Scientists uncover how superbug Staph aureus resists our natural defenses

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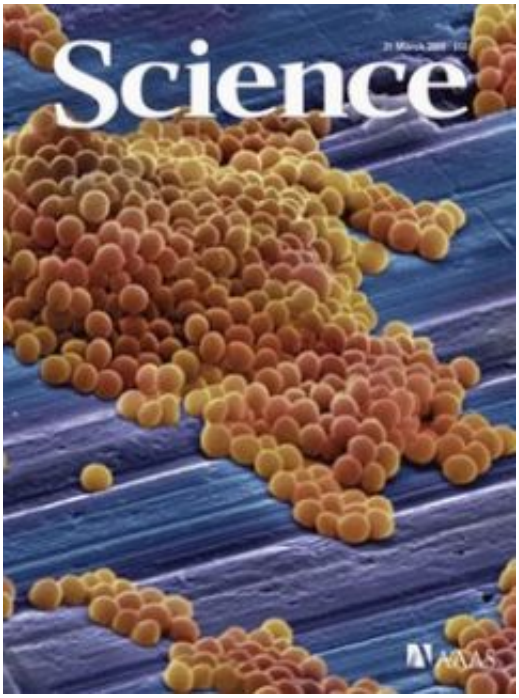

Dr. Ferric Fang and his colleagues at the UW have uncovered the mechanisms through which the bacteria Staph aureus, seen here in clusters under an electron microscope, can protect itself against our body's natural defenses. Fang's research was featured on the cover of Science magazine on March 21.

Researchers at the University of Washington have uncovered how the bacterium Staphylococcus aureus, including the notorious MRSA (methicillin-resistant Staph aureus) “superbug” strains, resists our body's natural defenses against infection. The work, which was featured on the

cover of the March 21 issue of *Science*, could lead to new ways to fight the bacteria.

Dr. Ferric Fang, UW professor of laboratory medicine and microbiology, and his UW colleagues Dr. Anthony Richardson and Dr. Stephen Libby set out to determine what makes Staph aureus a better pathogen than other bacteria.

They focused on a chemical compound called nitric oxide (NO), a natural antibiotic that our cells excrete to protect us from pathogens. For most bacteria, NO creates an environment that keeps invading microbes from undergoing respiration or fermentation, vital chemical processes that allow bacteria to grow.

The researchers found that Staph aureus has a mechanism that allows it to produce lactic acid in the presence of NO, which allows it to maintain its chemical balance and keep growing and thriving in the harsh host environment. When Staph aureus is exposed to NO, it produces the novel enzyme responsible for lactic acid production, along with another enzyme that converts NO to non-toxic products. NO is commonly found in the nose and nasal passages, and is meant to protect people against disease-causing microbes. But Staph aureus is commonly found in the nose despite the presence of NO, the researchers explained.

When the researchers modified Staph aureus to take away its ability to make lactic acid, the bacteria could no longer tolerate NO. The modified bacteria also lost their ability to survive in host immune cells and cause lethal disease in mice.

"MRSA has become an enormous public health problem, by causing both hospital- and community-acquired infections," explained Fang. "Staph aureus has already colonized about one-third of the world's population, so traditional antibiotics will probably not be the complete

answer to the MRSA problem."

However, the researchers added, trying to make Staph aureus more susceptible to our natural defenses might lead to new strategies to de-colonize the population and prevent staphylococcal infections.

Source: University of Washington