

Parasite bacteria may help fight spread of mosquito-borne diseases

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This picture shows an adult female *Ae. aegypti* mosquito biting. Researchers have shown that infecting the *Aedes aegypti* mosquito with the wMelPop strain of Wolbachia parasite inhibits transmission of the filarial nematode. Credit: Wellcome Images

Infecting mosquitoes with a bacterial parasite could help prevent the spread of lymphatic filariasis, one of the major neglected tropical diseases of the developing world, according to research published today in the journal *Science*.

Lymphatic filariasis affects more than 120 million people worldwide - over 40 million of these are seriously incapacitated and disfigured by the disease. It is caused by infection with the parasitic filarial nematode, a threadlike worm that is spread by [mosquitoes](#) and occupies the [lymphatic system](#). In chronic cases, infection leads to a condition known

as elephantiasis, which can cause severe swelling in the legs, male scrotum and female breasts.

Previous research has shown that infecting a mosquito with a strain of the bacterial parasite *Wolbachia* known as wMelPop - nicknamed 'popcorn' - can halve its lifespan. Mosquito-borne parasites such as the filarial nematode or the [malaria parasite](#) require an [incubation period](#) between ingestion and transmission, so only older mosquitoes can be infective. Skewing the mosquito population towards younger individuals reduces the number of infectious insects.

Now, researchers funded primarily by the Wellcome Trust have shown that as well as reducing the mosquito's lifespan, wMelPop directly inhibits transmission of the filarial nematode by encouraging the mosquito's [immune system](#) to attack the worm. They found that significantly reduced numbers of filarial nematodes developed in mosquitoes infected with wMelPop - in some cases, less than 15% of the number in mosquitoes which were not carrying wMelPop.

"*Wolbachia* infection appears to significantly increase the activity of around two hundred mosquito genes, many of which are involved in the immune response," says Dr Steven Sinkins, a Wellcome Trust Senior Research Fellow at the University of Oxford. "This then primes the mosquito's immune system to fight infection by the filarial nematodes, preventing the worm from developing to a stage where transmission to humans is possible."

Wolbachia infections - including wMelPop - have also been shown to protect against certain viruses. Today's research suggests that this effect could also be a result of the boost to the mosquito's immune system.

Dr Sinkins and colleagues are currently looking at whether infecting other species of mosquito, such as *Anopheles gambiae* - the mosquito

responsible for the majority of malaria infections - with wMelPop will have a similar effect and help inhibit malaria transmission as well as filariasis transmission. Another potential target is the *Aedes polynesiensis* mosquito, which spreads lymphatic filariasis in the islands of Polynesia, where decades of mass drug administration have failed to eradicate the filarial parasites from the human population.

"The *Wolbachia* 'popcorn' strain is a naturally-occurring organism found in a particular species of fruit fly which, if successfully introduced into mosquito populations, could potentially help us fight a number of the world's most serious diseases," says Dr Sinkins.

Wolbachia have been shown in previous studies to be capable of spreading rapidly through insect populations. When a male carrying *Wolbachia* mates with a female that does not, the resulting eggs fail to develop. However, a female that is infected with *Wolbachia* can breed successfully with any male, and thus produces more offspring on average than *Wolbachia*-uninfected females.

Source: Wellcome Trust ([news](#) : [web](#))

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