
Malaria Treatment Is Not Just a Cosmetic Fix

The future weapon against malaria may be a common ingredient found in shampoo. Fenja Theden reports.

Malaria was declared eradicated from Australia in 1981. The last major Australian outbreak of the disease occurred at the end of World War II. Despite being “malaria-free”, some 800–1000 cases occur in Australia each year, mainly from travellers who contract the disease overseas. But the prognosis is worse: the malaria parasite is becoming more resistant to conventional drug treatment, and global warming could mean a return of the disease to the northern regions of Australia in epic proportions.

With this dark forewarning, Australian scientists are at the frontlines of research into the disease. Dr

Together with climate change, another dangerous trend is emerging around the globe, making the fight against malaria more difficult every year. The malaria parasite is becoming increasingly resistant to conventional antimalarial drugs, such as chloroquine. There is some fear that even the few drugs to which the parasite has not shown resistance are expected to lose their effectiveness soon because of overuse and indiscriminate treatment.

Resistance to conventional drugs means that malaria treatment is often only possible with more expensive drugs, which may have dangerous side-effects. Due to the high cost of alter-

natural vitamin B5, but can be converted into vitamin B5 by mammalian cells. Importantly, vitamin B5 is one of the few vitamins the malaria parasite needs to take up from its host, but the parasite can be fatally tricked into taking up pantothenol instead.

“If we give pantothenol to the parasite, it takes it up instead of vitamin B5,” Dr Saliba explains. “Unlike mammalian cells, the parasite is unable to convert pantothenol into vitamin B5, and basically starves itself of vitamin B5. Without vitamin B5, the parasite dies.”

The malaria parasite’s life cycle is complex, going from mosquito to human host and back to the mosquito. Dr Saliba’s team looks at one particular stage of the parasite’s life cycle, the stage where the parasite emerges from its hiding phase in the human liver and invades human red blood cells to replicate itself.

Inside the red blood cell, the parasite is sheltered from the body’s immune

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Kevin Saliba of the Australian National University (ANU) is involved in research of the malaria parasite and the development of new drugs to combat the disease.

Malaria still kills 1–2 million people each year, most of them young children in Africa. Dr Saliba feels that “Australia obviously has a responsibility to try to help other countries that cannot afford to fight the disease themselves”.

Dr Saliba sees his research as not only relevant to those countries currently most affected by malaria, but also crucial to the future of Australia. He says that Australian tourists and military personnel going to malaria-infected areas need to take precautions against malaria, and would need to be treated efficiently if infected by the parasite.

native treatment, access to these drugs is often not an option in those countries most affected by malaria.

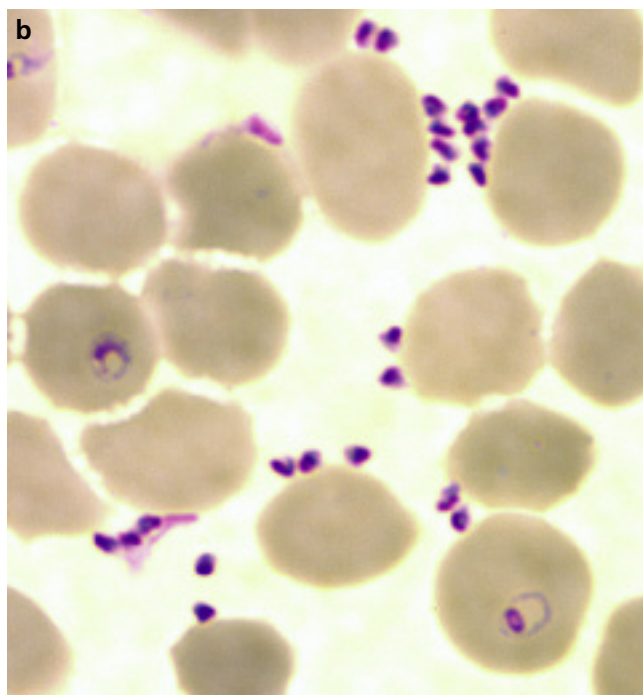
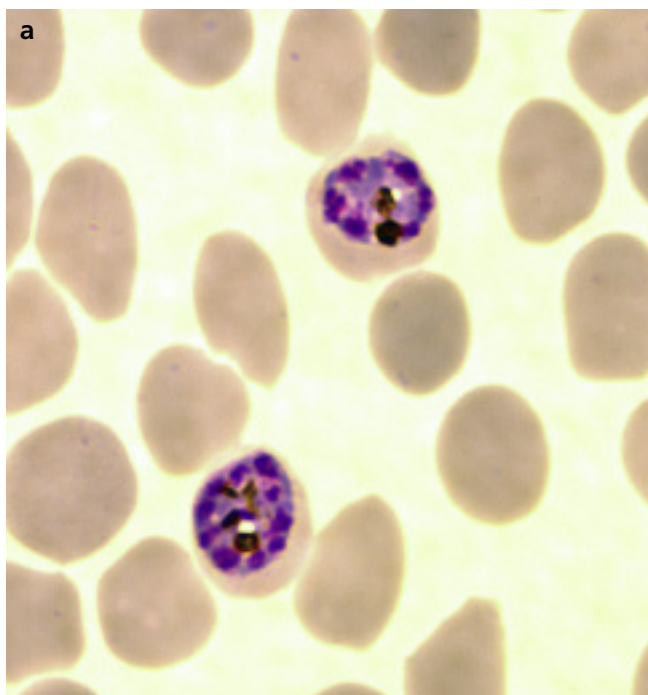
Alongside researchers throughout Australia and the world, Dr Saliba is hunting for new ways to combat malaria. His research team, in collaboration with Prof Kieran Kirk at ANU, is working to come up with alternative drugs against the parasite.

Dr Saliba’s research looks promising. A common ingredient in cosmetics and shampoo may be guiding the way to a revolutionary treatment. Provitamin B5, or pantothenol, is often added to shampoos to retain moisture and to make the hair shiny. Pantothenol is also a common ingredient in vitamin preparations because it is more stable than

system because the body sees only its own cells. During this phase, people start getting sick from released toxins, and occasionally die from the infection.

Dr Saliba’s research focuses on the parasite’s uptake of nutrients during this stage in the red blood cells. One of these nutrients is vitamin B5, which is essential for the survival of the parasite. The parasite can’t synthesise its own vitamin B5, so it relies on its host’s blood plasma to obtain the nutrient. Initial testing in mice showed that pantothenol reduced the number of malaria parasites by 80–90%.

Despite these initial results, pantothenol is far from being a wonder drug. Unfortunately, pantothenol is quickly converted to vitamin B5 by the



Giemsa-stained malaria parasites (blue/purple) among human red blood cells. (a) Two mature-stage parasites (known as trophozoites) inside red blood cells. (b) Daughter parasites (known as merozoites) ready to invade new uninfected red blood cells. Three red blood cells have already been invaded by merozoites, forming a young stage of the parasite known as a “ring”.

human body. The trials indicate that pantothenol lasts long enough in the body to be taken up by the parasite, but not long enough for all parasites to be killed. Thus, says Dr Saliba, if an infected person was given a dose of pantothenol, they would “convert most of it into vitamin B5 by the time it’s actually had the chance to kill all the parasites”.

But with a weakness in the parasite’s life cycle clearly identified, Dr Saliba is developing his antimalarial drugs further. The research team has discovered that other analogues of pantothenol, compounds similar to the real vitamin B5, could be even better drugs. Nearly 50 compounds have been tested so far, with about 15 of them able to kill the parasite.

However, Dr Saliba says there are other constraints: “You obviously want to find compounds that are able to kill the parasite at low concentrations, so that they won’t be toxic to the human host. The concentration with which a couple of our new compounds are able to kill the parasite is encouraging.”

But most drugs developed in the world face the same challenge: harmful organisms adapt and evolve to become resistant to drugs. This has happened to conventional anti-malarial drugs. If these new antimalarial compounds were to be used on a large scale, will the malaria parasite eventually develop resistance towards the damage caused by destructive vitamin B5 analogues?

Dr Saliba points out that it is very hard to predict whether resistance to the analogues would develop. However, he is

hopeful that the parasite would find it difficult to develop resistance because it “has to obtain this nutrient from the plasma in order to grow. For resistance to develop, the parasite would need to synthesise vitamin B5 itself in high quantities, and we currently have no evidence that it’s able to do so. Alternatively, it needs to come up with a strategy for limiting the uptake of the analogues. This will be difficult as the mechanism would need to discriminate between vitamin B5 and the structurally very similar analogues.

“Also, a recent trend has been to combine new compounds shown to kill the parasite with other compounds that kill the parasite in a completely different way. You essentially hit two independent targets. This makes it even more difficult for the parasite to become resistant to the drug combination as it would need to develop two separate resistance mechanisms simultaneously, or one mechanism that can deal with both drugs.”

Dr Saliba hopes the new drugs will be used either to treat people that have already contracted malaria or to prevent a malaria episode by being taken during travel to malaria-endemic areas.

In research facilities around Australia and the world, the race to save millions of lives from malaria continues every day. Dr Saliba envisages a world in which people can live and travel without fear of contracting the disease.

Fenja Theden has a background in molecular biology. She is currently undertaking a Graduate Diploma in Science Communication with the Centre for Public Awareness of Science at the ANU.