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One Bacteria Stops Another on Contact; Findings Have Potential Implications for Urinary Tract Infections

Scientists have discovered a new phenomenon in which one bacterial cell can stop the growth of another on physical contact. The bacteria that stop growing may go into a dormant state, rather than dying. The findings have implications for management of chronic diseases, such as urinary tract infections.

The discovery by a team of scientists working in the laboratory of David Low, professor of biology at the University of California, Santa Barbara, is reported in the August 19 issue of the journal *Science*. The findings indicate that *Escherichia coli*, one culprit in urinary tract infections, contains genes that when turned on block the growth of other *E. coli* bacteria that they touch. The finding was a complete surprise to the scientists, said Low.

The discovery may eventually lead to new antimicrobial agents to halt bacterial growth which would be an entirely new system to shut bacteria down, according to the scientists. "This has potential implications for new antibiotics," said Low. "If bacteria can do this, then maybe we can do it."

Doctoral student and first author Stephanie Aoki, and a team of scientists working in the Low lab, made the discovery while studying other aspects of *E. coli*. After working for two years, the team identified two genes required for this "stop on contact" phenomenon.

"We don't know if these 'stopped' cells are dead or alive," said Low. "They don't grow after they've been touched. They don't grow on plates, but laboratory stains show they may be alive. You might call them dead, but they don't break apart the way dead cells do. These cells appear to stay intact, perhaps in a quiescent mode, or dormant state."

Aoki explained, We are currently exploring how contact between bacteria can inhibit cell growth --- and determining what this contact-dependent inhibition of growth (CDI) system is used for. These genes are present in *E. coli*, including uropathogenic *E. coli* that cause urinary tract infections, and similar genes may be present in other pathogens such as the plague bacillus, *Yersinia pestis*.

Low said that one possible interpretation is that bacteria use this system to eliminate competition in the environments they grow in. "Another possibility is that the bacteria use the CDI system to shut themselves off inside a host, going into a dormant state where they may go undetected by the immune system," he said.

Thousands of women in this country have chronic urinary tract infections, noted the scientists. The disease seems to go away for awhile, then something triggers recurrence of the disease.

Work by Scott Hultgren at Washington University has indicated that *E. coli* cells may hide in the walls of the bladder and urinary tract in a dormant state, explained Low. It is possible that the newly discovered CDI system contributes to this process.

"By studying the CDI system, we hope to understand more about how bacteria interact with each other and with their hosts, and how these interactions contribute to disease," said Aoki.

The findings may have repercussions outside of better understanding of urinary tract infections. Other diseases may have similar mechanisms, according to the scientists. "This research is in its infancy, but opens the door for exploration of the roles of contact-dependent growth inhibition in urinary tract infections and possibly other diseases," said Low.

"Aoki has discovered an entirely new phenomenon," explained Low, who has studied *E. coli* for over 20 years. "It is fascinating that bacteria have developed a system by which one cell can contact another and inhibit its growth."

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