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Edinburgh Study Finds Fungus is Effective Agent in Fight Against Malaria

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Scientists have discovered an unlikely ally in the fight against malaria. Infecting mosquitoes with fungi can drastically reduce transmission of the disease, surprising new research from the University of Edinburgh and Imperial College London, reveals.

A study in *Science* journal suggests that infecting mosquitoes with fungi while they digest human blood could help to significantly curb the disease that claims at least a million lives each year.

Insecticides like DDT have been used for decades to kill the mosquitoes that transmit malaria, but many mosquitoes have become resistant to chemical pesticides. By contrast, this radical new approach uses a fungus as a biological pesticide. Inert fungal spores are impregnated on cloth or netting, or sprayed on house walls or ceilings. When a mosquito touches the spores, the fungus germinates, penetrating the mosquito and growing within it. The mosquito succumbs to the fungus before it has begun to transmit malaria.



Fungus fed mosquito

The Edinburgh and Imperial scientists discovered that fungal infection reduced malaria transmission in the laboratory by 98 per cent. Mostly, the mosquitoes died before they became infectious. But the fungus also reduced transmission by interrupting mosquito feeding and may also have directly interfered with the malaria parasites in the mosquito. "It seems likely that fungal-infected mosquitoes will also fly less well, and produce fewer eggs," said Dr Simon Blanford, of the University of Edinburgh's School of Biological Sciences, who carried out the laboratory work.

"There is no evidence that insects can develop resistance to fungi," said Dr Matt Thomas of Imperial College, one of the leaders of the work. However, even if mosquitoes were to become resistant, it is extremely unlikely that they would also be resistant to chemical pesticides. It should be possible to use the chemical and biological pesticides together or in rotation to prolong their usefulness, said Dr Thomas.

The method would be practical in Africa, according to a companion paper in *Science* by scientists from a research consortium involving the Ifakara Health Research and Development Centre in Tanzania, the Swiss Tropical Institute in Basel and Wageningen University in The Netherlands. They hung fungus-impregnated black sheets inside African houses near Ifakara, in central Tanzania, and found that mosquitoes resting on these sheets after taking a blood meal became infected and died. In houses in this area, people are bitten almost once a night by a malaria-carrying mosquito. Mathematical calculations showed that the use of fungal-impregnated sheets could reduce this to once every three weeks.

"The results are extremely encouraging," said Ernst-Jan Scholte, who led the fieldwork. "The fungi provide another tool for use in the fight against malaria". His Tanzanian counterpart, Kija Ng'habi, emphasised the desire to push this research line further: "This technology needs to be developed to be manageable and affordable. We need to evaluate this on a larger scale in communities that have little resources."

This is the first biological control agent for adult malaria mosquitoes and it could contribute to real health benefits if incorporated into integrated malaria programmes, said Dr Gerry Killeen, of the Ifakara Health Research and Development Centre and the Swiss Tropical Institute "If this fungus can kill mosquitoes and prevent malaria, then it merits serious investigation. We need alternatives to chemical insecticides, especially DDT." The trial results were warmly received by the community in which it took place. "Everybody in the village would like to have this dawa (medicine) tomorrow so there's clearly a demand from the end user that we can't yet fulfill,"

said Dr Killeen.

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