FOOD FOR THOUGHT

CAN YOU EAT YOURSELF OFF THE MOZZIE MENU?

Plants can change their chemical constitution to protect themselves from plant-eating insects. Would the same be true for humans – can we avoid contracting malaria by eating foods with certain characteristic compounds that are unappealing to mosquitoes?

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Humans must eat. So do mosquitoes.

This begs the question: is it possible to find a solution for the personal prevention of mosquito-borne malaria in the food we like to eat but which mosquitoes "don't like" to eat?

A culinary collaboration between Dr Taneshka Kruger of the University of Pretoria Institute for Sustainable Malaria Control (UP ISMC) and Dr Hennie Fisher of the Department of Consumer and Food Sciences to illustrate how food can be used to educate people about malaria and malaria-carrying mosquitoes has led to an innovative research idea waiting to be explored.

Semiochemistry ("semio" is derived from the Greek word "signal") refers to the study of chemical compounds released by an organism that can cause changes in behaviour. The UP ISMC is engaged in transdisciplinary research involving semiochemistry. This exploratory collaboration concept will add to those endeavours, and may have the potential to put personal malaria control under the microscope.

Despite being both preventable and treatable, malaria is estimated to kill more than half-a-million people annually. Prevention remains the best cure. The female Anopheles mosquito, which carries the parasite, infects people once they have been bitten. In the absence of insect repellents, bed nets, protective clothing, door screens and prophylactics, one simple method to protect people from being bitten is through awareness creation or education. This culinary communication collaboration cognisance can be broken down as follows:

The entrée: Mosquitoes locate hosts through a stepwise process: first, they become aware of the host through cues like carbon dioxide and visual signals, then they detect near-host signals like heat and moisture, and finally, they rely on skin odours to decide where to land and bite. This sophisticated process involves their olfactory system and specific receptors on antennae and appendages binding to odour molecules, initiating a neural signal for navigation.

The main course: This is where the exploratory research idea gets meaty. Certain plants are able to adapt compounds in their molecular structure to turn themselves into an unappetising food source. When threatened, they can protect themselves from being eaten by plant-eating insects. These chemicals can be grouped into repellents, feeding deterrents, toxins and growth regulators. In a much more complex way, humans have similar adaptive abilities. This means that people may have a similar ability to prevent malaria by eating foods with certain characteristic compounds that are unappealing to mosquitoes.

All we need to do is figure out "the how", and tap into that ability – this is where the challenge lies.

A taste of things to come: The human skin microbiome produces scents that attract mosquitoes. These scents are volatile organic compounds that contribute to our unique body odour. Genetics, hormones, diet, hygiene, microbes, health, stress, age and environmental influences affect these odours.

"By altering the skin microbiome to produce less appealing, or repelling, odours, we may be able to deter mosquitoes from biting and consequently prevent malaria," Dr Kruger says. "But much more in-depth research is required."

Malaria's impact is especially prevalent in endemic regions where severe illnesses and deaths are common among children, pregnant women and other vulnerable people. Non-fatal cases often result in lasting health problems such as anaemia, cognitive impairment and chronic organ damage. These issues perpetuate the cycle of poor health and poor performance.

Dr Fisher summarises the dire outcome: "Malaria hinders education, disrupts productivity, causes loss of income and strains scarce healthcare facilities – all of which prevents economic prosperity."

Why this research matters

It is estimated that well over a half-a-million people die from malaria annually. Researchers at the University of Pretoria are probing innovative, transdisciplinary collaborative ideas involving semiochemistry and nutrition to explore the feasibility of making personal malaria control accessible and sustainable in rural communities.

Good health and well-being

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This is the impetus behind UP's exploratory focus on semiochemistry in collaboration with related and complementary sciences. Advances in this research supported by a holistic, community-centred approach that addresses general health, nutrition and socio-economic factors will inevitably lead to equitable, sustainable development and better malaria control.

The outcomes of this advanced research will be critical because, as the saying goes, the proof lies in the pudding.

Image Credit: Eyescape