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Major study links malaria mosquitoes to Amazon deforestation

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(PhysOrg.com) -- In one of the most field-intensive efforts to explore the connection between malaria and tropical deforestation, a team led by Jonathan Patz, a specialist in the link between environment and health at the Nelson Institute for Environmental Studies at the University of Wisconsin-Madison, has established a strong correlation between the extent of forest destruction and the incidence of the Amazon's most dangerous malaria vector, the mosquito Anopheles darlingi.

"The Amazon study site was chosen because of the rapid increase in malaria in the early 1990s there," Patz notes of the study, which appeared in the July issue of the American Journal of Tropical Medicine and Hygiene. "We saw a major upsurge in the incidence of the disease that coincided with an extensive push in human settlement. It was critical to ask why."

One hypothesis attributed the increase to the arrival of settlers bearing the malaria parasite and the mosquito that is its vector. But the people who arrived were also changing the landscape, mainly by harvesting trees for timber and clear-cutting to create subsistence farms, thus laying the groundwork for a natural experiment. By 1997, about a third of the residents in the Peruvian Amazon had contracted malaria. A hot spot of disease resurgence was coinciding with a region of intense deforestation.

Patz, who also holds an appointment in the Department of Population Health Sciences, and his team, including lead authors Amy Vittor and William Pan, identified 56 sites along a recently constructed road near

Iquitos, Peru. The researchers established lines, each one kilometer (0.6 miles) long, and used dip nets to sample for mosquito larvae in streams and ponds along each line.

During 12 months of fieldwork, they collected 5,524 water samples from 1,224 streams and ponds, and identified about 24,000 mosquitoes. Of those that could carry malaria, a greater number were found in more heavily deforested landscapes. Surprisingly, this relationship remained strong regardless of the human population density in these locations.

In all, the malaria vector was found in 17 percent of ponds and streams where deforestation was heavy, in 10 percent of water bodies where forest disturbance was light and in only 2 percent of water surrounded by intact forest. This study, which focused on mosquito larvae, follows the team's 2006 documentation of greater abundance of Anopheles darlingi adults in deforested habitats.

In combination the two studies — first on adult mosquitoes, and now on their larvae — lead to a consistent and serious result. "The unintended consequence of deforestation in the Amazon, unfortunately, is the increase in abundance of the main malaria-carrying mosquito in the region," Patz says.

"The study improves our understanding of the role that habitat disturbance can have on malaria risk and can lead to expanded prevention measures, especially those that focus on environment," says Vittor, an infectious disease fellow at the University of Pennsylvania. "While meeting with villagers and health workers, we saw the huge impact of malaria, not only on people's health, but also on their ability to work and maintain their livelihoods. It is a disease of the highest priority. Our findings now demonstrate that prevention is not just about bed nets and vector control; it is very much a matter of habitat management."

While the ecological mechanisms at play remain to be fully explained, "the correlation across the varying extents of deforestation and water-body factors, such as algae or emergent grasses arising from opening of the forest canopy, was highly statistically significant with larval abundance," says Pan, an assistant professor at the Johns Hopkins Bloomberg School of Public Health. Pan, who leads a follow-up study, reports that approximately a third of his study population has had malaria during the past year, with nearly all cases being people living near recently deforested areas or involved in resource logging.

The malaria parasite destroys red blood cells. The World Health Organization estimates that 500 million people are infected each year. It is prevalent in Latin America, Africa and Southeast Asia. Malaria kills about one and one-half million people per year, most of them pregnant woman or very young children.

"In the time it takes to read this article, thirteen of them will have died," says Patz.

"After 65 miles of bushwhacking through the jungle," he says, "our team has shown that conservation policy and public-health policy are one and the same."

Provided by University of Wisconsin-Madison (news : web)