New insight to Campylobacter sensor structures could lead to targeted antibiotic development

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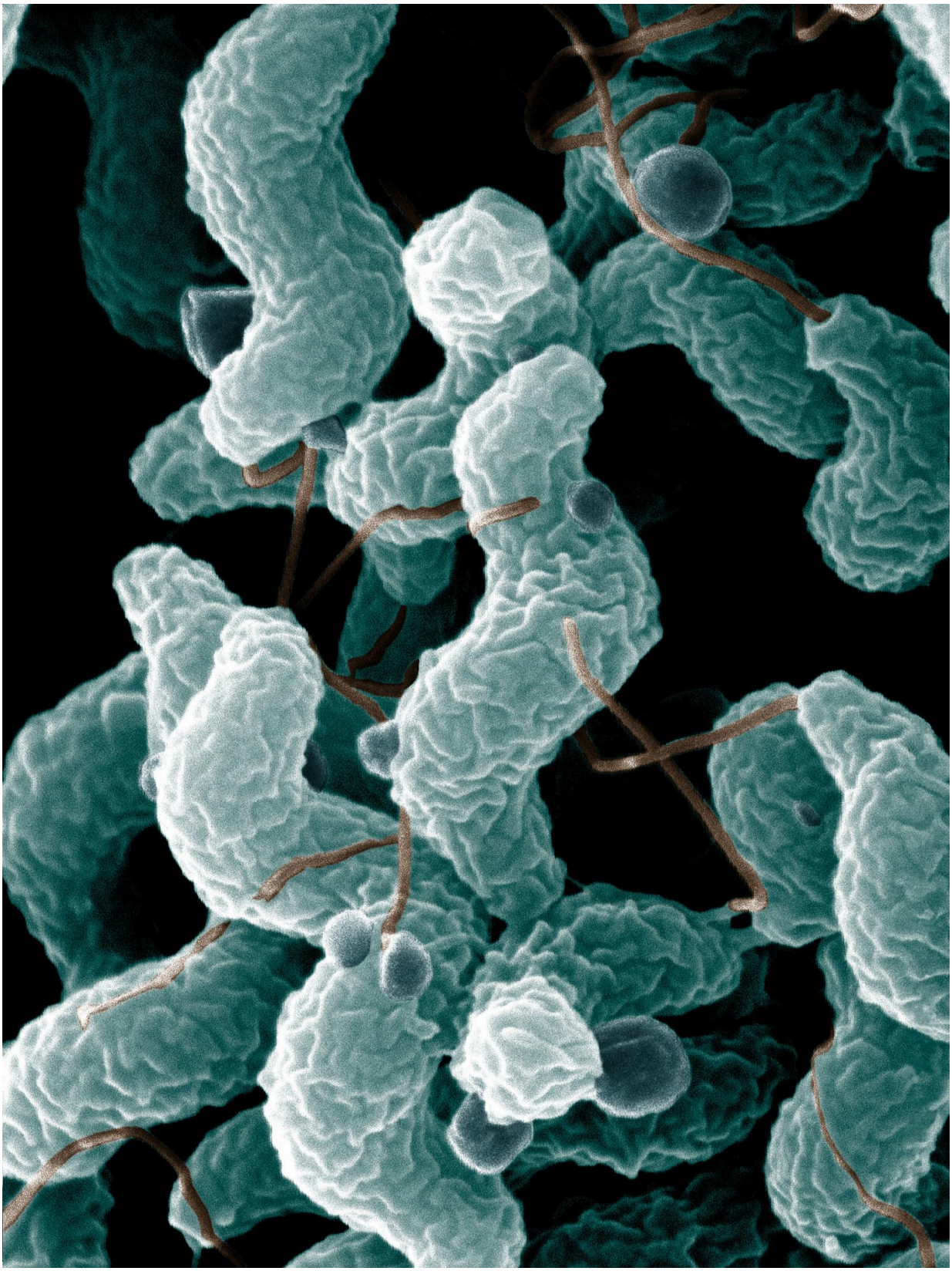

This scanning electron microscope image shows the characteristic spiral, or corkscrew, shape of C. jejuni cells and related structures. Credit: De Wood; digital colorization by Chris Pooley/ Public Domain

Researchers from the Institute of Glycomics have identified a novel bacterial sensor in Campylobacter species that enable the pathogenic cells to find suitable host cells. The findings have been published in *Science Signalling*.

Campylobacter bacteria are the leading cause of food-borne illness, contributing to enteritis and other gastrointestinal distress we commonly identify as "food poisoning." About one percent of the U.S. population are infected with Campylobacter jejuni, the most common species in human infections, each year. The bacteria are common in all food animals but particularly in chicken, and can be contracted from the consumption of undercooked meat or raw milk, as well as through contaminated water or direct contact with livestock.

Campylobacter, like all bacteria, finds its way to the appropriate host cells using sensor structures. The findings of this research reveal a novel "guidance system" for Campylobacter that senses multiple molecules found in human tissue and blood cells, contributing to its high infection rate. "This is a very important finding as sensory structures are very specific to each bacteria and offer high target specificity for design of new antimicrobial compounds," says Professor Victoria Korolik, research leader of microbial glycobiology and communicating author of the published results.

The benefit to understanding the target sensors of bacteria are fairly straightforward: If we know how bacteria are finding their forever homes, we can create pharmaceutical options that target the structures on

the bacteria themselves, thereby rendering them unable to infect and multiply in the appropriate environments. "Essentially, it should be possible to design an antimicrobial drug to target a specific pathogen that will not affect normal flora," Dr. Korolik says.

This is good news on two fronts. Firstly, the destruction of beneficial flora, or the healthy human microbiome, is an unfortunate side effect of broad-spectrum antibiotics. Renewing the gut microbiome following antibiotic courses takes time, and can lead to infections from otherwise benign bacteria, like yeast infections.

Secondly, antimicrobial resistance is a real problem for disease control in an increasingly populous and globalized society, where pathogenic infection can spread rapidly and unchecked without effective treatment. Korolik explains: "Targeting sensory apparatus of microbes also reduces risk of development of antimicrobial resistance, since the bacterial cell will not be killed, but rather have its ability to reach host cells and cause disease disabled."

In the meantime, to avoid Campylobacter infection and other foodborne illnesses like Salmonella and Shigella, be sure to wash your hands regularly with soap and warm water; cook all animal proteins, including eggs and fish, to temperatures recommended by the USDA for safety, and avoid unprocessed dairy or unnecessary contact with food animals.

Campylobacter also populate quickly in water after floods or failures in water infrasstructure that allow sewage or other wastewater to contaminate wells and other water sources. If you suspect your water is the source of campylobacteriosis, follow the CDC guidelines for decontamination: boil all water for at least three minutes prior to consumption, including uses for cooking and handwashing. You can contact your state certification officer for testing of private wells, as well.

More information: Bassam A. Elgamoudi et al. The Campylobacter jejuni chemoreceptor Tlp10 has a bimodal ligand-binding domain and specificity for multiple classes of chemoeffectors, *Science Signaling* (2021). DOI: 10.1126/scisignal.abc8521