6. F. J. R. Hird, thesis, Cambridge University, Cambridge, England (1950).
7. A. Meister, in *Conference on Glutathione*, L. Flohe, Ed. (Thieme, Stuttgart, 1973), pp. 57–69; in *The Enzymes*, P. D. Boyer, Ed., (Academic Press, New York, 1974), vol. 10, p. 671.
8. E. Heinz, in *Metabolic Pathways*, L. E. Hokin, Ed. (Academic Press, New York, ed. 3, 1972), vol. 6, p. 455.
9. F. Binkley and K. Nakamura, *J. Biol. Chem.* **173**, 411 (1948).
10. S. S. Tate, L. L. Ross, A. Meister, *Proc. Natl. Acad. Sci. U.S.A.* **70**, 1447 (1973).
11. L. L. Ross, L. Barber, S. S. Tate, A. Meister, *ibid.*, p. 2211.
12. The cycle enzymes also occur in certain tumors (R. V. Krishna, unpublished studies). There seem to be significant relationships between glutathione metabolism and certain types of carcinogenesis [W. P. Neish, H. M. Davies, P. M. Reeve, *Biochem. Pharmacol.* **13**, 1291 (1964)].
13. F. Binkley, *J. Biol. Chem.* **236**, 1075 (1961).
14. H. N. Christensen, C. de Cespedes, M. E. Handlogten, G. Ronquist, *Biochim. Biophys. Acta* **300**, 487 (1973).
15. The interaction of the transpeptidase with peptides and the question as to whether the activity of certain peptides reflects a physiological function are being studied (S. S. Tate and A. Meister, *Fed. Proc.*, in press).
16. P. Van Der Werf, R. A. Stephani, A. Meister, *Proc. Natl. Acad. Sci. U.S.A.* **71**, 1026 (1974).
17. V. P. Wellner, R. Sekura, A. Meister, A. Larsson, *ibid.*, in press.

11 March 1974

Laetrile and Schistosomiasis

Perhaps one of the reasons for the impression that "Laetrile 'scientists' frequently do poor science" (*1*) is that the workers who failed to demonstrate therapeutic efficacy have tended to keep their findings to themselves—thereby greatly limiting the sample size on which the impression is based.

It was predicted (*2*), on theoretical grounds, that Laetrile would be effective in the treatment of schistosomiasis (one of the most important parasitic diseases of man), and some preliminary claims were made for the efficacy of long-term Laetrile treatment in the clinic (*3*). I know of no published contrary evidence, and in view of the current resurgence of interest in Laetrile, perhaps I should here record an unpublished attempt in 1966 to demonstrate efficacy in schistosomiasis in mice (*4*).

Albino mice infected with *Schistosoma mansoni* were treated with Laetrile at a time (day 28 of infection) just prior to the expected onset of schistosome egg deposition. Groups of ten mice were subjected to one of the following regimens: 100 mg/kg per day intravenously, 100 mg/kg per day intraperitoneally, 500 mg/kg per day intraperitoneally, 500 mg/kg per day subcutaneously, or 1000 mg/kg per day intraperitoneally. In each instance the drug was given to the mice for 10 days, the days being consecutive except for the group treated intravenously, in which the 10 injections were administered over a 14-day period. A group of five mice was given potassium antimony tartrate in the diet at a concentration of 0.2 percent. Because the experiment was adjunctive to a larger trial, more than 100 additional infected mice, from the same infection batch and similarly housed in groups of five to ten animals each, received either no treatment or treatment with drugs that had no antischistosomal action. At necropsy, 28 days after the beginning of treatment, the status of infection was assessed with respect to the intensity of egg-induced granuloma formation in the liver and the presence of live schistosomes in the mesenteric veins (*5*).

All mice treated with Laetrile, in any regimen, had infections that were indistinguishable from those of the untreated mice or of the mice treated with nonantischistosomal drugs; that is, they had uniformly intense hepatic granuloma formation, the characteristic peripheral "dead worm lesions" of the liver were absent, and live worms were present in the veins. In contrast, all of the mice treated with the antimonial drug were free of hepatic granulomata (no attempt was made to determine whether all of the worms had been killed).

Thus Laetrile, as used in this experiment, neither killed the schistosomes nor suppressed their egg production (the latter usually being a sensitive indicator of antischistosomal activity). It is possible that the use of older infections or prolonged treatment would reveal an antischistosomal effect. Thus, although the therapeutic correlation between schistosomiasis in mouse and in man is quite good on a qualitative basis, these results do not rule out the possibility that Laetrile would be of value in the treatment of schistosomiasis.

WILLIAM C. CAMPBELL
Merck Institute for Therapeutic Research, Rahway, New Jersey 07065

References and Notes

1. B. J. Culliton, *Science* **182**, 1000 (1973).
2. E. T. Krebs, cited by O. D. Kittler, in *Control of Cancer* (Paperback Library, New York, 1963), p. 111.
3. M. D. Navarro, W. Vitug, G. A. Moral, C. Vylango, A. Merced-Lucindo, *Int. Med. J. Philipp. Coll. Physicians* **3**, 145 (1965).
4. The drug was injected as a sterile solution (supplied by the McNaughton Foundation, Montreal). I am indebted to the Rev. Mr. A. F. Hill for calling my attention to the predicted efficacy of Laetrile in schistosomiasis.
5. W. C. Campbell and A. C. Cuckler, *J. Parasitol.* **53**, 977 (1967).

18 January 1974; revised 20 February 1974