TACKLING MALARIA WITH BIOPESTICIDES

Background

Human malaria is caused by a small number of species of unicellular *Plasmodium* parasites, all of which are transmitted by *Anopheles* mosquitoes. The most common practice for controlling transmission of malaria is the use of pyrethroid insecticides sprayed on surfaces in the sleeping area of homes. While this is currently an effective intervention, there are concerns about the impact of the insecticide on the environment and human health. The usefulness of insecticide in the future is also likely to be limited by the evolution in the vector of resistance to the chemicals.

A recent breakthrough in pest control is the use of biopesticides – natural pathogens used against endemic parasites. The practice of using one life form against another offers great promise in the control of pests over sustained periods of time. For example, fungal biopesticides for locust control have already been approved in some countries. Professor Andrew Read (University of Edinburgh, now Penn State University, USA) and Dr Matt Thomas (Commonwealth Scientific and Industrial Research Organisation, Australia; now Penn State University) are at the forefront of developing, characterising and modelling this approach to use against malaria.

Advance

Professor Read and Dr Thomas have shown, in laboratory tests on a rodent malaria model, that the entomopathogenic fungus *Beauveria bassiana* can be used as a biopesticide against infectious mosquitoes. The relatively slow time a fungal infection takes to kill mosquitoes may be of advantage to the long-term sustainability of this method of malaria control. This is because it causes the fungus to be a significant threat to the transmission of the malaria parasite without representing a severe selection pressure on the mosquito population itself. The mosquitoes most vulnerable to the fungus are those already carrying malaria, which reduces the selection pressure on the general mosquito population by the biopesticide.

The team is currently working on an understanding of the biology, population biology and evolution, which will be essential for the correct use of such biopesticides. They therefore aim to avoid the problems seen in previous approaches to pest control, where highly efficient technologies have been devalued by the evolution of the parasite or its vector.

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A fungus-killed mosquito.

How it's making a difference

Biopesticides have the potential to be a cost-effective technology for the control of malaria. By spraying suspensions of spores on walls or mosquito nets, mosquitoes are likely to rest on the residue and be exposed to the fungus. Furthermore, the basic elements for the use of fungal biopesticides are now in place. These include proof of concept, production systems on an industrial scale, application technologies and strategies, ecotoxicology and safety testing. Thus fungal biopesticides could be making a real difference to rates of malaria infection in humans within a few years.

This approach to malaria control has received significant media interest from, for example, ABC, CNN, BBC, Channel 4, *The Times*, *The New York Times* and *New Scientist*.

References

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