

**Damian R T.** Molecular mimicry: antigen sharing by parasite and host and its consequences. *Amer. Naturalist* 98:129-49, 1964.

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Antigen sharing between parasites and hosts was reviewed and named molecular mimicry. The main adaptive advantage of molecular mimicry to parasites was considered to be compromised host recognition and rejection. It was also suggested that hosts could have evolved antigenic polymorphisms to defend against molecular mimicry. [The *SCI*<sup>1</sup> indicates that this paper has been cited in over 160 publications.]

## Molecular Mimicry: Parasites Versus Hosts

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Sir Peter B. Medawar wrote, "All scientists know of colleagues whose minds are so well equipped with the means of refutation that no new idea has the temerity to seek admittance."<sup>1</sup> Sometimes it is an advantage not knowing too much about a subject, as was my condition while a graduate student in parasitology under Professor Robert B. Short at Florida State University. Reading about antigenic variation in G.H. Beale's *The Genetics of Paramecium aurelia*<sup>2</sup> made me muse on parasite antigens and wonder if in their range of variation some might not have come to resemble host antigens. Perhaps if I had been more familiar with the literature, with its abundance of reports on "heterogenetic" antigens, I wouldn't have become excited enough about this idea to be able to see its potential for explaining long-term parasite survival. But it was new to me, and almost at once, caught up in it, I went further and imagined that the development of host antigenic polymorphisms

could offset encroachment upon "self" through parasite antigenic convergence. This second part of my hypothesis was influenced by W.C. Boyd's, *Genetics and the Races of Man*,<sup>3</sup> which outlined enigmas about blood groups. Later, I fleshed out the hypothesis and expanded my doctoral research on schistosome antigens to look for antigens shared with the mouse.<sup>4</sup> This later was followed by our discovery of  $\alpha_2$ -macroglobulin mimicry,<sup>5</sup> which we are still investigating.

These ideas were aired in local seminars before formal presentation at the 1962 national meeting of the American Society of Parasitologists. Dr. Margaret Y. Menzel recommended publication in the *American Naturalist* to reach a wider audience; and a fellow graduate student, Dwayne N. Kruse, provided a catchy phrase, "molecular mimicry," for the title. I reviewed existing evidence for antigens shared by hosts and their parasitic flora or fauna and considered their evolution. The part about host antigenic polymorphisms was the hardest to write, since I had difficulty finding a mechanism by which molecular mimicry could maintain them, until finally hitting upon frequency-dependent selection as a solution. Unfortunately, this aspect has gone largely unnoticed or uncited by writers on host antigenic polymorphisms, a notable exception being George D. Snell, who discussed molecular mimicry in relation to murine H-2 polymorphism.<sup>6</sup>

I believe one result of my paper was to add molecular mimicry to the special case of antigenic variation, thus creating "a new conceptual environment in which parasitologists and immunologists were encouraged to pose new questions and try new approaches to uncover other candidate evasive mechanisms."<sup>7</sup> A more general effect may have been to help make the idea of biological mimicry at the molecular level explicit and to ascribe it to more than just chance. Molecular mimicry, greatly enlarged in scope, is now riding a surge. For example, a recent symposium, the proceedings of which have been published,<sup>8</sup> was devoted to it.

1. Medawar P B. *The uniqueness of the individual*. New York: Basic Books, 1957. p. 74. (Cited 130 times.)
2. Beale G H. *The genetics of Paramecium aurelia*. Cambridge, England: Cambridge University Press, 1954. 179 p. (Cited 215 times.)
3. Boyd W C. *Genetics and the races of man*. Boston, MA: Little, Brown, 1950. 453 p. (Cited 115 times.)
4. Damian R T. Common antigens between adult *Schistosoma mansoni* and the laboratory mouse. *J. Parasitology* 53:60-4, 1967. (Cited 35 times.)
5. Damian R T, Green N D & Hubbard W J. Occurrence of mouse  $\alpha_2$ -macroglobulin antigenic determinants on *Schistosoma mansoni* adults, with evidence on their nature. *J. Parasitology* 59:64-73, 1973. (Cited 55 times.)
6. Snell G D. The H-2 locus of the mouse: observations and speculations concerning its comparative genetics and its polymorphism. *Folia Biol. -Prague* 14:335-58, 1968. (Cited 240 times.)
7. Damian R T. Molecular mimicry revisited. *Parasitol. Today* 3:263-6, 1987.
8. Lernmark Å, Dyrberg T, Terenius I & Hokfelt B, eds. *Molecular mimicry in health and disease*. Amsterdam, The Netherlands: Elsevier, 1988. 412 p.

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