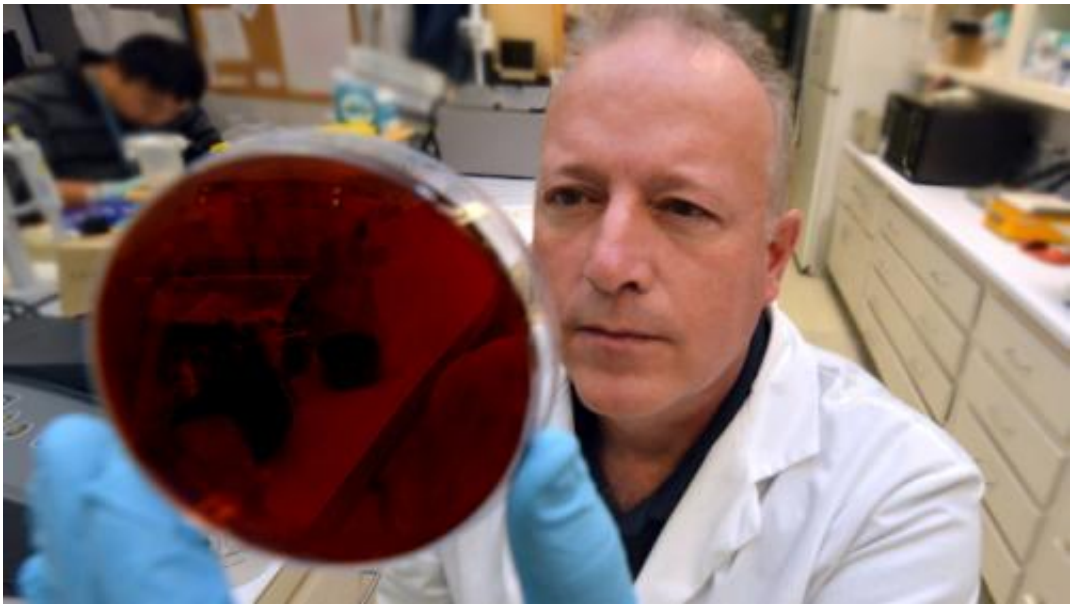
Scientists look to tackle bacterium that is major cause of diarrhea, vomiting

December 19 2013



Dr. Stuart A. Thompson, microbiologist at the Medical College of Georgia.at Georgia Regents University. Credit: Phil Jones

Scientists want to make a chink in the armor of a bacterium that has little name recognition yet is the number-one bacterial cause of the diarrhea, vomiting and stomach pain Americans experience annually.

While Salmonella is likely quicker to sound an alarm, infection with *Campylobacter jejuni* is at least 25 times more common. Americans report about 42,000 cases of Salmonella sickness each year compared

with approximately 1.3 million cases of *Campylobacter infection*, according to the Centers for Disease Control and Prevention.

Chickens and other birds are a major source for both, and, as is becoming the norm, antibiotic resistance is a problem in treating either infection, said Dr. Stuart A. Thompson, microbiologist at the Medical College of Georgia.at Georgia Regents University.

"We are looking for a way to make *Campylobacter* more vulnerable," said Thompson, who just received a $1.5 million grant from the National Institutes of Health to learn more about the fascinating film that helps protect *Campylobacter*.

It's called biofilm, a slimy sugar coating made by bacteria and fungi that coats teeth overnight and leaves a pink ring in rarely used toilets. "Any standing water that goes down and leaves that ring, that is biofilm," Thompson said. In fact, that is basically how scientists grow biofilm in the lab.

However gross if may sound, biofilm is likely super-attractive to bacteria, which use it to deal with excess oxygen or to huddle and hibernate when nutrition is scarce. It's also hard for antibiotics to penetrate and handy in helping bacteria avoid more natural enemies like antibodies and free radicals.

"We are studying how biofilm formation is regulated," said Thompson, who wants to know the primary sugar *Campylobacter* uses to make its biofilm and how the regulatory protein, CsrA, helps.

"If we know what the sugar is, maybe we can come up with an inhibitor that essentially dissolves it," Thompson said. That approach could be used, as examples, to reduce the *Campylobacter* population in chickens, and/or to reduce antibiotic resistance in infected humans.

Thompson is working with Drs. Artur Muszynski and Russ Carlson at the University of Georgia Complex Carbohydrate Research Center to identify the primary sugar c uses to make biofilm. The new grant will help him analyze the biochemical pathway used to make the sugar and look at CsrA's role in regulating that biochemical process. He believes it's substantial.

When Thompson's research team removes CsrA, *Campylobacter* struggles to move, stick to the gastrointestinal track, stick to each other and colonize, resist oxidative stress or make biofilm. "In a normal cell, CsrA appears to promote all those features," he said.

The crux may be the tail, called the flagellum, which enables movement of the comma-shaped bacterium. The sticky tails also enable bacterium to stick together, which is when they start making sugar and, eventually, biofilm, so they can survive. "We are trying to figure out how CsrA regulates motility and, ultimately, biofilm formation," he said.

Thompson notes that different bacteria use different sugars to make biofilm and that they also use a lot of sugar internally. "They need sugar for all their metabolic pathways; they will take it up, then convert it to different molecules they need."

Campylobacter thrives comfortably in the intestines of chickens and other birds and is found in their excrement, which is one way the bacterium ends up in bodies of water and one reason *Campylobacter infections* tend to increase during the summer. Indoors, most infections occur from eating undercooked poultry or from cross-contamination that can occur when raw poultry and other foods are prepared on the same surface.

Provided by Medical College of Georgia