MALARIA ANTIGENS—STRUCTURAL ANALYSIS OF REPEAT AND NONREPEAT REGIONS

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Structure of Malaria Antigens

The protein sequences of many antigens of the human malaria parasite *Plasmodium falciparum* have been determined by DNA sequencing recombinant clones. Antigens sequenced include those of the sporozoites, liver stages, asexual blood stages, and sexual stages. A striking feature of many of the sequences is the presence of short repeating regions of a given amino acid sequence. The function of the repeat regions in parasite antigens is not known. One possibility is that the repeats form immunodominant epitopes that prevent the developlment of a high-affinity protective antibody response. The relative proportions of different amino acids have been analyzed in the repeat and nonrepeat regions of antigens that have been completely sequenced.

Results of Analysis

There is a significant difference in the distribution of many amino acids between the repeat and nonrepeat regions. In particular, hydrophobic amino acids have a decreased frequency of occurrence in repeat regions. Also, cysteine is significantly decreased in the repeats. Correspondingly, there is an increase in amino acids that carry a negative charge in the repeat.

Conclusions

The results suggest that, repeat regions are likely to be exposed to the solvent on the outside of the protein molecules. The repeats also probably have no alpha helical or pleated sheet structure in view of the amino acid composition in the repeats. These observations are consistent with the repeating regions being immunodominant epitopes through the formation of random coils or loops on the outside surface of protein antigens.