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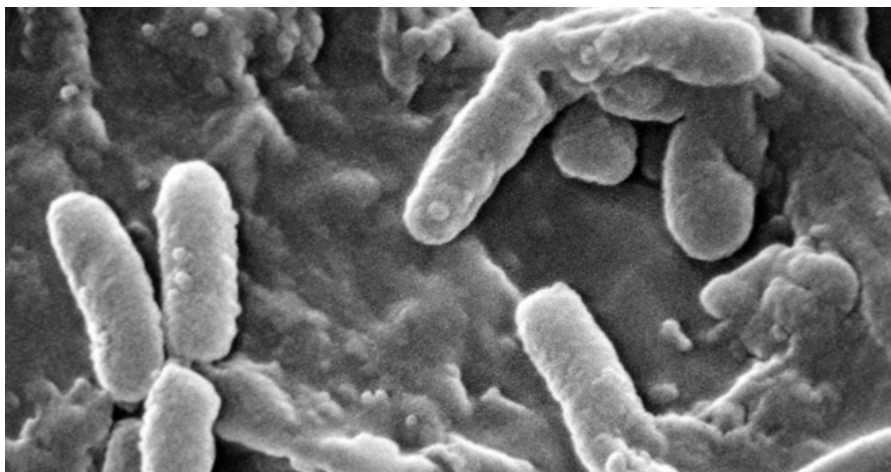
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Scientists Exploit Bacterial Laziness to Beat Disease

By Brandon Keim February 19, 2009 | 12:00:57 PM Categories: [Bacteria](#), [Medicine & Medical Procedures](#)



Infectious diseases may have an unexpected weakness: their own propensity for laziness.

Researchers genetically engineered "cheating" versions of a common, inflammation-causing microbe. When injected into already-infected mice, the bugs benefited from the chemical labors of other microbes without working themselves.

Able to devote their energies to reproduction, the lazy bugs divided faster than their brethren, and infections turned rapidly less virulent.

"The wild bacteria expend all this energy to make these signaling compounds and virulence factors. That slows down their growth," said [Kendra Rumbaugh](#), a microbiologist at Texas Technical University and lead author of the study, published Thursday in *Current Biology*. "The cheaters save up like crazy, divide like crazy, and take over the population."

When bacteria invade a host, they exchange chemical signals that activate genes responsible for producing virulence factors — toxic molecules that break down connective tissue, stop cellular defenses and wreak cell-level havoc, creating an environment in which the bacteria can flourish.

Earlier research found that some microbes don't participate in the signaling. Since then, researchers have shown that these freeloaders flourish, at least in laboratory tissue cultures, where they outcompete hard-working bugs and produce less-virulent colonies. Rumbaugh wondered whether the same would happen in an actual infection.

The results, though still preliminary — they involved just one type of infection, observed in a mouse model — suggest that bacterial laziness could be a back-door approach for treating disease, especially drug-resistant strains.

"I like the analogy of cheaters as bacteria who don't pay their taxes," said Rumbaugh. "We all pay taxes, that gets us services and infrastructure. But there's a few people in the population that don't pay, yet they still use these. What happens if cheaters grow to be the majority of the population? Eventually, the society is going to collapse."

To test their hypothesis, Rumbaugh's team engineered a mutant strain of *Pseudomonas aeruginosa*, a common inflammation-causing bug that infects cuts and open wounds, and is especially troublesome for burn victims and people with AIDS. Though it usually causes dermatitis, *P. aeruginosa* can be fatal if infection spreads internally.


The researchers knocked out the genes responsible for signaling, turning their bugs into cheaters. Then they added the mutants to mice with burn wounds infected by normal *P. aeruginosa*. The engineered strain flourished and soon dominated the bacterial population. More than half of treated mice survived, compared to just one-quarter of an untreated control group.

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"These wild bacteria make chemical signals, turning on genes, making proteins, expending energy. There's a significant cost, but a benefit for the whole population," said Rumbaugh. "The cheaters don't make these signals, or all the things controlled by signaling. They just live off what the majority of the population is making."

Rumbaugh hopes the technique could eventually treat infections, especially those resistant to drugs. "We could take an attenuated mutant cheater strain and spike the population," she said. "It would predominate, and maybe make them more susceptible to treatment."

However, she noted that such treatments are still "far off," a caution echoed by Harvard University systems biologist Kevin Foster.

Rumbaugh's laziness hack could work, he said, but several caveats first need to be addressed. "The idea of introducing more bacteria — even less-virulent ones — to a patient comes with obvious potential side effects, because you have to increase the total number of pathogens in a patient," said Foster, who was not involved in the study.

Other strains of bacteria may also react unpredictably to the mutants. "The modified strain could make things worse," he said.

Citation: "Quorum Sensing and the Social Evolution of Bacterial Virulence." By Kendra Rumbaugh, Stephen Diggle, Chase Watters, Adin Ross-Gillespie, Ashleigh Griffin and Stuart West. Current Biology, Vol. 19, Iss. 4, Feb. 19, 2009.

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Damn, that's smart :). However, I think that we shall also pay attention to excessive use of antibiotics, especially in farming. On some industrial farms animals get good with antibiotics, regardless of whether they are ill or not. This shall be prohibited, because it gives profit to the producers, but is screwing health of everyone else. If someone rises the argument, that this will make food more expensive, I reply saying that it would be much more efficient, if the food used to grow the animals would be eaten by humans. Far more efficient and far better for world's famine problems.

Posted by: **stoffer** | Feb 19, 2009 10:18:06 AM

OHhh the irony!
 "I like the analogy of cheaters as bacteria who don't pay their taxes," said Rumbaugh. "We all pay taxes, that gets us services and infrastructure. But there's a few people in the population that don't pay, yet they still use these. What happens if cheaters grow to be the majority of the population? Eventually, the society is going to collapse."
 Can someone fax this article to the White House?

Posted by: **manaconda** | Feb 19, 2009 11:17:22 AM

Great Article.
 Now here is the part where I bring in another scarcely-related problem that everyone already knows about. I don't see anyone answering it, so I will mention it again instead of discussing THIS article or doing something about it myself. Antibacterial soap blah blah blah. I just educated the world.
 The End

Posted by: **FireyFate** | Feb 19, 2009 11:38:30 AM

Ha! Can we call the cheaters the Daschle strain?!

Posted by: **lol** | Feb 19, 2009 11:40:45 AM

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Oh, I almost forgot. Taxes, blah blah blah. Politics are related to everything, I won't take a break from it for five minutes to think about something thats REALLY important. blah blah blah blah.

Posted by: **FireyFate** | Feb 19, 2009 11:41:03 AM

Todd: Daddy, what are taxes paying for?

Ned: Ohoho... everything! Policemen, trees, sunshine, and let's not forget the folks who just don't feel like working, God bless 'em!

Posted by: **maiqk** | Feb 19, 2009 12:31:33 PM

As an administrator on Wikimedia Commons (note the capitalization), thanks for the shout-out, but this image is really from the Centers for Disease Control, which our image page (http://commons.wikimedia.org/wiki/File:Pseudomonas_aeruginosa_SEM.jpg) clearly indicates.

Posted by: **Howcheng** | Feb 19, 2009 12:52:34 PM

Oops, no trailing parenthesis in the link:

http://commons.wikimedia.org/wiki/File:Pseudomonas_aeruginosa_SEM.jpg

Posted by: **Howcheng** | Feb 19, 2009 12:53:06 PM

i suggest making the modified bacteria susceptible to a specific chemical or specific antibiotic. after the modified bacteria have done their work of stopping an infection they could be killed off.

Posted by: **Paul Sagi** | Feb 19, 2009 4:06:49 PM

Rumbaugh? what an appropriate name for that quote! for the five of you who don't get it: Rush Limbaugh...

Posted by: **Darwin** | Feb 19, 2009 5:34:27 PM

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