# Natural carbohydrate shows promise as weapon against food poisoning

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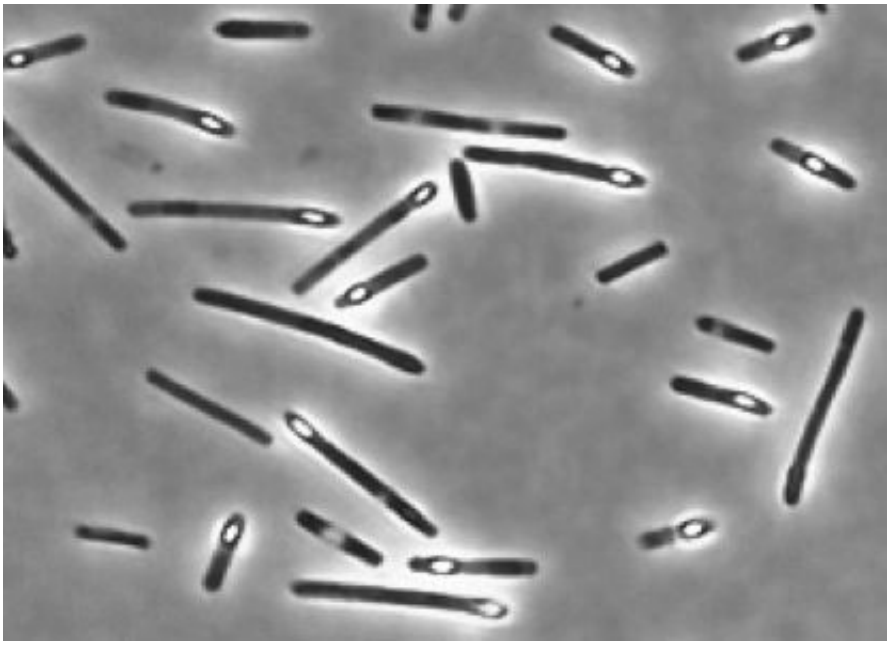

Clostridium perfringens cells. Credit: Oregon State University

Chitosan, a natural carbohydrate derived from crustacean shells, is showing promise as a weapon against a bacterium that annually sickens more than a million people in the United States.

After salmonella poisoning, the second-most common bacterial foodborne illness in the U.S. is Clostridium perfringens food poisoning.

Present in soil, decaying vegetation and the intestinal tracts of

vertebrates, C. perfringens typically infects humans when they eat meat that hasn't been thoroughly cooked or properly stored, allowing the bacteria to multiply.

Symptons of C. perfringens food poisoning include abdominal pain, stomach cramps, diarrhea and nausea; patients often mistake it for a 24-hour flu.

"People aren't dying, but they're getting sick," said Oregon State University researcher Mahfuzur Sarker. "And many times people don't report it, so there are likely way more people getting infected than we know about."

Sarker and OSU graduate student Maryam Alnoman were part of an international collaboration that studied the effect of chitosan on C. perfringens. Chitosan is a linear polysaccharide that results from treating the exoskeletons of shrimp and other crustaceans with an alkaline compound.

The tests involved both laboratory growth medium – bacteria in solution – and cooked, contaminated chicken meat left for several hours at 98.6 degrees Fahrenheit. The study looked at the full life cycle of the C. perfringen bacterium, which produces tough, metabolically dormant spores that are able to survive many food processing approaches.

Results were recently published in *Food Microbiology*.

The researchers found chitosan blocked C. perfringens growth in cooked chicken and also found chitosan inhibits:

- Spore germination and outgrowth;
- The spore core from releasing dipicolinic acid, which is associated with an early step of spore germination;

- The growth of vegetative cells – cells that are actively growing as opposed to producing spores.

"In lab conditions, low concentrations of chitosan were effective," said Sarker, professor of microbiology in OSU's colleges of science and veterinary medicine. "In meat, the concentration needs to be higher because there are a lot of ingredients in the cooked meat that can inhibit the activity of the antimicrobial chemicals.

"But the larger dose of 3 milligrams per gram of food is still a good dose that can be used in making food products. This is the first time chitosan was shown to work consistently both in lab conditions and in chicken meat."

Sarker said the next steps are researching chitosan's effectiveness in other types of meat and meat products and optimizing the conditions for using it. It's possible, for example, that chitosan may work best when combined with other food preservative chemicals such as sorbate and benzoate.

"It could be a combination of multiple agents," he said "There are options we can try."

**More information:** Maryam Alnoman et al. Chitosan inhibits enterotoxigenic Clostridium perfringens type A in growth medium and chicken meat, *Food Microbiology* (2017). DOI: 10.1016/j.fm.2016.11.019

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