

Study: Bacteria on marine sponges can develop capacity to move and inhibit biofilm formation

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(Phys.org)—A new study shows that when enough bacteria get together in one place, they can make a collective decision to grow an appendage and swim away. This type of behavior has been seen for the first time in marine sponges, and could lead to an understanding of how to break up harmful bacterial biofilms, such as plaque on teeth or those found on internal medical devices like artificial heart valves.

Bacteria have ways of communicating with each other, and scientists have now identified a new [signaling system](#) that, when there is a critical mass of bacteria present, causes the bacteria to produce an appendage known as a flagellum that moves like a [corkscrew](#) and gives them the ability to swim away, inhibiting the formation of biofilm.

"Anything we can discover about this bacterial communication could be really important in understanding how bacteria become pathogenic in humans or how they form film on teeth or internal [medical devices](#)," said study co-author Dr. Russell Hill, Director of the Institute of Marine and [Environmental Technology](#) in Baltimore, Maryland. "Understanding that process may help in the future for controlling biofilms."

It is estimated that pound by pound there are more bacteria on the Earth than all other life forms combined. They are simple organisms that consist of one cell and can only be seen through a microscope. However, bacteria have evolved ways to gather into densely populated and slimy

communities called "biofilms," which attach to hard surfaces. They also know how to talk to each other, and can make group decisions about how to behave, called 'quorum sensing.'

Marine sponges in particular harbor complex and diverse [bacterial communities](#), in some cases as much as 30-40% of the sponge's biomass. This high density of bacteria is an ideal place to study signaling, or how bacteria talk to each other using small chemical molecules. Just like in a business meeting, once enough bacteria gather in one place—or a quorum is met—a decision about their collective behavior can be made. This 'quorum sensing' is responsible for a number of cellular processes, including triggering molecular mechanisms that can make the surface of the ocean light up at night and the gathering of bacteria that causes plaque on teeth, otherwise known as biofilm.

The bacteria that colonize and are dependent on these [marine sponges](#) use quorum sensing to activate their locomotion when their population becomes dense, naturally limiting the amount of biofilm they form.

"This precise calibration of the bacterial interactions within the sponge may have evolved to help maintain a healthy, well-distributed symbiotic population," said study coauthor Clay Fuqua of Indiana University.

"Similar mechanisms may be at play in other complex microbial communities within hosts such as those within human intestines and in symbiotic plants

This new study by scientists from the University of Maryland Center for Environmental Science's Institute of Marine and Environmental Technology, Indiana University, and University of Colorado Denver's School of Medicine, is published in the September 2012 issue of *Molecular Microbiology*.

More information: Download the paper [here](#).

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