

Biologist fights deadly gut bacteria, *C. diff*

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A Texas A&M University biologist has received a federal grant to study the fecal samples of hundreds of people to better understand the gut bacteria *Clostridium difficile*—the cause of some 14,000 deaths a year in America—and to help lay the basic science foundation to develop drugs to combat its deadly results.

Joseph Sorg, an assistant professor in the Department of Biology since 2010, is among a wave of younger researchers studying *C. difficile* as it has gained more attention in the U.S. in recent years. These bacteria cause infections primarily during hospital visits, when antibiotics alter the composition of microbial flora in the colon and make patients, most commonly the elderly, vulnerable to infection.

Death can occur in the most severe cases, but more likely, *C. difficile* infection results in severe diarrhea which unleashes into the environment dormant spores that are immune to antibiotic treatment.

Although antibiotics successfully treat the active *C. difficile* infection, patients are left susceptible to recurring infections. Beyond the psychological and physical toll it takes on its victims, *C. difficile* is an economic burden: A 2011 University of Pittsburgh study estimated that costs related to infections exceed \$1.8 billion.

"If you talk to people who have *C. diff* and are relapsing, they are miserable," Sorg said. "We want to make sure that we can eventually treat people and prevent them from relapsing, or even keep them from becoming infected in the first place. *C. diff* is one of the most common

hospital-acquired infections now, so it's a big problem in the U.S. and other industrialized nations."

Sorg and his postdoctoral mentor at Tufts University, Abraham Sonenshein, have started a company to commercialize their research, Spordiff Therapeutics, in an effort to create a drug that would prevent the dormant spores from growing and causing disease, a process called germination. The human body produces two types of signals—two different bile acids—that act on the *C. difficile* spore, one that activates germination and another which inhibits the process.

"What we're interested in doing is trying to develop an inhibitor as a potential drug," Sorg said. "If you inhibit the process of germination, you would completely inhibit the disease."

Sorg and his research group will be working on the recent two-year, \$275,000 National Institutes of Health grant with Sonenshein and Yoav Golan, a clinician at Tufts Medical Center in Boston. The goal of the trio's research is to understand the bile acid composition of various human populations—healthy people, those who have *C. difficile*, and those who have recurring *C. difficile* infection—in order to develop drugs with the potential to inhibit *C. difficile* infection. The human fecal samples will be collected at Tufts Medical Center and shipped to Texas A&M, where Sorg will use his \$80,000 portion of the grant funding to analyze the bile acid composition of the blind samples.

"The microbial flora in a healthy person metabolizes bile acids into secondary bile acids, and these secondary [bile acids](#) are actually toxic to *C. diff* growth," Sorg said. "One of the ways we think that microbial flora inhibits *C. diff* infection is this metabolism. And when you go on antibiotics, the microbial flora that does this metabolism is obliterated. This NIH grant will allow us to correlate a particular bile acid profile with susceptibility to *C. diff* infection."

In addition to research, Sorg has been recognized for teaching, recently earning selection as the 2013-14 recipient of the Montague-CTE Scholar Award for the College of Science. The honor is given to one tenure-track faculty member in each of Texas A&M's 10 academic colleges based on their early ability and interest in teaching. Sorg plans to use the grant to develop an open online course to assess the preparedness of students registering for Biology 351, Fundamentals of Microbiology. He hopes to have the course, which would be open to anyone with a valid Texas A&M NetID, developed by the end of spring.

Sorg received his bachelor's in biochemistry from Purdue University in 2001 before earning a doctorate in microbiology in 2006 from the University of Chicago, where he decided he wanted to study the basic science of *C. difficile*.

"It seemed attractive because there wasn't a whole lot known about it, and it seemed like a good opportunity to go into a field that was young," Sorg said. "I think it's important to study and fund basic research. I wanted to study *C. diff* and just happened to meander down the road of drug possibilities. Without basic research, we wouldn't have been able to go even remotely into the applied side."

Provided by Texas A&M University

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