

THE *Current*

August 29, 2013

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Dueling Infections: One Keeps the Other at Bay, Say UCSB Anthropologists

If the idea of hookworms makes you shudder, consider this: Those pesky intestinal parasites may actually help your body ward off other infections, and perhaps even prevent autoimmune and other diseases.

Studying members of the Tsimane, an indigenous population in the lowlands of Central Bolivia, UC Santa Barbara anthropologists Aaron Blackwell and Michael Gurven found that individuals infected by helminths -- parasitic worms -- were less likely than their counterparts to suffer from giardia, an intestinal malady caused by a flagellated protozoa. Similarly, those with giardia tended to be less infected by helminths. The researchers' findings appear in the *Proceedings of the Royal Society B*.

Treatment of one parasite also led to a greater likelihood of having the other later, the researchers found. The study used longitudinal data on 3,275 Tsimane collected over six years, which thereby permitted the authors to make more definitive causal inferences. This represents a distinct improvement over common correlative studies.

"People living in developing countries are often burdened by simultaneous infections," said Blackwell, an assistant professor of anthropology and the paper's lead author. "The key finding in this study is that worms and giardia have

antagonistic effects on one another, such that infection with one limits infection with the other."

The researchers' findings also suggest that treating one infection might allow the other to run rampant, which raises questions about currently accepted protocols for dealing with parasites.

According to Gurven, a professor of anthropology and co-director of the Tsimane Health and Life History Project, a collaboration between UCSB and the University of New Mexico, more than 1.5 billion people in the developing world have soil-transmitted intestinal worms. To determine which particular individuals are infected -- and require treatment -- however, is a very costly endeavor.

"There are campaigns in many developing countries to give every child under five de-worming medication, but if the basic infrastructure that leads to infection doesn't change -- like sanitation and access to shoes and clean water -- re-infection is likely to happen within six months," he said. "And if intestinal worms are protective against giardia, there's a tradeoff, and then the question is, which of the two is worse?"

Diagnosis and treatment of parasites usually happen on an organism-by-organism basis, continued Gurven, a co-author of the paper. Further, he argues that in the case of hookworm and giardia, the relationship between the parasites needs to be taken into account in order to maintain the overall health of the individual involved.

That one intestinal parasite has the ability to limit the pervasiveness of another also sheds light on the significance of parasites in general. "The community of pathogens in the body are interacting and can have differential effects on each other, and effects that are unanticipated," Gurven said. "Twenty years ago, people wouldn't have guessed so much that the presence of intestinal worms, gut bacteria, and other 'old friends' living in our bodies might have beneficial effects."

Hence the wave of probiotic supplements designed to increase the number of "good microbiota" in the intestines, he noted.

According to both Gurven and Blackwell, a growing number of studies show that helminths have existed for long periods of evolutionary history. They cite the "old friends" hypothesis, which suggests that, in the absence of these physiological compatriots, human immune responses may not behave the way they are supposed

to. "We see very minimal autoimmune disorder in the Tsimane," Gurven said.

"Imagine you have a gut parasite. Your body might be able to clear it, but it's more likely that it won't," he explained. "But when that's the case, you can often live with the parasite. The immune system is activated to hold the parasite at bay. Unlike bacteria, which grow in your body, most intestinal worms can't reproduce in the body. So your immune system is humming along, keeping the worms under control. And because your immune system is working on something else, it doesn't act wonky and start attacking itself."

Added Blackwell: "In terms of looking at disease and parasite transmission, it's important to look at the broader disease ecology and other factors that might be impacting the infection. That can be true not only for these particular infections or parasites, but for other diseases as well."

Other researchers contributing to the paper are Melanie Martin, a graduate student in anthropology at UCSB, and Hillard Kaplan of the University of New Mexico, Albuquerque, and the other co-director of the Tsimane Health and Life History Project.

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