

Listeria

Synergic Antimicrobial Activity of Lysozyme, Nisin, and EDTA against *Listeria Monocytogenes* in Ostrich Meat Patties

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Significance: Great interest is developing in food bio-preservation because of the ever-increasing needs to protect consumers' health and to valorize the naturalness and safety of food products.

Synergic antimicrobial activity of lysozyme (250 ppm), nisin (250 ppm), and disodium ethylenediamine tetraacetic acid (EDTA) (20 mM) against *Listeria monocytogenes* and meat-borne spoilage bacteria in ostrich patties packaged in air and vacuum was studied. The antimicrobial treatment decreased the *L. monocytogenes* population in ostrich patties below the official limit of the European Union (<2 log CFU/g). The total viable counts for the treated samples (air and vacuum) showed a reduction of 1 log cycle until to 2 d of storage. Moreover, the reduction of 2 log cycle for the lactic acid bacteria was observed. The ostrich patties packaged in vacuum had a desirable odor during the storage time and were not affected by antimicrobial treatment. The off-odors for the patties packaged in air developed faster in the control while the odor scores for the treated samples remained above the rejection point up to the end of storage.

Salmonella

Recovery of *Salmonella enterica* Serovars Typhimurium and Tennessee in Peanut Butter after Electron Beam Exposure

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Significance: *Salmonella* Tennessee and *Salmonella* Typhimurium will survive in peanut butter when exposed to nonlethal doses of e-beam irradiation.

The effect of electron beam (e-beam) radiation on the recovery of *Salmonella* serotypes Tennessee (ATCC 10722) and Typhimurium (ATCC 14028) in creamy peanut butter over a 14-d storage period at 22 °C was studied. Each *Salmonella* type was independently inoculated into peanut butter and subjected to e-beam doses that ranged from 0–3.1 kGy. After 2-, 4-, 6-, 8-, and 14-d of storage, microbial analyses were conducted. When samples were not e-

beam-treated, there were no significant changes ($P>0.05$) in microbial numbers over time. In e-beamed samples, microbial numbers decreased over time; however, reductions were not always significant. Initial recovery rates (R-rates) 2-d after e-beam treatment were significantly different for the 2 strains of *Salmonella* and between recovery media ($P<0.05$); however, these differences did not persist for the remainder of the storage period ($P>0.05$) indicating that injured cells were not able to survive in the high-fat, low-water activity peanut butter environment. R-rates for both strains of *Salmonella* were maintained until day 14 when there were significant reductions in *Salmonella* Typhimurium ($P<0.05$).

Qualitative Map of *Salmonella* Contamination on Young Chicken Carcasses

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Significance: Whole-carcass incubation succeeded by characterization of multiple isolates per carcass is needed to properly assess and manage this risk to public health.

This study mapped the distribution of *Salmonella* on 70 young chicken carcasses (Cornish game hen) to improve poultry inspection and food safety. Carcasses were aseptically sectioned into 12 parts, and then *Salmonella* was isolated from whole-part incubations. *Salmonella* incidence was 21.5% (181 of 840) for parts and 57.1% (40 of 70) for carcasses. The number of contaminated parts/carcass ranged from 0-12, with a mean of 4.5 among contaminated carcasses. *Salmonella* incidence differed among parts with rib back (38.6%) and sacral back (34.3%) being the most contaminated. There were 37/40 different patterns of contamination among parts. Of the 33 carcasses with >1 contaminated part, 12.1% contained two serotypes, 33.3% contained ≥ 2 antibiotic resistance profiles, and 100% contained ≥ 2 PFGE patterns. The most common serotype was Typhimurium (94.5%), and most (97.2%) isolates were resistant to multiple antibiotics.

The Prevalence of Multidrug Resistance Is Higher among Bovine than Human *Salmonella enterica* Serotype Newport, Typhimurium, and 4,5,12:i:- Isolates in the United States but Differs by Serotype and Geographic Region

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Applied and Environmental Microbiology, Vol. 76, No. 17; pp. 5947-5959, 2010

Link to full text: <http://aem.asm.org/cgi/content/full/76/17/5947>

Significance: Cattle are an important reservoir of multidrug-resistant *Salmonella* infections in humans.

Salmonella isolates from cattle and humans in the Pacific Northwest and Northeast were characterized using three common subtyping methods (pulsed-field gel electrophoresis [PFGE], multilocus variable number of tandem repeat analysis [MLVA], and multilocus sequence typing [MLST]). The distribution of antimicrobial resistance between human and cattle *Salmonella* isolates from the two study areas was analyzed, and *Salmonella* persistence on

individual dairy farms was characterized. For both *Salmonella enterica* subsp. *enterica* serotypes Newport and Typhimurium, multidrug resistance (MDR) was found to be significantly associated with bovine origin of isolates, with the odds of MDR for Newport isolates from cattle approximately 18 times higher than for Newport isolates from humans. Isolates from the Northwest were significantly more likely to be MDR than those from the Northeast, and susceptible and resistant isolates appeared to represent distinct *Salmonella* subtypes. Strain diversification during *Salmonella* persistence on farms was detected. While discriminatory power was serotype dependent, the combination of PFGE data with either MLVA or resistance typing data consistently allowed for improved subtype discrimination.

Effect of Temperature and Time of Storage on Protein Stability and Anti-*Salmonella* Activity of Egg White

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Significance: The fluctuation in anti-*Salmonella* activity of egg white could not be related to any variation of trypsin-like, chymotrypsin-like, or gelatinolytic activities that potentially account for degradation of antimicrobial egg white proteins.

This study analyzed the potential of egg white to inhibit growth of *Salmonella enterica* serovar Enteritidis following storage at 4, 20, or 37°C for 30 days prior to inoculation. Egg white displayed higher anti-*Salmonella* activity after a few days of storage at 20 and 37°C. The rate of increase in activity was more rapid and pronounced at the higher temperature. However, egg white stored at 20°C retained higher antimicrobial activity than that of egg white stored at 4 or 37°C. In contrast, storage of egg at 37°C for >14 days reduced the bacteriostatic potential of egg white. There was a correlation between pH and the antimicrobial activity of egg white. Moreover, diminished antimicrobial activity was associated with degradation of ovalbumin and ovotransferrin, as assessed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis and mass spectrometry.

Occurrence and Antimicrobial Resistance Profiles of *Salmonella* Species in Retail Meat Products

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Significance: A majority of the 50 *Salmonella* strains were multiresistant to three or more antimicrobial agents.

A total of 225 retail meat products (poultry meat, ground beef, and beef samples) were tested for the prevalence of *Salmonella*. Of these, 22.2% were positive for *Salmonella*. The pathogen was detected in 29.3% samples of poultry meat, 21.3% samples of ground beef, and 16% samples of beef. The most common isolate was *Salmonella enterica* serovar Typhimurium (9.8%), followed by *S. bongori* species (8.9%) and *S. enterica* subsp. *diarizonae* (3.5%). The *Salmonella* strains isolated were also examined for antimicrobial resistance patterns and production of β -lactamase

enzyme. None of the strains exhibited resistance to cefotaxime, ciprofloxacin, norfloxacin, or levofloxacin. However, the highest resistance rates in the meat isolates were 64% each for ampicillin and cephalosporin and 56% for amoxicillin-clavulanic acid. The exhibited multiple resistance to four or more antimicrobial drugs was 32%.

E. Coli

Effect of Storage Temperature and Duration on the Behavior of *Escherichia coli* O157:H7 on Packaged Fresh-Cut Salad Containing Romaine and Iceberg Lettuce

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Significance: Maintaining fresh-cut products at 5°C or below is critical for reducing the food safety risks as *E. coli* O157:H7 grows at a rapid, temperature-dependent rate prior to significant quality deterioration.

The impact of storage temperature and duration on the fate of *Escherichia coli* O157:H7 (*E. coli*) on commercially packaged fresh-cut Romaine and Iceberg lettuce salads of different commercial brands and on product quality was investigated. The package was cut open at one end and the lettuce was inoculated with *E. coli* via a fine mist spray and resealed with or without an initial N₂ flush to match the original package atmospheric levels. The products were stored at 5 and 12°C until their labeled “Best If Used By” dates. Storage at 5°C allowed *E. coli* to survive, but limited its growth, whereas storage at 12°C facilitated the proliferation of *E. coli*. There was >2.0 log CFU/g increase in *E. coli* populations on lettuce when held at 12°C for 3-days, followed by additional growth during the remainder of the storage period. The quality of lettuce held at 12°C was fully acceptable when *E. coli* growth reached a statistically significant level.

Non-O157 Shiga Toxin-Producing *Escherichia coli* in Foods

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Significance: This review article discusses the public health significance of non-O157 STEC and the implications for industry practices and regulatory actions.

Non-O157 Shiga toxin-producing *Escherichia coli* (STEC) strains have been linked to outbreaks and sporadic cases of illness worldwide. Illnesses linked to STEC serotypes other than O157:H7 appear to be on the rise in the United States and worldwide. Some cases of non-O157 STEC illness appear to be as severe as cases associated with O157. There is much variation in virulence potential within STEC serotypes. Of >400 serotypes isolated, <10 serotypes cause the majority of STEC-related human illnesses. Various virulence factors are involved in non-O157 STEC pathogenicity; the combined presence of both *eae* and *stx* genes has been associated with enhanced virulence. Several laboratories have attempted to develop detection and identification methods; a practical method of STEC

detection has yet to be validated. Foods associated with non-O157 STEC illness include sausage, ice cream, milk, lettuce, etc. Several studies suggest that control measures for O157 may be effective for non-O157 STEC.

Foodborne Pathogens

Development and Validation of a Predictive Model for Foodborne Pathogens in Ready-to-Eat Pork as a Function of Temperature and a Mixture of Potassium Lactate and Sodium Diacetate

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Significance: The LT and GR growth models can be used for the development of tertiary models for *Salmonella* Typhimurium and *S. aureus* in cooked-pressed RTE pork in the matrix of conditions described in this study.

This study developed and validated secondary models that can predict growth parameters of *Salmonella* Typhimurium and *Staphylococcus aureus* in cooked-pressed ready-to-eat (CP-RTE) pork as a function of concentrations (0-3%) of a commercial potassium lactate and sodium diacetate mixture (PL+SDA) and temperature (10-30°C). At 10°C, the growth of *Salmonella* Typhimurium and *S. aureus* in CP-RTE pork containing 2% and 3% PL+SDA was completely inhibited. The effects of temperature and concentration of PL+SDA on the growth kinetics of *Salmonella* Typhimurium and *S. aureus* in CP-RTE pork were modeled by response surface analysis using polynomial models of the natural logarithm transformation of both LT and GR. Model performance was also evaluated by use of the prediction bias (B_p) and accuracy (A_p) factors, median relative error, and mean absolute relative error, as well as the acceptable prediction zone method. Results showed that LT and GR models of *Salmonella* Typhimurium and *S. aureus* in CP-RTE pork are acceptable models.

Thermal Inactivation of Heat-Shocked *Escherichia coli* O157:H7, *Salmonella*, and *Listeria monocytogenes* in Dairy Compost

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Significance: Heat-shocked pathogens may have extended survival at lethal temperatures attained during the composting process.

Thermal resistance of heat-shocked *Escherichia coli* O157:H7 (*E. coli*), *Salmonella*, and *Listeria monocytogenes* was compared with that of non-heat-shocked (control) strains in finished dairy compost. A three-strain mixture of each pathogen was heat shocked at 47.5°C for 1-hr and inoculated into the compost at a final concentration of 10^7 CFU/g. The heat-shocked *E. coli*, *Salmonella*, and *L. monocytogenes* survived better at 50°C, with reductions of 2.7, 3.2, and 3.9 log CFU/g within 4-hrs vs. reductions of 3.6, 4.5, and 5.1 log CFU/g, respectively, in control cultures. The heat-shocked cultures of *E. coli*, *Salmonella*, and *L. monocytogenes* had 1.2-, 1.9-, and 2.3-log reductions,

respectively, within 1-hr at 55°C, whereas the corresponding control cultures had 4-, 5.6-, and 4.8-log reductions, respectively. At 60°C, a rapid population reduction was observed during the come-up time of 14-min in control cultures of *E. coli*, *Salmonella*, and *L. monocytogenes* with 4.9-, 4.8-, and 2.3-log reductions, respectively, vs. 2.6-, 2.4-, 1.7-log reductions, respectively, in heat-shocked cultures.

Norovirus

Evaluation of Various Methods for Recovering Human Norovirus and Murine Norovirus from Vegetables and Ham

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Significance: Murine norovirus could be a useful surrogate for detecting human norovirus in foods.

Each step in an analytical method for detecting norovirus from various foods was evaluated and optimized. The buffers needed for eluting norovirus from foods such as ham and lettuce were characterized. Two different concentration methods, polyethylene glycol (PEG) precipitation and hollow fiber ultrafiltration (HUF), were compared using both murine norovirus (MNV) and human norovirus (HuNoV). For PEG precipitation, an elution buffer containing 3% beef extract (pH 7.1) was more suitable than 0.05 M glycine plus 0.14 M NaCl (pH 7.5), and the recovery efficiency increased with increasing molecular weight of PEG. To determine the optimal buffer for concentrating norovirus by HUF, glycine buffers with different pH values and ionic strengths were examined as elution buffers. Overall, HUF was more efficient for norovirus recovery than was PEG precipitation.

Caffeine

Caffeine Consumption and Incident Atrial Fibrillation in Women

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American Journal of Clinical Nutrition, Vol. 92, No. 3; pp. 509-514, 2010

Link to full text: <http://www.ajcn.org/cgi/content/full/92/3/509>

Significance: Elevated caffeine consumption does not contribute to the increasing burden of atrial fibrillation in women.

The relation between caffeine intake and incident atrial fibrillation (AF) was assessed prospectively in 33,638 initially healthy women who participated in the Women's Health Study and who were ≥ 45 y of age and free of cardiovascular disease and AF at baseline. Subjects were prospectively followed for incident AF from 1993 to 2009. During a median follow-up of 14.4 y (interquartile range: 13.8–14.8 y), 945 AF events occurred. Median caffeine

intakes across increasing quintiles of caffeine intake were 22, 135, 285, 402, and 656 mg/d, respectively. Age-adjusted incidence rates of AF across increasing quintiles of caffeine intake were 2.15, 1.89, 2.01, 2.24, and 2.04 events, respectively, per 1000 person-years of follow-up. In Cox proportional hazards models updated in 2004 by using time-varying covariates, the corresponding multivariable-adjusted hazard ratios (95% CI) were 1.0, 0.88 (0.72, 1.06), 0.78 (0.64, 0.95), 0.96 (0.79, 1.16), and 0.89 (0.73, 1.09) (P for linear trend: 0.45).