

Scientists discover antarctic sponge extract can help kill MRSA

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Dendrilla membranosa, near Palmer Station, Antarctica. Credit: Bill Baker

A serious and sometimes fatal bacterial infection, known as methicillin-

resistant *Staphylococcus aureus* (MRSA), may soon be beatable thanks to the efforts of University of South Florida scientists who have isolated and tested an extract from a sponge found in Antarctica. The sponge extract, known as *Dendrilla membranosa*, yields a new, natural product chemical which has shown in laboratory tests that it can eliminate more than 98 percent of MRSA cells. The research team has named the new chemical "darwinolide."

The study describing their methods and results was published this week in the American Chemical Society's journal *Organic Letters*.

While years ago the highly-resistant MRSA [infection](#) was particularly problematic in places such as hospitals and nursing homes, it has developed into an infection that can be found in commonly-used places such as gyms, locker rooms and schools.

"In recent years, MRSA has become resistant to vancomycin and threatens to take away our most valuable treatment option against staph infections," said study co-author and USF microbiologist Dr. Lindsey N. Shaw.

MRSA is unique in that it can cause infections in almost every niche of the human host, from skin infections, to pneumonia, to endocarditis, a serious infection of tissues lining the heart. Unfortunately, the pace of the pharmaceutical industry's efforts to find new antibiotics to replace those no longer effective has slowed in recent years, said Shaw.

Like many other bacterium, the MRSA bacteria forms a biofilm.

"Biofilms, formed by many pathogenic bacteria during infection, are a collection of cells coated in a variety of carbohydrates, proteins and DNA," said Shaw. "Up to 80 percent of all infections are caused by biofilms and are resistant to therapy. We desperately need new anti-

biofilm agents to treat drug resistant bacterial infections like MRSA."

USF chemistry professor Dr. Bill Baker and colleagues have literally gone to the 'ends of the Earth' to help in the fight against MRSA. Baker, who also serves as director of the USF Center for Drug Discovery and Innovation (CDDI), studies the chemical ecology of Antarctica and dives in the frigid waters near Palmer Station to retrieve marine invertebrates, such as sponges, to carry out "natural product isolation," which means drawing out, modifying and testing natural substances that may have pharmaceutical potential.

His group led the effort to extract and characterize chemical structures to create darwinolide from the freeze-dried Antarctic sponges and then test in Shaw's lab to determine its effectiveness against the MRSA bacteria.

"When we screened darwinolide against MRSA we found that only 1.6 percent of the bacterium survived and grew. This suggests that darwinolide may be a good foundation for an urgently needed antibiotic effective against biofilms," said Baker, whose research team "rearranged" the chemical composition of the extracted sponge.

In the last 70 years, despite the discovery and use of antibiotics to treat infections, bacterial disease remains the second-leading cause of death globally, especially among children and the elderly, noted the researchers. In the U.S. alone there are two million hospital acquired infections annually with at least 100,000 deaths, many resulting from bacteria resistant to current antibiotics.

"We suggest that darwinolide may present a highly suitable scaffold for the development of urgently needed, novel, anti-biofilm-specific antibiotics," concluded the researchers.

Provided by University of South Florida

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