From Antarctic's Waters, a Sponge to Wipe MRSA Away

By Lila Abassi — May 18, 2016

Two million Americans become infected with some drug-resistant bacteria annually in the United States and at least 23,000 deaths are attributable to drug resistant infections. Antibiotic resistance is a scourge on the world that can be fatal, and it will be even more so if we don’t devise alternative treatments, or improve our cache of available antibiotics.

Specifically, methicillin-resistant staphylococcal aureus, or MRSA, is one of the most common resistant bacteria we hear about. It is a significant contributor to infections that are tough and very costly to treat. Once largely associated with infections acquired in healthcare settings, MRSA can also be found in the community where many cases of multi-drug and highly virulent strains of MRSA can be found. Although different options exist for the treatment of MRSA, vancomycin remains the antibiotic of choice.

“In recent years, MRSA has become resistant to vancomycin and threatens to take away our most valuable treatment option against staph infections,’ according to Dr. Lindsey N. Shaw, co-author of a study on treating MRSA. “Biofilms, formed by many pathogenic bacteria during infection, are a collection of cells coated in a variety of carbohydrates, proteins and DNA. 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.”

Dr. Shaw’s group, from the University of South Florida, have been conducting research on Antarctic sponges for quite some time and have discovered that one extract in particular, from the sponge Dendrilla membranosa, has proven effective against 98 percent of MRSA bacteria cells in the laboratory. The team investigating this compound have named it “darwinolide.”

A paper published by the same team in 1995, discusses the McMurdo Sound in Antarctica, which is home to a community of sponges, corals, echinoderms and other invertebrates that have learned to thrive in the region's sub-freezing climate with periodic low-light levels. Over 20 years
ago its research revealed that extracts from the existing species contained a variety of bioactive and cytotoxic behavioral and antibiotic properties. Additionally, other laboratories identified the regional marine species as having antineoplastic (cancer fighting) and antiviral activity.

Given that *Dendrilla membranosa* had not been heavily preyed upon served as a clue that it must have some form of chemical protection. The sea star, which was the main regional predator, exhibited avoidance behavior when exposed to extracts of the sponge sample.

“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,” according to Dr. Bill Baker, professor of chemistry at USF.

Hopefully, darwinolide will provide the backbone for new drug development in the fight against MRSA.