

# Biofilm researchers help doctors understand, treat chronic wounds

July 15 2019, by Marshall Swearingen

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Like doctors around the world, Randy Wolcott was confounded by diabetic foot ulcers.

When patients would come into his Texas clinic with the small and seemingly harmless sores, caused by the disease restricting blood flow and damaging nerves, the [wounds](#) would often resist traditional antibiotics and refuse to heal. In many cases, infection would spread to the bone and become life-threatening. Wolcott saw firsthand why diabetes is the leading cause of lower-extremity amputations not associated with traumatic injury. And when an amputation caused complications, he saw how the ulcers can, ultimately, result in death.

"Someone who comes in with a diabetic foot [ulcer](#) is more likely to die than someone who comes in with a heart attack," Wolcott said, adding that today's rising incidence of the wounds is a "crisis."

Around 2001, however, Wolcott attended a conference where someone mentioned that the ulcers appeared to involve unique bacterial communities. He found that some researchers had a name for such microbes: [biofilm](#). Then he called Montana State University, one of the few places in the world that specializes in biofilm research, and asked if anyone could help.

Since then, as a result of research at MSU's Center for Biofilm Engineering, "our healing outcomes have increased dramatically," said Wolcott, who will share the latest details of this story at the annual

Montana Biofilm Meeting in Bozeman on July 16-18. The research "has changed not just my practice, it has changed [wound care](#)," he said.

The turning point came in 2008, when Center for Biofilm Engineering researchers and Wolcott's clinic published the results of a study. Using DNA analysis and powerful microscopes, they had analyzed bacteria sampled from diabetic ulcers and similar infected wounds.

"What we found was that the majority of these chronic wounds had biofilm in them," said Center for Biofilm Engineering associate research professor Garth James, the study's lead author. James, who has since authored nearly 30 papers on the subject, will also present at the Montana Biofilm Meeting.

The finding was significant because it explained why the ulcers resisted antibiotics. Biofilms are known to be uniquely adapted to resisting [medical treatment](#) because they form interacting layers, with some bacteria acting as a shield for others.

The 2008 paper "basically created what we now call biofilm-based wound care," according to Wolcott. It gave him the evidence he needed to explore new treatment methods. One, called debridement, involves removing larger areas of tissue from around the wound, a more drastic approach that pays off in long-term recovery. The practice was recommended as one of the best ways to treat chronic wounds by an international expert panel that Wolcott and James served on in 2017.

Chronic wound research in James' Medical Biofilms Lab at MSU has also led to the development of medical products specifically designed to treat biofilm infections, including antimicrobial ointments that are more effective at penetrating and treating biofilms.

"The wound care companies were impressed with the work that was

going on here," said Paul Sturman, who coordinates the center's work with industrial partners. "They sought us out as a resource."

The Montana Biofilm Meeting is the main venue for the center's roughly 30 industrial partners to learn about the latest biofilm research across a wide range of topics. "It's really about letting people know how we think biofilm research can help society," Sturman said.

The 2019 meeting will include a presentation by Joyce Stechmiller, a researcher at the University of Florida who has partnered with James on a five-year wound biofilm study backed by a \$2.7 million grant from the National Institutes of Health. According to James, the study is likely the most comprehensive wound biofilm study to date because it involves 300 patients and a wide range of treatment variables.

According to Wolcott, "there's a lot of work yet to be done" to improve treatment of chronic wounds. Last year alone, he said, diabetic ulcers resulted in roughly 140,000 amputations in the U.S.

Provided by Montana State University

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