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Cover Story

October 23, 2006
Volume 84, Number 43
Web Exclusive

Talking To The Hosts

Bacteria find ways to have chemical conversations with their hosts as well

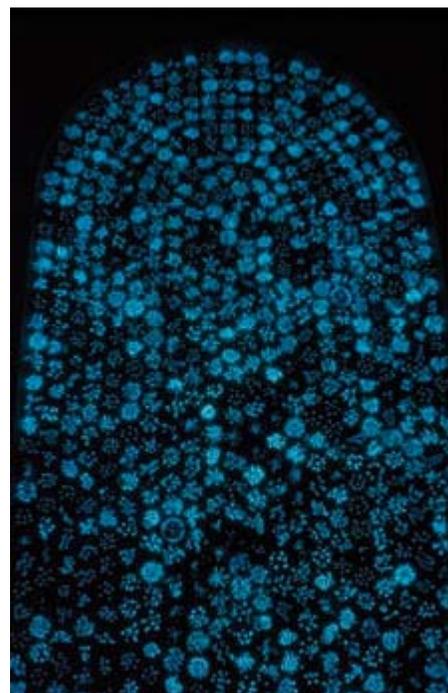
[Sarah Everts](#)

The fact that a higher organism, the Australian alga *Delisea pulchra*, interferes with bacterial conversations is not an exception. Many host organisms have evolved ways to communicate with bacteria, or to interfere with their conversations. Pea plants produce quorum-sensing mimics that both positively and negatively control the nitrogen-fixing bacteria that colonize its roots. In humans, a reactive intermediate of our innate immune system inactivates some of the *Staphylococcus* quorum-sensing peptides.

But bacteria are also "sniffing for hosts," says Stephen C. Winans, a Cornell University researcher who studies communication between bacteria and their hosts. When *Agrobacterium tumefaciens* detects wounding in woody plants, the bacteria begin inserting DNA into the plant, thereby creating the biomachinery to produce opines, their rare carbon source, says Winans. *Salmonella* turn on pathogenesis when they detect certain human peptides. *Vibrio cholera* detect cholesterol derivatives in the gut and turn on pathogenesis as a consequence.

On the other hand, hosts control the behavior of symbiotic bacteria. "In symbiotic relationships you expect that there ought to be some cheaters: bacteria that enjoy the benefit without contributing the cost," Winans says. "But cheating is a total breakdown of symbiosis. So there are ways to punish the cheaters." Soybeans punish rhizobia in their root nodules that do not actually fix nitrogen by decreasing their oxygen supply. In the bobtail squid, slacker *Vibrio fischeri*, those that live but do not luminesce, are punished by death, says Edward G. Ruby, who studies this relationship at the University of Wisconsin, Madison. "There are two important issues that any host has to face. The host has to make sure it lets the right kind of bacteria colonize itself, and it has to balance the bacterial populations."

Michael G. Surette, at the University of Calgary, in Alberta, believes many more bacteria-derived small molecules will be found that are important for setting up mutually beneficial relationships with humans. He points out that we have more bacterial cells living inside us than we do human cells?by more than an order of magnitude. "The role of signaling between commensal bacteria in our gut, on our skin, in our throats is only beginning to be investigated. Many more molecules will be found."



Montana State University-Bozeman Bioglyphs Project

Light Chatter When *Vibrio* bacteria get together, quorum-sensing chitchat induces the expression of light-producing proteins.

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