Natural pest control protein effective against hookworm: A billion could benefit

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A benign crystal protein, produced naturally by bacteria and used as an organic pesticide, could be a safe, inexpensive treatment for parasitic worms in humans and provide effective relief to over a billion people around the world. Researchers from the University of California, San Diego, La Jolla, CA, report on this potentially promising solution in a study published ahead of print in the journal *Applied and Environmental Microbiology*.

Hookworms, and other intestinal parasites known as helminths infect more than 1 billion people in poverty-stricken, tropical nations, sucking the vitality from the body, and leaving hundreds of millions of children physically and mentally stunted. Current drugs are insufficiently effective, and resistance is rising, but little effort has been made to develop better drugs because the relevant populations do not represent a profitable market for drug companies.

"The challenge is that any cure must be very cheap, it must have the ability to be mass produced in tremendous quantities, safe, and able to withstand rough conditions, including lack of refrigeration, extreme heat, and remote locations," says Raffi Aroian, a researcher on the study.

In earlier research, Aroian and his collaborators described a protein, Cry5B, that can kill intestinal nematode parasites—such as human hookworms—in infected test animals (hamsters). Cry5B belongs to a family of proteins that are generally accepted as safe for humans. These proteins are produced naturally in *Bacillus thuringiensis* (Bt), a bacterium

which is applied to crops as a natural insecticide on some organic farms, and CryB proteins have been engineered into food crops such as corn and rice, to render them pest resistant.

As shown for the first time in this paper, Cry5B can also be expressed in a species of bacterium, *Bacillus subtilis*, which is closely related to *Bacillus thuringiensis*, and which is also related to bacteria which are present in some probiotics, says Aroian. In the current research researchers showed that a small dose of Cry5B, expressed in this bacterium can achieve a 93 percent elimination of hookworm parasites from infected hamsters. That, says Aroian, is substantially better than current drugs.

The scientific significance of the research, he says, is that "bacteria similar to those that are food grade—which are cheap and can readily be mass produced—can be engineered to produce molecules that can cure parasitic diseases."

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