Viruses help scientists battle pathogenic bacteria and improve water supply

24 September 2012

(Phys.org)—Infectious bacteria received a taste of their own medicine from University of Missouri researchers who used viruses to infect and kill colonies of *Pseudomonas aeruginosa*, common disease-causing bacteria. The viruses, known as bacteriophages, could be used to efficiently sanitize water treatment facilities and may aid in the fight against deadly antibiotic-resistant bacteria.

"Our experiment was the first to use bacteriophages in conjunction with chlorine to destroy biofilms, which are layers of bacteria growing on a solid surface," said Zhiqiang Hu, associate professor of civil and environmental engineering in MU's College of Engineering. "The advantage to using viruses is that they can selectively kill harmful bacteria. Beneficial bacteria, such as those used to break down wastes in water treatment plants, are largely unaffected. Hence, viruses could be used to get rid of pathogenic bacteria in water filters that would otherwise have to be replaced. They could save taxpayers' money by reducing the cost of cleaning water."

Bacteria can be difficult to kill when they form a biofilm. The outer crust of bacteria in these biofilms can be killed by chlorine, but the inner bacteria are sheltered. Viruses solve this problem because they spread through an entire colony of bacteria. Hu noted that the bacteriophages are easier to create than the enzymes used to attack biofilms. The viruses also are better at targeting specific bacterial species.

Hu, along with MU's recent graduate, Yanyan Zhang, found the greatest success in killing biofilms by using a combination of bacteriophages and chlorine. An initial treatment with viruses followed by chlorine knocked out 97 percent of biofilms within five days of exposure. When used alone, viruses removed 89 percent of biofilms, while chlorine removed only 40 percent.

"The methods we used to kill *Pseudomonas aeruginosa* could be used against other dangerous bacteria, even those that have developed resistance to antibiotics," said Hu. "Our work opened the door to a new strategy for combating the dangers and costs of bacterial biofilms. The next step is to expand our experiment into a pilot study."

The study "Combined Treatment of *Pseudomonas aeruginosa* Biofilms with Bacteriophages and Chlorine" has been published in the journal *Biotechnology and Bioengineering*.

Provided by University of Missouri-Columbia