MedicalXpress

Researchers find prawn solution to spread of deadly disease

July 20 2015

A deadly disease may have met its match: a bug-eyed, pint-sized crustacean.

A Stanford-led study in Senegal, West Africa, finds that freshwater prawns can serve as an effective natural solution in the battle against schistosomiasis, a potentially deadly parasitic disease that infects about 230 million people. The prawns prey on parasite-infected snails, while providing a source of marketable protein-rich food. Because prawns cannot support schistosomiasis' complex life cycle, they do not transmit the disease themselves.

"The results of our study open the pathway to a novel approach for the control of schistosomiasis," said co-author Giulio De Leo, a biology professor at Stanford's Hopkins Marine Station and a senior fellow at the Stanford Woods Institute for the Environment.

The study, published in the *Proceedings of the National Academy of Science*, tracked parasite-infected snails and people in two villages. In one village, the international research team and Senegalese partner Biomedical Research Center Espoir pour la Santé stocked a river access point with prawns. Over the course of 18 months, they found 80 percent fewer infected snails and a 50 percent lower disease burden (the mean number of parasite eggs in a person's urine) in people living in the prawn-stocked village.

In a mathematical model of the system, stocking prawns, coupled with

infrequent mass drug treatment, eliminated schistosomiasis in high-transmission sites. "Where drugs, alone, fail to control schistosomiasis due to rapid reinfection, prawns may offer a complementary strategy" for controlling the disease, the study's authors write.

Local communities could be incentivized to maintain prawn populations in order to market them as a food product, the researchers noted.

"They are delicious," said lead author Susanne Sokolow, a Woods-affiliated research associate located at Stanford's Hopkins Marine Station. "They can synergize with local efforts in the developing world to fight parasitic disease and to foster new aquaculture-based industries." Thus, the approach could bring four major benefits: disease control, biodiversity restoration, poverty alleviation and improved nutrition.

Long-neglected disease

The stakes are big. Worldwide, nearly 800 million people are at risk of getting schistosomiasis - most colloquially known as "blood flukes" - an infestation of parasitic flatworms which can cause anemia, growth stunting, infertility, liver failure, bladder cancer and lasting cognitive impairment.

Currently, the only treatment for the disease is the drug praziquantel. Insufficient global supplies, cost and other factors limit that drug's effectiveness. Even if it were widely and cheaply available, praziquantel would be an incomplete solution for people who enter river water to bathe and clean clothing, among other reasons, and get reinfected frequently through contact with schistosome-contaminated waters.

In Africa, where most schistosomiasis cases occur, rates of infection often increased dramatically after construction of big dams. De Leo and his fellow researchers speculate this is due not only to the dams' positive

impact on snail habitat but to the dams' negative impact on snail predators, including freshwater prawns, that need to travel upstream and downstream to mate and lay eggs.

In addition to stocking river access points, the researchers suggest prawns could be restored to rivers through the use of dam-bypassing passages similar to salmon ladders used in the Western United States.

More natural solutions

Sokolow, De Leo and their colleagues have attracted international attention and more than $6 million in funding from organizations such as the Bill & Melinda Gates Foundation, the National Institutes of Health, the National Science Foundation and Grand Challenges Canada.

They plan to expand their work to focus on a range of natural solutions to global health and poverty challenges as part of an initiative called the Upstream Alliance. While the prawn research has shown the effectiveness of natural solutions at small scales, the researchers plan to explore whether such approaches can be viable and sustainable on larger scales.

De Leo credits Stanford, particularly the Stanford Woods Institute, with crucial support of the prawn project since 2013 through a seed grant program called Environmental Venture Projects.

"We hadn't been able to get big grants at that point. EVP provided us with the bridge funds to bring our data analysis to the next level, and conceive proposals to expand our research effort," he said.

More information: *PNAS*
www.pnas.org/cgi/doi/10.1073/pnas.1502651112

Provided by Stanford University