NUS staff bid to crack malaria mystery

Source : The Straits Times, Science & Tech Section (14 August 2003)
By : Chang Ai-Lien (SCIENCE CORRESPONDENT)

Scientists use laser 'tweezers' to stretch red blood cells; innovative effort draws support from MIT.

RESEARCHERS at the National University of Singapore (NUS) are using an innovative technique to help them combat one of the world's top killers - malaria.

They are studying how the parasite that causes the disease stiffens red blood cells, which are normally so flexible and elastic that they can bend, stretch and fold their way within blood vessels less than half their diameter.

As the parasite invades the cell and reproduces, it causes extensive physical changes - making the cell rigid and sticky - which have not been well studied.

To find out how malaria does this, the scientists are using laser 'tweezers' to stretch red blood cells.

By attaching tiny silica beads - so small that 25 can sit on the circumference of a strand of human hair - to each side of the cell, then zapping the beads with laser beams to make them move, the scientists tested the elasticity of normal cells.

By comparison, infected cells were up to 10 times stiffer.

'Now that we know how much the red blood cells suffer due to the infection, we can work on ways to interfere with these changes and perhaps reduce the parasite's virulence,' said Dr Lim Chwee Teck of NUS' bio-engineering division, who worked with Dr Kevin Tan of the microbiology department on the project.

'We also want to look at the proteins embedded in the cell membrane by the invaders as they refurbish their new home,' he added, explaining that the next step would be to look at drugs that could stop the offending proteins from working.

The work has so impressed scientists at the Massachusetts Institute of Technology (MIT) that they have joined the research effort.

MIT's department of materials science and engineering is now doing computer simulations of the stretching of the red blood cells, molecule by molecule.

This will display in more detail how the cell membrane is modified by the disease, and help to identify the harmful proteins at work.

Malaria hits an estimated 500 million people a year, killing 2.7 million, mostly children.

It is caused by the parasite plasmodium, which is transmitted from person to person through the female Anopheles mosquito's bite.

It usually causes fever, headache, vomiting and other flu-like symptoms.

If drugs are not available for treatment, or the parasites are resistant to them, the infection can kill by destroying red blood cells, and by clogging the capillaries that carry blood to the brain or other vital organs.

Malaria parasites are developing resistance to drugs, and insecticides are often no longer useful against the mosquitoes that transmit the disease.

Since the human genome was sequenced in 2000, gene sequencing has been completed on the malaria parasite and its mosquito carrier, and scientists have doubled their efforts to develop a vaccine.

But the World Health Organisation says there is no magic bullet, and an effective vaccine is years away at best.

So, researchers are looking to battle the disease on other fronts, by, say, producing insects with man-made genes that cannot spread malaria, or by rendering useless the proteins used by the parasite to invade red blood cells.

DEATHS

EVERY year, 2.7 million people, mostly children, die from the disease. It is caused by the parasite plasmodium, transmitted to people via by the female Anopheles mosquito's bite. Symptoms include fever, headache and vomiting.