Insecticide-treated bed nets critical to global elimination of filariasis

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An international team of scientists have demonstrated that a simple, low-cost intervention holds the potential to eradicate a debilitating tropical disease that threatens nearly 1.4 billion people in more than six dozen countries.

The researchers, including Case Western Reserve University School of Medicine professor James Kazura, MD, found that insecticide-treated bed nets reduce transmission of lymphatic filariasis to undetectable levels – even in the absence of additional medication. Their study appears in the August 22 issue of *The New England Journal of Medicine*.

The World Health Organization reports that more than 120 million people suffer from lymphatic filariasis, commonly known as elephantiasis. About a third of that number are disfigured or disabled by the disease, a parasitic-worm infection spread by mosquitoes.

"Our study quantifies the effect of the most widely implemented vector control measure – insecticide-treated bed nets – and highlights the importance of integrating this type of intervention as a part of the global strategy to eliminate lymphatic filariasis," said Kazura, the paper's senior author and director of the medical school's Center for Global Health and Diseases. "With a little bit of effort and not much money, we don't have to live with this painful, disfiguring disease."

This study follows research that Kazura published in in 2002 *The New England Journal of Medicine*. In that work, he and his colleagues

evaluated the safety and efficacy of administered annual antifilarial drugs over five years to residents of five villages in Papua New Guinea. The team demonstrated that the mass drug strategy nearly eliminated the parasite from humans but did not stop its transmission by mosquitoes.

The success of a strategy utilizing medication requires at least 80 percent of the population to receive treatment annually for at least five years. The initial results of mass treatment showed promising results, but transmission still took place in subsequent years, albeit at lower rates. Testing showed that parasite levels remained high in mosquitoes around the villages as much as decade later.

Ten years after villagers took their last medication round, they received free bed nets as part of Papua New Guinea's national malaria control effort. In the 36 months that followed, Kazura and team saw a dramatic decrease in the number of infected mosquito bites per person. In fact, rates fell annually from as many as 325 to zero. Kazura and his colleagues ultimately concluded that transmission has stopped completely; they could find no mosquitoes harboring parasites capable of transmitting the disease.

Insecticide-treated bed nets already are used widely in areas where lymphatic filariasis and malaria are present. They block female mosquitoes from securing blood, a process that is essential for them to lay eggs and produce offspring. The insecticide reduces the life-span of the insect by half, preventing it from living long enough for the parasite to become capable of transmission.

The researchers also discovered that the bed nets caused the insects to alter their biting behavior. Specifically, they did not seek to eat when the parasite reached its peak level in the human bloodstream – between midnight and 2:00 a.m. When the mosquitoes bite earlier in the day, they ingest fewer parasites, and thus, further compromise transmission of the

infection to another human.

"We should not rely solely on mass drug administration to eliminate lymphatic filariasis. By combining the existing strategy with vector control, we are more likely to reach elimination thresholds," said Lisa J. Reimer, PhD, first author on the paper and a lecturer at the Liverpool School of Tropical Medicine. "Our findings clearly demonstrate this low-cost solution could complement the successes of the current elimination program while having a high pay-off for both filariasis and malaria control."

Kazura and his colleagues in Papua New Guinea plan to study progress in eliminating the disease over the next several years. The group also will test new drug combinations for mass treatment in nearby populations and evaluate the effects of broader bed net distribution in the country.

Kazura and Reimer collaborated with researchers from Papua New Guinea Institute of Medical Research, Papua New Guinea Department of Health, Liverpool School of Tropical Medicine, University of Queensland, University of Notre Dame and Case Western Reserve University School of Medicine.

Provided by Case Western Reserve University