Stanford researchers fight disease via competition

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A research assistant holds the kind of freshwater prawn that feeds on the snails that spread schistosomiasis in Africa.

A freshwater prawn may not appear intimidating at first glance – it's a petite bottom-feeder that can fit in the palm of most people's hands. To snails, however, it might as well be Jack the Ripper.

In fact, the prawn, which dines heavily on snails that carry a debilitating parasitic infection called schistosomiasis, could provide an environmentally safe option for controlling the spread of the disease, while creating a source of marketable, protein-rich food. Researchers supported by the Stanford Woods Institute's Environmental Venture Projects (EVP) seed grant program are exploring this possibility by studying the effects of reintroducing prawns to river shoreline environments in Senegal, West Africa.

"The broad potential of this project is validation of a sustainable economic solution that not only addresses a major neglected tropical disease, but also holds the promise of breaking the poverty cycle in affected communities," said Michael Hsieh, the project's principal investigator and an assistant professor of urology at the Stanford School of Medicine.

The schistosome worm is among the deadliest parasites in the world. Among other symptoms, schistosomiasis can cause chronic anemia, growth stunting, liver failure, bladder cancer and lasting cognitive impairment. Worldwide, about 700 million people are at risk of getting schistosomiasis, with about 220 million infected and 20 million suffering from severe symptoms, according to Hsieh and his fellow investigators on the project, Stanford Woods Institute Senior Fellow Giulio De Leo, a professor of biology, and Susanne Sokolow, a postdoctoral scholar in biology.

Currently, the only treatment for the disease is a drug called praziquantel (PZT). Insufficient global supplies, cost and other factors limit PZT's effectiveness. Even if the drug were widely and cheaply available, it would still be an incomplete solution, De Leo said. "Traditional sanitary interventions for disease control and eradication based on repeated drug treatments, while partially effective in the short term, have failed to deliver the expected results. People get re-infected when they go back to

the river."

In Africa, where 97 percent of all schistosomiasis cases occur, people become infected through contact with snails while bathing, cleaning clothes and other river-based activities. Rates of infection increased dramatically after many African countries began building dams in the 1980s. Hsieh, De Leo and Sokolow speculate this is due, at least in part, to the dams' impact on regional freshwater prawns, which need to travel upstream and downstream to mate and lay eggs.

The EVP team is examining the effect of river prawns on snails in lab and field settings. In one experiment, they found that local rates of schistosomiasis infection came down after shrimp were released into a netted area of a river in Senegal. The researchers are looking at the roles of seasonality and frequency of prawn restocking, among other influencing factors. If their work continues to prove successful, they envision introducing prawns in other areas of Africa.

If the prawns prove to be effective disease fighters, Hsieh, De Leo and Sokolow envision them as natural tools in optimizing drug treatment for schistosomiasis by minimizing environmental exposure that can lead to reinfection. "This approach turns to ecology for a solution where drug treatment, alone, has failed to deliver results in terms of sustainable disease reductions," Sokolow said.

The sustainability of prawns as a solution could rest on their tastiness. Local communities could be inspired to maintain prawn populations in order to market the delicacy domestically and, perhaps, internationally.

Provided by Stanford University

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