Pals use nanotech to study malaria

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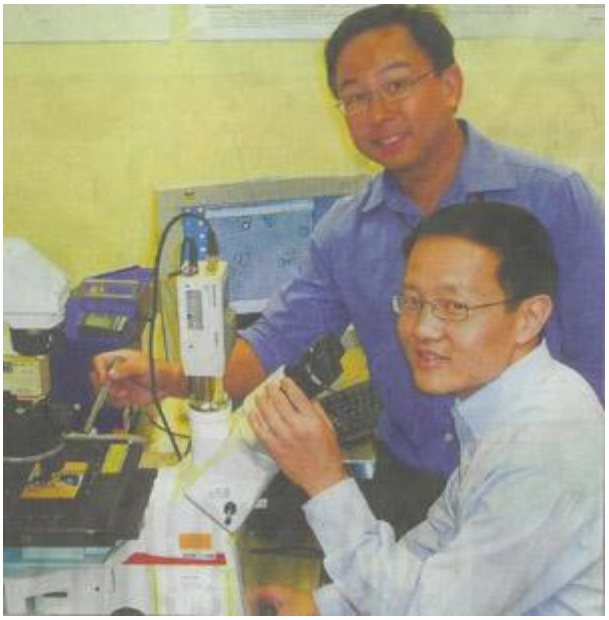
By Tania Tan

Scientific fusion of nanotechnology and cell biology making big waves in medical world.



SUCCESSFUL TEAM-UP: Dr Kevin Tan (standing), a microbiologist, and Dr Lim Chwee Teck, a mechanical engineer, used laser "tweezers" to determine the rigidity of malaria-infected cells.

Long-time friends, microbiologist Kevin Tan and mechanical engineer Lim Chwee Teck, decided three years ago over a coffee break to combine their disciplines to study Dr Tan's pet research topic, malaria.

Their multidisciplinary approach has already led to new insights into malaria-infected red blood cells. And that could help determine how effective anti-malaria drugs are in the future.

Such fusion of nanotechnology and cell biology, termed nanobiomechanics, is making big waves in the medical world. A journal published by the Massachusetts Institute of Technology has listed nanobiomechanics in its annual list of top 10 technologies to watch.

The latest issue of Technology Review said it is making "increasing contributions" to the understanding and treatment of diseases and would have a "significant impact" on medicine.

While nanotechnology is not new, its application in the study of diseases like malaria, is.

It allows for more accurate measurements in and around the cell. This precision helps researchers get a better picture of cell mechanisms.

Caused by the parasite Plasmodium falciparum, malaria causes oxygen carrying red blood cells to become stiff and sticky, making dangerous clots in fine blood vessels in the heart or brain more likely to occur. Malaria kills about 1.3 million people annually.

In an attempt to better understand the disease, Dr Lim and Dr Tan measured how stiff infected red blood cells become using laser “tweezers” to grab and stretch the cells.

A beam of infrared light is focused on beads which had previously been stuck to the red blood cells. Using a joystick, Dr Lim then moves the beam and stretches the cell. “Like playing a computer game,” said Dr Lim.

But like all research, the process is tedious.

“The beads stick randomly, so it can be difficult to find that one cell out of millions with beads on opposite ends. You just have to be patient,” explained Dr Lim.

Using 3D simulations created by collaborators in MIT, the team can translate their observations into degrees of stiffness.

The joint effort resulted in the discovery that infected cells become 10 times stiffer than healthy ones – three to four times more rigid than previously estimated.

Information like that may help determine how effective anti-malarial drugs are in the future.

“It helps us to compare treatments – like one that reduces rigidity up to seven times versus three times for another drug,” explained Dr Tan, 36.

Dr Lim, 40, hopes to further his research in the study of cancer cells.

“We will be discussing future plans over our coffee breaks,” said Dr Tan.