A zap of cold plasma reduces harmful bacteria on raw chicken

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A new study by food safety researchers at Drexel University demonstrates that plasma can be an effective method for killing pathogens on uncooked poultry. The proof-of-concept study was published in the January issue of the *Journal of Food Protection*.

Although recent high-profile outbreaks of foodborne illness have involved contaminated fresh produce, the most common source of harmful bacteria in food is uncooked poultry and other meat products. The bacteria responsible for most foodborne illnesses, *Campylobacter* and *Salmonella*, are found on upwards of 70 percent of chicken meat tested.

Treating raw meat products to remove pathogens before they reach a consumer's home can reduce the risk of cross contamination during food preparation, according to senior author Dr. Jennifer Quinlan, an assistant professor in Drexel's College of Nursing and Health Professions. "If you could reduce contamination on the raw chicken, then you wouldn't have it in the kitchen," Quinlan said.

Past studies have shown that plasma could successfully reduce pathogens on the surface of fruits and vegetables without cooking them.

The value of using plasma "is that it is non-thermal, so there is no heat to cook or alter the way the food looks," said lead author Brian Dirks, a graduate student in the College of Arts and Sciences. Dirks and Quinlan worked with researchers from the University's Anthony J. Drexel Plasma

Institute to test the use of plasma for poultry.

In the Drexel study, raw chicken samples contaminated with Salmonella enterica and *Campylobacter jejuni* bacteria were treated with plasma for varying periods of time. Plasma treatment eliminated or nearly eliminated bacteria in low levels from skinless chicken breast and chicken skin, and significantly reduced the level of bacteria when contamination levels were high.

The researchers also tested using plasma to treat samples of bacteria grown on agar, and demonstrated that antibiotic-resistant strains of bacteria were as susceptible to plasma as the wild-type strains.

Plasma, known as the "fourth state of matter" (after solid, liquid and gas), is a high-energy, charged mixture of gaseous atoms, ions and electrons. Plasma has a wide range of potential applications including energy production and control, biomedical treatments and environmental remediation.

Quinlan described the plasma treatment of poultry in this study as "proof of concept." Current plasma technology is expensive relative to the narrow cost margins involved in food production, and the technology is not currently being developed for processing poultry on a large scale.

If plasma technology becomes cost-effective for use in treating poultry, it may be used in conjunction with existing methods to reduce pathogens, Dirks said, and it may also help prolong the shelf-life of raw chicken if it can be honed to remove more microorganisms responsible for spoilage.

"Until these technologies are more fully developed, consumers should assume that raw poultry has pathogens on it and take care to prevent infection," Quinlan said. "That means cooking thoroughly and making

sure not to cross contaminate when handling uncooked meat and poultry."

Quinlan holds a a Ph.D. in food microbiology from North Carolina State University and bachelor's and master's degrees in food science from Rutgers University. Her research focuses on the microbiological quality and safety of food. Her ongoing work focuses on safe consumer handling of food.

The A.J. Drexel Plasma Institute recently received a $1 million grant from the W.M. Keck Foundation to expand its plasma research.

More information: Dirks, B.P., Dobrynin, D., Fridman, G., Mukhn, Y., Fridman, A., & Quinlan, J.J. Treatment of Raw Poultry with Nonthermal Dielectric Barrier Discharge Plasma To Reduce Campylobacter jejuni and Salmonella enterica. *Journal of Food Protection*. DOI: 10.4315/0362-028X.JFP-11-153

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