentration, host survival was 86–92% at all pH values, and no correlation was evident between host survival and pH.

Many factors such as salinity, temperature, and pollution can affect the efficiency of *R. culicivora*. Although lower pH values appear to enhance the ability of the preparasite to infect a host, pH is probably not a significant factor in most mosquito habitats.

#### LITERATURE CITED

1. BROWN, B. J., and E. G. PLATZER. 1977. The effects of temperature on the infectivity of *Romanomermis culicivora*. *J. Nematol.* 9:166-172.
2. BROWN, B. J., and E. G. PLATZER. 1978. Salts and the infectivity of *Romanomermis culicivora*. *J. Nematol.* 10:53-61.
3. CHEN, PAO-SHU. 1976. A study on *Reesimermis nielseni* for control of *Culex pipiens fatigans* in Taiwan. *Bull. Inst. Zool. Acad. Sin.* 15:21-28.
4. GALLOWAY, T. D., and R. A. BRUST. 1977. Effects of temperature and photoperiod on the infection of two mosquito species by the mermithid *Romanomermis culicivora*. *J. Nematol.* 9:218-221.
5. KURIHARA, T. 1976. Population behavior of *Reesimermis nielseni*, a nematode parasite of mosquitoes, with notes on the attraction of infective stage nematodes by mosquito larvae *Culex pipiens molestus*. *Jap. J. Parasitol.* 25: 8-16.
6. PETERSEN, J. J., and O. R. WILLIS. 1970. Some factors affecting parasitism by mermithid nematodes in southern house mosquito larvae. *J. Econ. Entomol.* 63:175-178.