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A Termite Terminator?

By Elsa Youngsteadt
ScienceNOW Daily News
8 June 2009

Crowded, warm, and damp, a termite nest should be a paradise for pathogens. But colonies of the wood-munching insects rarely succumb to epidemics, and now researchers have discovered one reason why. Termites produce an antimicrobial enzyme that they also slather on their bodies and nest walls. The team found a simple way to block this defense, a discovery that may be useful in "natural" pest control.

In humans and insects alike, the immune system revs up once the body knows it's been invaded. Insect immune systems get going when so-called Gram-negative bacteria binding proteins (GNBPs) latch onto sugar molecules on the cell walls of bacteria and fungi.

While studying the evolution of GNBPs in termites, molecular ecologist Mark Bulmer of Towson University in Maryland got a hunch that the proteins weren't just sentinels. He noticed that, according to its structure, termite GNBPs should be able to digest the invaders' sugar molecules--known as glucans--and harm microbes directly.

So Bulmer and colleagues purified a GGBP from the tropical termite *Nasutitermes corniger* and showed that, unlike GNBPs found so far in other insects, it was a glucan-cleaving enzyme. Termite GGBP attacked the cell walls of bacteria and fungi, making them leaky and more susceptible to the termites' other antimicrobial agents. The effect was so potent that the extract from a single insect was enough to kill hundreds of fungal spores, the researchers report today in the *Proceedings of the National Academy of Sciences*.

The GGBP also showed up on the surface of the termites' bodies and in their nest walls--dispensed in saliva as the insects groomed each other and built their home. This external GGBP still digests glucans. Bulmer thinks the small glucan breakdown products it releases could act as signals that get passed around the nest and trigger what's known as social immunity: The entire colony prepares for microbial attack before most termites ever encounter a germ.

GGBP's glucan-chopping function is essential for termite survival. Based on the

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Group therapy. *Nasutitermes corniger* termites produce and share an antimicrobial enzyme.

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structure of GNBPs, the researchers deduced that a simple sugar derivative known as GDL would inhibit the enzyme. When 24 termites ate GDL-treated filter paper before exposure to a fungal pathogen, all of them died within 5 days. In contrast, groups with intact GNBPs activity hung on 4 days longer. Even insects that ate GDL but no pathogen died sooner than control animals, their bodies ravaged by opportunistic microbes.

GDL is cheap and nontoxic--it's even used as a food additive--and the researchers are looking for ways to formulate it into paints, wood, or baits to make termites sickly.

James Traniello, a behavioral ecologist at Boston University in Massachusetts, describes the work as "wonderful" and a "greatly advanced" study in molecular immunology. But he wants to see more evidence before he believes that GDL could be a viable pesticide.

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Comments

Thanks for your feedback. Please keep it polite and to the point.

After I read this paper,I realize that everyone has its enemy in our living surrounding,only if it need our hard work to find it so that we can protect ourselves from its harm.	File Tuesday, June 09, 2009
More Like this comment? [yes] [no] (Score: -2 by 2 votes)	[reply]
If the GDL is so common in our food, termite might evolve some mechanism against GDL.	Guest Tuesday, June 09, 2009
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I do not think we understand fully the ramifications of destroying a whole class of a specie. In nature, everything has a purpose and a purpose for everything. I am hoping that the colonies in the wild are left alone.	pdas Tuesday, June 09, 2009
More Like this comment? [yes] [no]	[reply]
Neither this article nor the paper suggest killing an entire species of organisms. We already use pesticides against termites that attack our homes. This study points to a potential alternative to the harsher chemicals is use. It does NOT suggest we go into the "wild" and kill all termites. I'm actually pretty positive that the researchers understand (more than you) the important role of termites in the ecosystem.	Guest Friday, June 12, 2009
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We still have to be vigilant. Termites ain't the only ones who will be affected.	Marcel  Sunday, June 14, 2009
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Is anyone working on the other aspect of this? Might not GNBPs be the basis of an effective agent against pathogenic bacterial and fungi that attack humans?	Alan Wednesday, June 10, 2009
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If GDL is common in our food, does it reduce our resistance to fungi and bacteria?	dande_ionne Sunday, June 14, 2009
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How About That?	Guest Sunday, June 14, 2009
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ya, we may do something with the GNBPs	Guest Monday, June 22, 2009
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