Cicadas' Fungal Foe Is Potential Friend of Science

Cicadas, *Magicicada septendecimthe.*

People in the eastern United States may believe that not much good can come from cicadas.

That's because it was less than 2 years ago that they experienced Brood X of *Magicicada septendecimthe,* the cicada species that emerges every 17 years. That species' sheer numbers force it to commandeer entire neighborhoods, piling atop one another on sidewalks, bumping into windows, collecting in storm gutters, and flying into hairdos.

But work by researchers that include ARS scientists seems to have found something beneficial in an Australian relative of Brood X's cicadas. Well, on it, anyway.

It turns out that compounds in fungi that grow on and infect some cicadas may be scientifically important. Specifically, these compounds possess antimicrobial and immunosuppressant properties, and they may one day serve as models for scientists who develop new synthetic chemistries.

These findings were made by the team of plant physiologist Donna Gibson of ARS's Plant Protection Research Unit (PPRU) in Ithaca, New York, and Cornell University research associate Stuart Krasnoff, while they studied the fungus *Cordyceps heteropoda*.

In *C. heteropoda,* they discovered two small peptides—carbon-based compounds made of amino acids linked by chemical bonds—with antibacterial and antifungal properties.

These peptides can form pores in lipid membranes, causing cells—especially bacterial and fungal cells—to die. "They're made up of unusual amino acids," says Gibson. "One of these is alpha-aminoisobutyric acid, which causes the peptide to coil into a helical structure." She says these structures may be useful for engineering of molecules. "This is important, because many drugs and pesticides on the market are modeled after the chemical structures of natural products."

The research team also found that *C. heteropoda* produces myriocin (my-ree-OH-sin). It's a known antifungal compound that's being investigated in studies elsewhere for potent immunosuppressant activity, a key to preventing posttransplant organ rejection in humans.

"This represents a new source for myriocin," says Gibson. "There are only two other fungi that have been reported to produce it." She adds that the pathway for biosynthesis of myriocin is unknown.

The fungal isolate studied here was taken from *Cicadetta puer,* an annual cicada that appears from October to February in eastern Australia. It had been placed in PPRU's Collection of Entomopathogenic Fungi in 1985 by curator and microbiologist Richard Humber. This collection serves scientists involved in isolating, collecting, preserving, and distributing fungal strains gathered from insects, arthropods, and nematodes worldwide. The various strains are studied for potential use against agricultural pests. (See "Safeguarding Fungi That Protect Plants Against Pests," *Agricultural Research,* April 2003, p. 8.)

Krasnoff and Gibson came across these *C. heteropoda* isolates during a molecular screening program started 6 years ago that's aimed at developing a diverse core collection for identifying novel chemistries.

The recent findings have been described in the *Journal of Natural Products.*—By **Luis Pons,** ARS.

This research is part of Plant, Microbial, and Insect Genetic Resources, Genomics, and Genetic Improvement, an ARS National Program (#301) described on the World Wide Web at www.nps.ars.usda.gov.

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