Chemical Compound Effective in Destroying Antibiotic-Resistant Biofilms

ScienceDaily (Apr. 11, 2010) — Researchers at North Carolina State University have found a chemical compound that, when used in conjunction with conventional antibiotics, is effective in destroying biofilms produced by antibiotic-resistant strains of bacteria such as the *Staphylococcus* strain MRSA and *Acinetobacter*. The compound also re-sentsitizes those bacteria to antibiotics.

Infections from antibiotic-resistant bacteria such as MRSA are especially difficult to get rid of because the bacteria can attach to surfaces and then create biofilms, sticky layers of cells that act as a shield and prevent antibiotics from destroying the bacteria underneath. While a limited number of existing antibiotics may destroy part of the biofilm, enough bacteria survive to create a recurring infection as soon as antibiotic therapy stops, and over time the surviving bacteria build resistance to that antibiotic.

NC State chemist Dr. Christian Melander had already shown that combining a compound made from a class of molecules known as 2-aminoimidazoles with antibiotics was effective in dispersing the biofilms created by certain bacterial strains. The next step was to see if this combination could remove resistant bacteria from surfaces.

"The problem with biofilms is that even if you treat with effective antibiotics, they never succeed in completely dispersing the biofilm and killing the bacteria on the surface they've stuck to," Melander says. "This is especially exacerbated when the bacteria are antibiotic-resistant. Basically, if you are trying to treat a multi-drug resistant bacterial infection, you need to worry about both the bacteria forming a biofilm and disarming their antibiotic resistance genes."

Melander and his team, in collaboration with NC State biochemist John Cavanagh, found that pre-treating the bacteria with their compound and then introducing the antibiotic penicillin one hour later increased the penicillin's effectiveness 128-fold, even when the bacteria was penicillin resistant. The antibiotics also provided a 1,000-fold enhancement to the ability of the 2-aminoimidazole to disperse biofilms.

The researchers' results were published online March 8 in the journal *Antimicrobial Agents and Chemotherapy*.

"We had two goals in mind -- to overcome antibiotic resistance and to disperse biofilms," Melander says. "This compound cooperates with conventional antibiotics, overcoming an infectious threat that would otherwise persist if treated with either agent individually."

The Department of Chemistry is part of NC State's College of Physical and Mathematical Sciences, and the Department of Biochemistry is a part of the College of Agriculture and Life Sciences.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **North Carolina State University**.

Journal Reference:

1. S. A. Rogers, R. W. Huigens, J. Cavanagh, C. Melander. **Synergistic Effects Between Conventional Antibiotics and 2-Aminoimidazole-Derived Antibiofilm Agents.**. *Antimicrobial Agents and Chemotherapy*, 2010; DOI: 10.1128/AAC.01418-09