BOUNTY OF INFO FOR THE MOSQUITO HUNTER

Physically hunting mosquitoes to learn more about their breeding habits is integral to understanding how to control and eliminate malaria and other vector-borne diseases.

Researcher: Dr Megan Riddin, medical entomologist and lecturer, School of Health Systems and Public Health

How do you kill the deadliest creatures in the world? You live among them. A medical entomologist from the University of Pretoria Institute for Sustainable Malaria Control (UP ISMC) has based her malaria research on the principle of "know thy enemy".

Dr Megan Riddin physically enters malaria-endemic areas to hunt mosquitoes in their home territory. Here she searches for favoured sites where mosquitoes lay their eggs, collects adult and immature mosquitoes using various traps and lures, then identifies the various species and determines their vector potential or capacity.

"Vector surveillance often follows standard mosquito collection techniques or methods, but this might not always provide the answers we need," she explains. "There are many different entomological indicators to consider, and you really need to get innovative and creative in your approaches."

A scarce skill

Medical entomology is focused on arthropods and insects that affect human health. This includes scientific research on their behaviour, ecology and epidemiology (the incidence, distribution and possible control of diseases). Despite the critical need to understand disease vectors (organisms that transmit an infectious agent or pathogen) from one host to another, medical entomology remains a scarce, globally sought-after skill.

"I became a medical entomologist because I was fascinated by how intricate insects are, and in particular, the vast effect that such small creatures can have on public and animal health," Dr Riddin says. "My interest in mosquitoes and malaria started because of the impact the disease has on the global population, which results in thousands of deaths annually, particularly among children below the age of five. Mosquitoes are very efficient and rapidly evolving, and my research is focused on gaining a greater understanding of them in order to find new solutions to end the devastating effects of malaria."

Simultaneously, elements such as human and animal movement, climate and parasite prevalence impact on vector abundance (and malaria prevalence). "We often enlist the assistance of citizen scientists, local community members who are trained to help gather relevant data," Dr Riddin adds.

Why vector surveillance?

While major progress has been made towards eliminating malaria over the past two decades, other challenges hamper global efforts. These include insecticide and drug resistance, climate change, lack of data, lack of resources and changes in vector behaviour.

Vector control is an exceedingly effective way to decrease malaria transmission and is a vital component of malaria control and elimination strategies. The mainstay of vector control is the use of insecticide-treated bed nets and indoor residual spraying, although mosquitoes can become resistant to the insecticides.

New and innovative strategies and interventions are needed to supplement existing strategies. Adequate vector surveillance will help inform such interventions.

Beyond mosquitoes

As head of the UP ISMC's Vector Control Cluster, Dr Riddin and her fellow researchers address other malaria challenges. These include ascertaining what lures or deters mosquitoes from biting humans through semiochemistry (chemicals used to attract insects to a trap). They also monitor mosquito biting behaviour altered as a result of control methods, test for insecticide resistance, and develop innovative and safer tools and strategies to control vectors.

"Working with mosquitoes enables me to broaden my research focus beyond malaria," Dr Riddin says. "My expertise allows me to address all types of vector-borne diseases, and I am able to work with researchers looking at the bigger picture of One Health (a collaborative approach that recognises that the health of humans, domestic and wild animals, plants, and the wider environment are interdependent). At the same time I am helping to train a new generation of medical entomologists to address the global medical entomologist deficit."

Malaria cases reported in 2021

- Africa: **235 Million (95%)**
- Rest of the world: **247 Million**

Malaria deaths reported in 2021

- Africa: **619 000 (96%)**
- Rest of the world: **594 000**

How is this research transdisciplinary?

To assess how elements such as human and animal movement, climate and parasite prevalence affect malaria prevalence, this research relies on the expertise of various researchers. The ideas of experts from fields including biochemistry, public health, chemical engineering, chemistry, zoology, plant and soil sciences, geography and early childhood education provide answers to crucial research questions which can translate into new control innovations.