

Newly discovered reactions from an old drug may lead to new antibiotics

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A mineral found at health food stores could be the key to developing a new line of antibiotics for bacteria that commonly cause diarrhea, tooth decay and, in some severe cases, death.

The trace mineral selenium is found in a number of proteins in both [bacterial cells](#) and [human cells](#) called selenoproteins. University of Central Florida Associate Professor William Self's research shows that interrupting the way selenoproteins are made can halt the growth of the super bug *Clostridium difficile* and *Treponema denticola*, a major contributor to gum disease.

Infections of *Clostridium difficile* (commonly known as C-diff) lead to a spectrum of illnesses ranging from severe diarrhea to colitis, which can cause death. It's a life-threatening problem in hospitals and nursing homes worldwide, and the number of cases is on the rise. There are an estimated 500,000 cases per year in the United States alone. Between 15,000 to 20,000 people die each year while infected with this superbug. *Treponema denticola* is one of leading causes of gum disease and costs individuals thousands of dollars in dental care each year.

Self's findings are published in the May and June editions of the *Journal of Biological Inorganic Chemistry* and the *Journal of Bacteriology*. The National Institutes of Health and the Florida Department of Health funded the research, which was conducted at UCF during the past three years.

"It's the proof of principle that we are excited about," Self said from his research lab at UCF. "No one has ever tried this approach, and it could potentially be a source for new narrow spectrum [antibiotics](#) that block bacteria that require selenium to grow."

The key discovery occurred when the team found that the gold drug Auranofin, used to treat arthritis, impacted selenium's metabolism process. The chemical reaction changes the selenium, which prevents bacteria from using it to grow. Auranofin is an FDA-approved gold salt compound that is used to control inflammation and is already known to inhibit the activity of certain selenoproteins. Since certain bacteria, such as *C. difficile*, require selenoproteins for energy metabolism, the drug acts as a potent antimicrobial halting the growth of the bacteria.

The initial studies with *C. difficile* led to studies with *T. denticola*, known for several years to require selenium for growth. While testing the gold salt, Self's group also uncovered another surprise; the stannous salts found in many antimicrobial toothpastes in the form of stannous fluoride also inhibited the synthesis of selenoproteins. Previous independent research had already established that stannous salts are more effective at preventing [tooth decay](#) and inhibiting growth of *T. denticola*, but the mechanism of this inhibition of growth was not yet known. These findings could lead to new approaches to preventing [gum disease](#).

"No one has tried to block the metabolism of selenium before as a therapeutic approach," Self said. "That's what's new and exciting and could lead to a whole host of other possibilities, including a better understanding of how the gold salt works for arthritis."

Self said more research is needed, and he already has another grant proposal before the NIH that would move his research forward.

Source: University of Central Florida ([news](#) : [web](#))

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