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Food Safety Briefs

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Foodborne Pathogens

Transfer of Pathogens From Cantaloupe Rind to Preparation Surfaces and Edible Tissue as a Function of Cutting Method

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Journal of Food Protection, Vol. 79, No. 5; pp. 764–770, 2016

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

Significance: The extent of microbial transfer underscores the importance of preventing contamination of whole cantaloupes.

Preparation methods that minimize pathogen transfer from external surfaces of whole and cut canteloupes to the edible tissue are needed. Two preparation methods were compared for the transfer of *Listeria monocytogenes*, *Salmonella enterica* serovar Typhimurium LT2, murine norovirus, and Tulane virus from inoculated cantaloupe rinds to edible tissue and preparation surfaces. For the first method, cantaloupes were cut into eighths, and edible tissue was separated from the rind and cubed with the same knife used to open the cantaloupes. For the second method, cantaloupes were scored with a knife around the circumference sufficient to allow manual separation of the cantaloupes into halves. Edible tissue was scooped with a spoon and did not contact the preparation surface touched by the rind. Bacteria and virus were recovered from the rinds, preparation surfaces, and edible tissue and enumerated by culture methods and reverse transcription, quantitative PCR, respectively. Cut method 2 yielded approximately 1 log lower recovery of *L. monocytogenes* and *Salmonella* Typhimurium from edible tissue, depending on the medium in which the bacteria were inoculated. A slight reduction was observed in murine norovirus recovered from edible tissue by cut method 2. The Tulane virus was detected in approximately half of the sampled cantaloupe tissue and only at very low levels.

Salmonella

Salmonella Levels Associated With Skin of Turkey Parts

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Significance: The high prevalence of *Salmonella* associated with the skin of turkey parts could be a potential source for ground turkey contamination.

This study determined and compared *Salmonella* levels (presence and numbers) associated with the skin of turkey parts (i.e., drumstick, thigh, and wing). Over

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a 10-month period, 20 turkey flocks expected to be highly contaminated with Salmonella based on boot-sock testing data of turkey houses were sampled. A total of 300 samples per type of turkey part were collected postchill and were tested for Salmonella using the most-probable-number (MPN) and enrichment methods. Overall, Salmonella was detected in 13.7, 19.7, and 25.0% of drumstick skin, thigh skin, and wing skin samples, respectively. Salmonella prevalence from wing skin was significantly higher ($P < 0.05$) than in drumstick skin, but the difference was not significant when compared with thigh skin. Salmonella was 2.4 times more likely to be present from thigh skin when the pathogen was found from wing skin. Salmonella mean numbers from drumstick, thigh, and wing were 1.18, 1.29, and 1.45 log MPN per sample, respectively; these values were not significantly different.

Listeria

Capacity of *Listeria monocytogenes* Strains From the 2011 Cantaloupe Outbreak to Adhere, Survive, and Grow on Cantaloupe

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



Significance: Rinsing of cantaloupe fragments in sterile water has the potential to reduce risk of listeriosis if the produce is promptly consumed.

This study investigated the potential of strains of serotypes 1/2a and 1/2b from the 2011 cantaloupe outbreak of listeriosis to adhere, survive, and grow on cantaloupe rind and flesh and in juice extracted from cantaloupe at different temperatures (4, 8, and 25°C). All strains were able to adhere and grow, with ~10-fold increases after 7 days at 4 or 8°C and after 24 h at 25°C, with a propensity for more growth on rind than on flesh or in extract. No significant differences in growth potential were noted among the different strains or between them and unrelated strains from other listeriosis outbreaks involving celery, deli meats, or hot dogs. Similarly to the cantaloupe outbreak strains, these other strains exhibited greater propensity for growth on rind than on flesh or in extract. Rinsing of cantaloupe fragments in sterile water resulted in temporary reductions of the populations by 50- to 100-fold. The absence of marked differences in adherence or growth between the cantaloupe outbreak strains and strains from other outbreaks highlights the need to further characterize the 2011 cantaloupe outbreak strains and elucidate potential biological attributes that contributed to their implication in the outbreak.

E. coli

Effect of Deep-Frying or Conventional Oven Cooking on Thermal Inactivation of Shiga Toxin–Producing Cells of *Escherichia coli* in Meatballs

A.C.S. Porto-Fett, M. Oliver, M. Daniel, B.A. Shoyer, L.J. Stahler, L.E. Shane, et al.

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Significance: This study provides new information on the effect of prior storage temperature (refrigerated or frozen), as well as subsequent cooking via deep-frying or baking, on inactivation of Shiga toxin-producing cells of *Escherichia coli*-8 in meatballs prepared with beef, pork, and/or veal.

The effects of deep-frying or oven cooking on inactivation of Shiga toxin-producing cells of *Escherichia coli* (STEC) in meatballs were investigated. Finely ground veal and/or a finely ground beef-pork-veal mixture were inoculated (ca. 6.5 log CFU/g) with an eight-strain, genetically marked cocktail of rifampin-resistant STEC strains (STEC-8; O111:H, O45:H2, O103:H2, O104:H4, O121:H19, O145:NM, O26:H11, and O157:H7). Inoculated meat was mixed with liquid whole eggs and seasoned bread crumbs, shaped by hand into 40-g balls, and stored at -20°C (i.e., frozen) or at 4°C (i.e., fresh) for up to 18 h. Meatballs were deep-fried or baked for up to 9 or 20 min at 176.7°C (350°F), respectively. Cooked and uncooked samples were homogenized and plated onto sorbitol MacConkey agar with rifampin ($100\ \mu\text{g}/\text{ml}$) followed by incubation of plates at 37°C for ca. 24 h. Up to four trials and three replications for each treatment for each trial were conducted. Deep-frying fresh meatballs for up to 5.5 min or frozen meatballs for up to 9.0 min resulted in reductions of STEC-8 ranging from ca. 0.7 to ≥ 6.1 log CFU/g. Likewise, reductions of ca. 0.7 to ≥ 6.1 log CFU/g were observed for frozen and fresh meatballs that were oven cooked for 7.5 to 20 min.

Impact of Mulches and Growing Season on Indicator Bacteria Survival During Lettuce Cultivation

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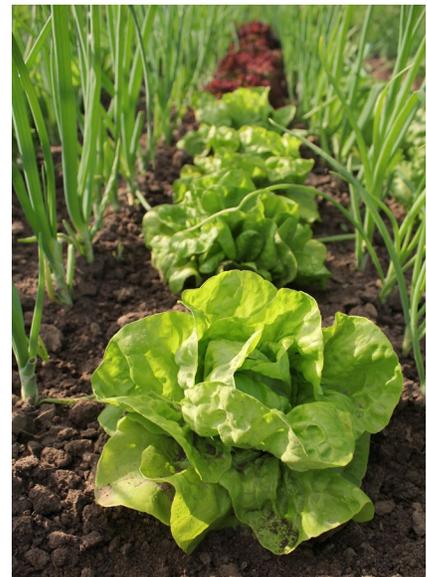
International Journal of Food Microbiology, Vol. 224, 2 May 2016; pp. 28–39, 2016

doi: 10.1016/j.ijfoodmicro.2016.02.013

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

Significance: Mulches used in lettuce production may impact the fate of enteric bacteria in soil or on lettuce, most likely in relation to soil moisture retention, and other weather-related factors, such as temperature and rainfall.

This study assessed the impact of different mulching methods on the survival of soil and epiphytic fecal indicator bacteria on organically grown lettuce during different growing seasons. Organically managed lettuce, cultivated with various ground covers — polyethylene plastic, corn-based biodegradable plastic, paper and straw mulch — and bare ground as a no-mulch control, was overhead inoculated with manure-contaminated water containing known levels of generic *Escherichia coli* and *Enterococcus* spp. Indicator bacterial concentrations in the lettuce phyllosphere decreased over time under all treatments, with more rapid *E. coli* declines in the fall than in the spring. Persistence of *E. coli* in spring was correlated with higher maximum and minimum temperatures in this season, and more regular rainfall. The survival model gave very good fits for the progression of *E. coli* concentrations in the phyllosphere over time ($R^2 = 0.88 \pm 0.12$). In the spring season, decline rates of *E. coli* counts were faster (2013 $p = 0.18$; 2014 $p < 0.005$) for the bare ground-cultivated lettuce compared to mulches. In fall 2014, the *E. coli* decline rate on paper mulch-grown lettuce was higher. Bacteria fluctuated more, and persisted longer, in soil compared to lettuce phyllosphere, and mulch type was a factor for fecal coliform levels, with higher counts retrieved under plastic mulches in all trials, and higher enterococci levels under straw in fall 2014.



Food Allergy

Randomized Trial of Introduction of Allergenic Foods in Breast-Fed Infants

M.R. Perkin, K. Logan, A. Tseng, B. Raji, S. Ayis, J. Peacock, et al. for the EAT Study Team

New England Journal of Medicine, Vol. 374, No. 18; pp. 1733–1743, 2016

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

Significance: This trial did not show the efficacy of early introduction of allergenic foods in an intention-to-treat analysis.

This study evaluated whether the early introduction of allergenic foods in the diet of breastfed infants would protect against the development of food allergy. Exclusively breast-fed infants (n=1303) who were 3 months of age were randomly assigned to the early introduction of six allergenic foods (peanut, cooked egg, cow's milk, sesame, whitefish, and wheat; early-introduction group) or to the current practice recommended in the United Kingdom of exclusive breast-feeding to approximately 6 months of age (standard-introduction group). The primary outcome was food allergy to one or more of the six foods between 1 year and 3 years of age. In the intention-to-treat analysis, food allergy to one or more of the six intervention foods developed in 7.1% of the participants in the standard-introduction group (42 of 595 participants) and in 5.6% of those in the early-introduction group (32 of 567) (P=0.32). In the per-protocol analysis, the prevalence of any food allergy was significantly lower in the early-introduction group than in the standard-introduction group (2.4% vs. 7.3%, P=0.01), as was the prevalence of peanut allergy (0% vs. 2.5%, P=0.003) and egg allergy (1.4% vs. 5.5%, P=0.009); there were no significant effects with respect to milk, sesame, fish, or wheat.



Maternal Diet During Pregnancy and Lactation and Cow's Milk Allergy in Offspring

J. Tuokkola, P. Luukkainen, H. Tapanainen, M. Kaila, O. Vaarala, M.G. Kenward, et al.

European Journal of Clinical Nutrition, Vol. 70, No. 5; pp. 554–559, 2016

doi: 10.1038/ejcn.2015.223

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

Significance: High maternal consumption of milk products during pregnancy may protect children from developing cow's milk allergy, especially in offspring of non-allergic mothers.

The associations between maternal diet during pregnancy and lactation and cow's milk allergy (CMA) in offspring were examined in a population-based birth cohort with human leukocyte antigen-conferred susceptibility to type 1 diabetes (n=6288). Consumption of milk products in the highest quarter during pregnancy was associated with a lower risk of CMA in offspring (OR 0.56, 95% CI 0.37–0.86; P<0.01). When stratified by maternal allergic rhinitis and asthma, there was evidence of an inverse association between high use of milk products and CMA in offspring of non-allergic mothers (OR 0.30, 95% CI 0.13–0.69, P<0.001). Cord blood IgA correlated positively with the consumption of milk products during pregnancy, indicating exposure to CMA and activation of antigen-specific immunity in the infant during pregnancy.

Allergenicity Attributes of Different Peanut Market Types

S.J. Koppelman, S. Jayasena, D. Luykx, E. Schepens, D. Apostolovic, G.A.H. de Jong, et al.

Food and Chemical Toxicology, Vol. 91; pp. 82–90, 2016

doi: 10.1016/j.fct.2016.02.016

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

Significance: Peanuts from the main market types consumed in Western countries are highly comparable in their allergenicity attributes, indicating that safety considerations with regard to peanut allergy are not dependent on the peanut cultivar in question.

The aim of this study was to compare allergenicity attributes of different peanut cultivars (Runner, Virginia Spanish, and Valencia). The protein content and protein profiles were highly comparable for all tested cultivars. All cultivar samples contained the major allergens Ara h 1, Ara h 2, Ara h 3 and Ara h 6, as assessed by SDS-PAGE and RP-HPLC, although some minor differences in major allergen content were found between samples. All samples were reactive in commercial ELISAs for detection and quantification of peanut protein. IgE-binding potency differed between samples with a maximum factor of 2, indicating a highly comparable allergenicity.

Enquiring About Tolerance (EAT) Study: Feasibility of an Early Allergenic Food Introduction Regimen

M.R. Perkin, K. Logan, T. Marrs, S. Radulovic, J. Craven, C. Flohr, et al. on behalf of the EAT Study Team

Journal of Allergy and Clinical Immunology, Vol. 137, No. 5; pp.1477–1486, 2016

doi: 10.1016/j.jaci.2015.12.1322

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

Significance: Early introduction, before 6 months of age, of at least some amount of multiple allergenic foods appears achievable and did not affect breastfeeding.

This randomized controlled trial determined the feasibility of the early introduction of multiple allergenic foods to exclusively breast-fed infants (n=1303) from 3 months of age and the effect on breastfeeding performance. The early introduction group (EIG) continued breastfeeding with sequential introduction of 6 allergenic foods: cow's milk, peanut, hard-boiled hen's egg, sesame, whitefish (cod), and wheat; the standard introduction group followed the UK infant feeding recommendations of exclusive breastfeeding for around 6 months with no introduction of allergenic foods before 6 months of age. By 5 months of age, the median frequency of consumption of all 6 foods was 2 to 3 times per week for every food in the EIG and no consumption for every food in the standard introduction group ($P < .001$ for every comparison). By 6 months of age, nonintroduction of the allergenic foods in the EIG was $<5\%$ for each of the 6 foods. Achievement of the stringent per-protocol consumption target for the EIG proved more difficult (42% of evaluable EIG participants). Breastfeeding rates in both groups significantly exceeded UK government data for equivalent mothers ($P < .001$ at 6 and at 9 months of age).

Norovirus

Recognition of Histo-Blood Group Antigen-Like Carbohydrates in Lettuce by Human GII.4 Norovirus

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Applied and Environmental Microbiology, Vol. 82, No. 10; pp. 2966–2974, 2016

doi: 10.1128/AEM.04096-15

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

Significance: Specifically bound human noroviruses cannot be removed by simple washing, which may allow viral transmission to consumers.

This study showed the presence of histo-blood group antigen (HBGA)-like carbohydrates in the cell wall of lettuce. The digestion of lettuce leaves with cell wall-degrading enzymes exposed more binding sites and significantly increased the level of binding of genogroup II genotype 4 (GII.4) human norovirus (HuNoV) virus-like particles (VLPs). Competition assays showed that both the HBGA monoclonal antibody, recognizing the H type, and plant lectins, recognizing α -L-fucose in the H type, effectively inhibited VLP binding to lettuce tissues. Lettuce cell wall components were isolated and their NoV VLP binding characteristics were tested by enzyme-linked immunosorbent assays. The binding was inhibited by pretreatment of the lettuce cell wall materials with α -1,2-fucosidase. Collectively, our results indicate that H-type HBGA-like carbohydrates exist in lettuce tissues and that GII.4 HuNoV VLPs can bind the exposed fucose moiety, possibly in the hemicellulose component of the cell wall.

Sanitizing Agents

Efficacy of Neutral Electrolyzed Water, Quaternary Ammonium and Lactic Acid-Based Solutions in Controlling Microbial Contamination of Food Cutting Boards Using a Manual Spraying Technique

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Journal of Food Science, Vol. 81, No. 5; pp. M1177–M1183, 2016

doi: 10.1111/1750-3841.13275

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

Significance: Neutral electrolyzed water could be applied as a spray and used as an effective alternative to commonly used chemical sanitizers such as quaternary ammonium.

Bactericidal activity of neutral electrolyzed water (NEW), quaternary ammonium (QUAT), and lactic acid-based solutions was investigated using a manual spraying technique against *Salmonella* Typhimurium, *Escherichia coli* O157:H7, *Campylobacter jejuni*, *Listeria monocytogenes* and *Staphylococcus aureus* that were inoculated onto the surface of scarred polypropylene and wooden food cutting boards. Within the first minute of treatment, NEW and QUAT solutions caused $>3 \log_{10}$ bacterial reductions on polypropylene surfaces whereas $<3 \log_{10}$ reductions were achieved on wooden surfaces. After 5 min of treatment, $>5 \log_{10}$ reductions were achieved for all bacterial strains inoculated onto polypropylene surfaces. Using NEW and QUAT solutions within 5 min reduced Gram-negative bacteria by 4.58 to 4.85 \log_{10} compared to $>5 \log_{10}$ reductions in Gram-positive bacteria inoculated onto wooden surfaces. Lactic acid treatment was significantly less effective compared to NEW and QUAT treatments. A decline in antimicrobial effectiveness was observed (0.5 to $<2 \log_{10}$ reductions were achieved within the first minute) when both cutting board types were used to prepare raw chopped beef, chicken tenders or salmon fillets.

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