MONASH University

Media Release

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Monash research breakthrough to treat malaria

A team of Monash University researchers led by Professor James Whisstock has made a major breakthrough in the international fight against malaria, which claims the life of a child across the world every 30 seconds.

The research, performed in collaboration with Professor John Dalton at the University of Technology, Sydney, provides a new approach to treating and controlling the disease that is contracted by half a billion people and causes around 1 million deaths a year.

The team, based at the Monash University ARC Centre of Excellence in Structural and Functional Microbial Genomics, has been able to deactivate the final stage of the malaria parasite's digestive machinery, effectively starving the parasite of nutrients and disabling its survival mechanism. This process of starvation leads to the death of the parasite.

Professor Whisstock said the results had laid the scientific groundwork to further develop a specific class of drugs to treat the disease.

"About forty percent of the world's population are at risk of contracting malaria. It is only early days but this discovery could one day provide treatment for some of those 2.5 billion people across the globe," Professor Whisstock said.

"Drug-resistant malaria is an ever increasing problem, meaning that there is an urgent requirement to develop new therapeutic strategies."

Researchers used the Australian Synchrotron, located adjacent to Monash University's Clayton campus. The results are published today in the prestigious *Proceedings of the National Academy of Sciences U.S.A*.

Lead author of the research paper, Dr Sheena McGowan, from the Monash University NHMRC program on protease systems biology said their findings prove their concept.

"We had an idea as to how malaria could be starved and we have shown this, chemically, can be done," Dr McGowan said.

"A single bite from an infected mosquito can transfer the malaria parasite into a human's blood stream. The malaria parasite must then break down blood proteins in order to obtain nutrients. Malaria carries out the first stages of digestion inside a specialised compartment called the digestive vacuole – this can be considered to be like a stomach. However, the enzyme we have studied (known as PfA-M1), which is essential for parasite viability, is located outside the digestive vacuole meaning that it is easier to target from a drug perspective."

This breakthrough is in addition to existing malaria drug discovery research advances at Monash University. A new drug candidate which aims to provide a single dose cure, discovered by a major international project involving the Monash Institute of Pharmaceutical Sciences, is currently progressing to first human studies with support from the Medicines for Malaria Venture, Geneva, Switzerland.

Dr Sheena Mc Gowan can be contacted for interview on: + 61 419 399 454
Professor James Whisstock can contact for interview on: +61 418 170 585
For a copy of the research paper contact Samantha Blair, +61 3 9903 4841 or 0439 013 951.

Malaria research fast facts

The disease
Malaria is caused by a parasite called Plasmodium, which is transmitted via the bites of infected mosquitoes. In the human body, the parasites multiply in the liver and then infect red blood cells. Symptoms of malaria include fever, headache and vomiting, and usually appear between 10 and 15 days after the mosquito bite. If not treated, malaria can quickly become life-threatening by disrupting the blood supply to vital organs. In many parts of the world the parasites have developed resistance to a number of malaria medicines.
Key interventions to control malaria include: prompt and effective treatment with artemisinin-based combination therapies; use of insecticidal nets by people at risk; and indoor residual spraying with insecticide to control the vector mosquitoes.*

The human toll
About 40 per cent of the world's population, mostly those living in the poorest countries, are at risk of malaria. Of these 2.5 billion people at risk, more than 500 million become severely ill with malaria every year and up to 2 million can die from the effects of the disease.
The disease is a critical problem in Asia and South America but is especially a serious problem in Africa, where one in every five (20 per cent) of childhood deaths are due to the effects of the disease. An African child has on average between 1.6 and 5.4 episodes of malaria fever each year. Every 30 seconds a child dies from malaria.*

Professor James Whisstock – biography
Professor Whisstock is recognised as a world-leading expert on protease biology. He is an ARC Federation Fellow, Chief Investigator in the ARC Centre of Excellence in Structural and Functional Microbial Genomics and leader of the NHMRC Program grant on protease systems biology. Professor Whisstock's research includes understanding how proteases and pore forming toxins modulate immunity and pathogenesis.

Dr Sheena McGowan – biography
Dr McGowan joined Professor Whisstock's laboratories in 2004. Over the last two years, her primary research focus has been in the areas of malaria and protease biology. She has won numerous international young scientist awards and currently holds NHMRC funding to further develop novel anti-malarials.

* Source: World Health Organisation, 2009