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A parasite exposed

Margaret Perkins

Malaria Immunology. Edited by P. Perlmann and H. Wigzell. Karger: 1988. Pp. 372. SwFr.262, £119.10, \$174.75.

MALARIA remains one of the most devastating of human diseases. In the past decade, researchers have rapidly (and anxiously) applied the technologies of molecular biology and immunology to identify plasmodial antigens and test their immunological importance. *Malaria Immunology*, a collection of 12 reviews which have been edited expertly by Peter Perlmann and Hans Wigzell, documents the resulting, prodigious growth in our knowledge and the steady progress towards the ultimate goal — the development of a vaccine for human malaria. The book will be of use not only to researchers inside the field but to those generally interested in immunity to infectious diseases.

Mosquitoes transmit malaria by injection of sporozoites into the blood, and thus it is appropriate that the first two chapters are concerned with this stage. The coat of the sporozoite is composed of a single antigen, the CS (circumsporozoite) protein first identified and characterized by Ruth Nussenzweig and colleagues. Given its pre-eminence as a vaccine candidate, the CS protein has been the most intensely studied of all malarial antigens. Both B- and T-cell epitopes of the antigen have been identified and their relative importance in the immune response is currently being examined. The complex task of unravelling the immune response to the CS protein is well analysed in Chapters 1 and 11.

In contrast to the relative simplicity of the antigenic make-up of the sporozoite stage, the blood stages of plasmodia have presented us with an overwhelming number of antigens, many of them highly immunogenic. The sheer number of antigens probably increases parasite survival by diluting the immune response to critical antigens. But choosing which of the many antigens or epitopes will be successful immunogens for vaccination is still a matter of debate.

The properties of the blood-stage antigens are discussed in Chapters 3–7; although there is some overlap in material between them, most aspects are well covered. Anders and colleagues provide a valuable summary of the structure of many of the antigens that have been sequenced, the most dramatic feature of which is the presence of highly repetitive sequences (as many as ten), often constituting more than 80 per cent of the protein. Although there are no real clues yet as to what advantage these antigens confer on

the parasite, there is speculation that repetitive structures may play a role in immune evasion. The discussion of receptor-mediated erythrocyte invasion by the parasite is confusing on certain points, and perhaps the topic could have been better explained with a few clear diagrams. The contribution on immunity to the sexual stages gives a well-balanced picture of the potential advantages and problems of developing an appropriate vaccine.

From the results of recent animal and human malaria vaccine trials, it has become apparent that T-cell epitopes of antigens will also have to be included in future trials. Chapters 9 and 10 of the book give a comprehensive survey of the current literature on the role of T-cell immunity, an area that is increasingly gaining attention. The success of the malarial parasite is attributed in large part to the novel strategies it has devised to avoid immune destruction in the host. One aspect of this that receives little discussion is the question of why individuals in endemic areas are repeatedly infected with the disease in the face of a highly efficient production of anti-plasmodial antibodies.

In their preface Perlmann and Wigzell caution us that, despite the extraordinary progress in malaria research in the past decade, a vaccine is not just "around the corner". But since their book went to press, there have been breakthroughs. Manuel Patarroyo and colleagues (*Nature* 332, 158; 1988) have successfully immunized humans against *Plasmodium falciparum* by using a synthetic polymer composed of peptides of several different blood-stage antigens. Although *Malaria Immunology* demonstrates that we have a lot more to learn about the immune response to this complex and entrenched parasite, these developments certainly give us cause for optimism. □

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