'Protein microarrays' may reveal new weapons against malaria

November 1 2011

Dr. Alyssa Barry from the infection and immunity division is using "protein microarray" technology to screen human blood serum samples for immunity to malaria. Credit: The Walter and Eliza Hall Institute of Medical Research, Melbourne, Australia.

A new research technology is revealing how humans develop immunity to malaria, and could assist programs aimed at eradicating this parasitic disease.

Dr Alyssa Barry from the Walter and Eliza Hall Institute's Infection and Immunity division is using 'protein microarray' technology to screen human blood serum samples for immunity to proteins produced by the malaria-causing Plasmodium falciparum parasite. Her research, which determines a person's immunity to hundreds of proteins simultaneously, has been published in the journal *Molecular and Cellular Proteomics* this

month.

Malaria is a mosquito-borne disease that affects more than 500 million people each year. It causes more than one million deaths, mostly in children under five years of age.

Dr Barry is investigating how humans living in countries where malaria is prevalent, such as Papua New Guinea, establish immunity that protects them from developing malaria.

The malaria parasite has evolved many ways to evade the immune system, Dr Barry said. "We know that one protein, called PfEMP1, that is particularly important for the host immune response can be produced in many different varieties, and these can be altered by the parasite to avoid detection by the immune system."

Dr Barry and colleagues at the Queensland Institute of Medical Research, the Papua New Guinea Institute of Medical Research and the University of California Irvine adapted existing protein microarray technology to allow small samples of human serum (less than one hundredth of a millilitre) to be tested simultaneously against hundreds of variants of PfEMP1 to determine to which variants the person was immune.

Dr Barry said the testing revealed that in a small region of Papua New Guinea where malaria is endemic, children under the age of two are immune to only a few specific variants of PfEMP1 while older children and adults show immunity to an increasing range of PfEMP1 variants.

"Young children are the most vulnerable to malaria," she said. "Our studies show that this is partly because they have not developed immunity to the many different malaria variants to which they are exposed. As people get older, they become immune to a wider spectrum

of malaria parasites, and so when they are infected they develop milder disease and eventually do not develop disease at all, although they can still be infected."

The research team is now undertaking a larger study that will screen more people from other regions of Papua New Guinea, and will screen a wider variety of Plasmodium protein variants.

Dr Barry said she hoped the research would lead to the development of a diagnostic test for susceptibility to malaria, and also determine which proteins might be the best to use as the basis for a malaria vaccine. "We currently do not know how people become immune to malaria," she said. "Our protein microarray technology could assist in monitoring malaria control and elimination programs, by showing when a population becomes more susceptible to the disease as a result of waning immunity."

Provided by Walter and Eliza Hall Institute