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E. coli

Inactivation of Escherichia coli O157 Bacteriophages by Using a Mixture of Ferrous Sulfate and Tea Extract

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Link to full text: [Click here](#)

Significance: Use of a virucide for phage inactivation is recommended to improve the accuracy of evaluations of phage efficacy for biocontrol of E. coli O157.

The ability of virucidal solution containing a mixture of ferrous sulfate [iron(II) sulfate, FeSO₄] and tea extract [Fe(II)T] to inactivate residual T5-like, T1-like, T4-like, and rV5-like phages was assessed using Escherichia coli O157 as the host. At concentrations of ≥ 10 mM FeSO₄, all phages were not detected after 20 min in a broth culture model. Compared with the virucidal solution-free samples (1 to 96% recovery), Fe(II)T (10 mM FeSO₄ plus 15% tea extract) recovered a greater ($P < 0.01$) number of E. coli O157 from phage-treated broth culture (97 to 100% recovery) and beef samples (52 to 100% recovery). Moreover, with the addition of Fe(II)T, the number of bacteria surviving after exposure to T5-like or T4-like phages was greater ($P < 0.01$) than that after exposure to T1-like or rV5-like phages.

Salmonella

Effect of Product Dimensions and Surface Browning Method on Salmonella Contamination in Frozen, Surface-Browned, Breaded Chicken Products Treated with Antimicrobials

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Significance: Data from this study may be useful for the selection of antimicrobials, product dimensions, and surface browning methods for reducing Salmonella contamination.

Not-ready-to-eat breaded chicken products formulated with antimicrobial ingredients were tested for the effect of sample dimensions, surface browning method and final internal sample temperature on inoculated Salmonella populations. Fresh chicken breast meat portions (5×5×5 cm), inoculated with Salmonella (7-strain mixture; 5 log CFU/g), were mixed with (5% v/w total moisture enhancement) (i) distilled water (control), (ii) caprylic acid (CAA; 0.0625%) and carvacrol (CAR; 0.075%), (iii) CAA (0.25%) and ϵ -polylysine (POL; 0.5%), (iv) CAR (0.15%) and

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POL (0.5%), or (v) CAA (0.0625%), CAR (0.075%) and POL (0.5%). Sodium chloride (1.2%) and sodium triphosphate (0.3%) were added to all treatments. The mixtures were ground and formed into 9×5×3 cm (150 g) or 9×2.5×2 cm (50 g) portions. The products were breaded, browned in an oven (208°C, 15 min) or deep fryer (190°C, 15 s), packaged, and stored at -20°C (8 d). Overall, maximum internal temperatures of 62.4±4.0°C (9×2.5×2 cm) and 46.0±3.0°C (9×5×3 cm) were reached in oven-browned samples, and 35.0±1.1°C (9×2.5×2 cm) and 31.7±2.6°C (9×5×3 cm) in fryer-browned samples. Irrespective of formulation treatment, total (after frozen storage) reductions of Salmonella were greater for 9×2.5×2 cm oven-browned samples (3.8 to at least 4.6 log CFU/g) than for 9×5×3 cm oven-browned samples (0.7 to 2.5 log CFU/g). Product dimensions did not affect Salmonella reductions (0.6 to 2.8 log CFU/g) in fryer-browned samples. All antimicrobial treatments reduced Salmonella to undetectable levels (<0.3 log CFU/g) in oven-browned 9×2.5×2 cm samples.

Effects of Domestic Storage and Thawing Practices on Salmonella in Poultry-Based Meat Preparations

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Significance: Domestic storage and thawing practices can affect food safety, and time-temperature abuse can cause a substantial increase of Salmonella numbers in some types of poultry-based meat preparations.

This study performed storage tests of burgers, sausages, and kebabs and investigated (i) the effect of refrigerator temperatures (4°C versus 8 or 12°C), with or without prior temperature abuse (25°C for 2 h), and (ii) the impact of the thawing method (overnight in the refrigerator at 8°C versus on the kitchen countertop at 23°C) on the presence and numbers of Salmonella bacteria. Storage tests were carried out on naturally or artificially (Salmonella enterica serovar Typhimurium at ca. 10 CFU/g) contaminated products, while freezing-thawing tests were conducted only on artificially contaminated products (Salmonella Typhimurium at ca. 10, 100, and 1,000 CFU/g). Artificially contaminated products showed significant growth of Salmonella Typhimurium at 12°C (i.e., from ca. 8 most probable number [MPN]/g to > 710 MPN/g) in kebabs after 7 and 10 days but more moderate growth in sausages (i.e., from ca. 14 MPN/g to a maximum of 96 MPN/g after 9 days of storage). Storage of naturally contaminated burgers or sausages (contamination at or below 1 MPN/g) at 4, 8, or 12°C and a short time of temperature abuse (2 h at 25°C) did not facilitate an increase in the presence and numbers of Salmonella bacteria. Thawing overnight in the refrigerator led to either a moderate reduction or no change of Salmonella Typhimurium numbers in burgers, sausages, and kebabs.

Microbiological Safety of Commercial Prime Rib Preparation Methods: Thermal Inactivation of Salmonella in Mechanically Tenderized Rib Eye

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Link to full text: [Click here](#)

Significance: Cooking at low temperatures and extended holding at relatively low temperatures may pose a food safety risk to consumers in terms of inadequate lethality and/or subsequent outgrowth of Salmonella.

Boneless beef rib eye roasts were surface inoculated on the fat side with ca. 5.7 log CFU/g of a five-strain cocktail of Salmonella for subsequent searing, cooking, and warm holding using preparation methods practiced by some restaurants. A portion of the inoculated roasts was then passed once through a mechanical blade tenderizer. For both intact and nonintact roasts, searing for 15 min at 260°C resulted in reductions in Salmonella populations of ca. 0.3 to 1.3 log CFU/g. For intact (nontenderized) rib eye roasts, cooking to internal temperatures of 37.8 or 48.9°C resulted in additional reductions of ca. 3.4 log CFU/g. For tenderized (nonintact) rib eye roasts, cooking to internal temperatures of 37.8 or 48.9°C resulted in additional reductions of ca. 3.1 or 3.4 log CFU/g, respectively. Pathogen populations remained relatively unchanged for intact roasts cooked to 37.8 or 48.9°C and for nonintact roasts cooked to 48.9°C when held at 60.0°C for up to 8 h. In contrast, pathogen populations increased ca. 2.0 log CFU/g in nonintact rib eye cooked to 37.8°C when held at 60.0°C for 8 h.

Norovirus

Application of Water-Assisted Ultraviolet Light Processing on the Inactivation of Murine Norovirus on Blueberries

C. Liu, X. Li, H. Chen

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Link to full text: [Click here](#)

Significance: Water-assisted UV treatment could be used as an alternative to chlorine washing for blueberries and potentially for other fresh produce.

A novel set-up using water-assisted UV processing was developed and evaluated for its decontamination efficacy against murine norovirus (MNV-1) inoculated on fresh blueberries for both small and large-scale experimental setups. Blueberries were skin-inoculated with MNV-1 and treated for 1–5 min with UV directly (dry UV) or immersed in agitated water during UV treatment (water-assisted UV). The effect of the presence of 2% (v/v) blueberry juice or 5% crushed blueberries (w/w) in wash water was also evaluated. Results showed that water-assisted UV treatment generally showed higher efficacies than dry UV treatment. With 12,000 J/m² UV treatment in small-scale setup, MNV reductions of > 4.32- and 2.48-log were achieved by water-assisted UV and dry UV treatments, respectively. Water-assisted UV showed similar inactivating efficacy as 10-ppm chlorine wash. No virus was detected in wash water after UV treatment or chlorine wash. MNV-1 was more easily killed on skin-inoculated blueberries compared with calyx-inoculated berries. When clear water was used as wash water in the large-scale setup, water-assisted UV treatment (UV dose of 12,000 J/m²) resulted in > 3.20 log and 1.81 log MNV-1 reductions for skin- and calyx-inoculated berries, respectively. The presence of 2% blueberry juice in wash water decreased the decontamination efficacy of water-assisted UV and chlorine washing treatments.



Foodborne Pathogens

Meta-analysis of the Effects of Sanitizing Treatments on Salmonella, Escherichia coli O157:H7, and Listeria monocytogenes Inactivation in Fresh Produce

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Significance: Slightly acidic electrolyzed water, acidified sodium chlorite, and the gaseous chlorine dioxide clustered together, possessed the strongest bactericidal effect for sanitizing fresh produce.

The aim of this study was to perform a meta-analysis of the effects of sanitizing treatments of fresh produce on *Salmonella* spp., *Escherichia coli* O157:H7, and *Listeria monocytogenes*. From 55 primary studies found to report on such effects, 40 were selected based on specific criteria, leading to more than 1,000 data on mean log reductions of these three bacterial pathogens impairing the safety of fresh produce. Moderating variables assessed in the meta-analytical models included type of fresh produce, type of sanitizer, concentration, and treatment time and temperature. The results indicated that both time and temperature significantly affected the mean log reductions of the sanitizing treatment ($P < 0.0001$). Sanitizer treatments led to lower mean log reductions when applied to leafy greens (e.g., 0.68 log reductions [0.00 to 1.37] achieved in lettuce) compared to other, nonleafy vegetables (e.g., 3.04 mean log reductions [2.32 to 3.76] obtained for carrots). Among the pathogens, *E. coli* O157:H7 was more resistant to ozone (1.6 mean log reductions), while *L. monocytogenes* and *Salmonella* presented high resistance to organic acids, such as citric acid, acetic acid, and lactic acid (~3.0 mean log reductions).



Biopreservative Methods to Control the Growth of Foodborne Pathogens on Fresh-Cut Lettuce

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Significance: This study highlighted the potential of biocontrol, but the combination with other technologies may be required to improve their application on fresh-cut lettuce.

The first objective of this study was to isolate native microbiota from whole and fresh-cut produce and to determine whether *Escherichia coli* O157:H7, *Salmonella* and *Listeria monocytogenes* were antagonistic toward foodborne pathogens. A total of 112 putative antagonist isolates were screened for their ability to inhibit the growth of *Salmonella enterica* on lettuce disks. Five different genera reduced *S. enterica* growth more than 1-log unit at 20°C at the end of 3 days. When tested against *L. monocytogenes* 230/3, only *Pseudomonas* sp. strain M309 (M309) was able to reduce pathogen counts by more than 1-log unit. Therefore, M309 strain was selected to be tested on lettuce disks at 10°C against *S. enterica*,

E. coli O157:H7 and *L. monocytogenes*. M309 strain was only able to reduce *S. enterica* and *E. coli* O157:H7 populations. The second objective was to test different biopreservative methods including M309 strain, *Pseudomonas graminis* CPA-7 (CPA-7), bacteriophages (Listex P100 and Salmonex) and nisin at conditions simulating commercial applications against *Salmonella* and *L. monocytogenes* on fresh-cut lettuce. The addition of the biopreservative agents did not result in a significant reduction of *Salmonella* population. However, CPA-7 strain together with nisin reduced *L. monocytogenes* numbers after 6 days of storage at 10°C. The cocktail of *Salmonella* and *L. monocytogenes* was not markedly inactivated by their respective bacteriophage solutions.

Caffeine

Caffeine Intake in Pregnancy: Relationship Between Internal Intake and Effect on Birth Weight

F. Partosch, H. Mielke, R. Stahlmann, U. Gundert-Remy

Food and Chemical Toxicology, Vol. 86, December 2015; pp. 291–297, 2015

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Significance: The reduction in birth weight was related to the AUC and peak concentration up to a dose of 250 mg caffeine.

We used a physiologically based kinetic model to simulate caffeine blood concentration-time profiles in non-pregnant and pregnant women. The model predicted concentration-time profile was in good accordance with experimental values. With 200 mg, the safe dose per occasion in non-pregnant women, AUC and peak concentration in pregnant women were nearly twice that of non-pregnant women. In order to derive a safe dose for the pregnant women, we estimated the dose in the pregnant women model taken at once which would not exceed AUC and peak concentration in the non-pregnant women of 200 mg as single dose. The resulting dose is 100 mg caffeine per occasion, which we recommend as safe. The caffeine dose of 200 mg per day is declared as safe for pregnant women with respect to the foetus by EFSA based on results on reduced birth weight in epidemiological studies. We modelled AUC and peak concentration for different caffeine doses to investigate the relationship between internal caffeine exposure and risk measures of reduced birth weight from epidemiological studies.

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