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Listeria

A Comparative Risk Assessment for *Listeria monocytogenes* in Prepackaged versus Retail-Sliced Deli Meat

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Significance: Retail-sliced deli-meats are 1.7 times more likely to result in death from listeriosis than prepackaged deli meats, even if the former were stored for 25% of the time as the latter.

Deli meat was ranked as the highest-risk ready-to-eat food vehicle of *Listeria monocytogenes* within the 2003 FDA and USDA Food Safety and Inspection Service risk assessment. The comparative risk of *L. monocytogenes* in retail-sliced versus prepackaged deli meats was evaluated with a modified version of this model. The updated risk assessment model considered slicing location as well as the use of growth inhibitors. The per annum comparative risk ratio for the number of deaths from retail-sliced versus prepackaged deli meats was found to be 4.89, and the per-serving comparative risk ratio was 4.27. There was a significant interaction between the use of growth inhibitors and slicing location. Almost 70% of the estimated deaths occurred from retail-sliced product that did not possess a growth inhibitor.

Quantitative Risk Assessment of Listeriosis-Associated Deaths Due to *Listeria monocytogenes* Contamination of Deli Meats Originating from Manufacture and Retail

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Significance: There is a critical need for further development and implementation of effective control strategies to reduce *L. monocytogenes* contamination in deli meats at the retail level.

This study estimated the relative risk of listeriosis-associated deaths attributable to *Listeria monocytogenes* contamination in ham and turkey formulated without and with growth inhibitors (GIs). Two contamination scenarios were investigated: (i) prepackaged deli meats with contamination originating solely from manufacture at a frequency of 0.4% and (ii) retail-sliced deli meats with contamination originating solely from retail at a frequency of 2.3%. Reformulation with GIs was estimated to reduce human listeriosis deaths linked to ham and turkey by 2.8- and 9-fold, respectively, when contamination originated at manufacture and by 1.9- and 2.8-fold, respectively, for products contaminated at retail. Contamination of ham and turkey originating at retail was estimated to account for 76 and 63% of listeriosis deaths (without GI), respectively, and for 83 and 84% of listeriosis deaths (with GI), respectively. Sensitivity analyses indicated that storage temperature was the most important factor affecting the estimation of per annum relative risk. Scenario analyses suggested that reducing storage temperature in home refrigerators to

consistently below 7°C would greatly reduce the risk of human listeriosis deaths, whereas reducing storage time appeared to be less effective.

***Listeria monocytogenes* Contamination in Pork Can Originate from Farms**

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Significance: Good farm-level practices can be utilized to reduce the prevalence of *L. monocytogenes*.

The presence of *Listeria monocytogenes* in the pork production chain was followed from farm to slaughterhouse by examining the farm and slaughterhouse levels in the same 364 pigs, and finally by analyzing the cut meats from the same pig lots. Samples were collected (n=1962) and the 424 *L. monocytogenes* isolates were analyzed by pulsed-field gel electrophoresis. The prevalence of *L. monocytogenes* was 11, 1, 1, 24, 5, 1, and 4% in feed and litter, rectal swabs, intestinal contents, tonsils, pluck sets (including lungs, heart, liver, and kidney), carcasses, and meat cuts, respectively. The prevalence was significantly higher in organic than in conventional pig production at the farm and slaughterhouse level, but not in meat cuts. Similar *L. monocytogenes* genotypes were recovered in different steps of the production chain in pigs originating from the same farm. *L. monocytogenes* was present in the production chain, and transmission of the pathogen was possible throughout the chain, from the farm to pork.

Salmonella

EMA-Real-Time PCR as a Reliable Method for Detection of Viable *Salmonella* in Chicken and Eggs

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Journal of Food Science, Vol. 75, No. 3; pp. M134-M139, 2010

Significance: The use of ethidium bromide monoazide with a DNA-based real-time PCR can successfully prevent false positive results and represents a simple, yet accurate detection tool for enhancing the safety of food.

Culture-based *Salmonella* detection takes at least 4 d to complete. Ethidium bromide monoazide (EMA) is a dye that can bind to DNA of dead cells and prevent its amplification by PCR. The aim of this study was to design an accurate detection method that can detect only viable *Salmonella* cells from poultry products. The sensitivity of EMA staining coupled with real-time PCR was compared to that of an RNA-based reverse transcription (RT)-real-time PCR. To prevent false negative results, an internal amplification control was added to the same reaction mixture as the target *Salmonella* sequences. With an optimized EMA staining step, the detection range of a subsequent real-time PCR was determined to be 10^3 - 10^9 CFU/mL for pure cultures and 10^5 - 10^9 CFU/mL for food samples. After a 12-h enrichment step, EMA staining combined with real-time PCR could detect as low as 10 CFU/mL *Salmonella* from chicken rinses and egg broth.

***Salmonella* in Chicken: Current and Developing Strategies to Reduce Contamination at Farm Level**

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Significance: This review article summarizes current research and suggests future areas to investigate regarding *Salmonella* control in poultry at the farm level.

Preventive strategies that have been developed and that aim at reducing the incidence of *Salmonella* colonization in broiler chickens at the farm level are reviewed in this article. In addition, feed and drinking water acidification with organic acids and immune strategies based on passive and active immunity are investigated. Modification of the diet by changing ingredients and nutrient composition with the intent of reducing a bird's susceptibility to *Salmonella* infection are also examined. Because in ovo feeding accelerates small intestine development and enhances epithelial cell function, this approach could be an efficient tool for controlling enteric pathogens. Feed additives such as antibiotics, prebiotics, probiotics, and synbiotics that modify the intestinal microflora are part of another field of investigation, and their success depends on the additive used. Other control methods such as the use of chlorate products and bacteriophages also are under study.

Foodborne Pathogens

Use of Ionic Liquid-Based Extraction for Recovery of *Salmonella* Typhimurium and *Listeria monocytogenes* from Food Matrices

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Significance: It is feasible to apply ionic liquids in sample pretreatment steps for rapid detection and quantification of bacterial pathogens.

A new class of organic salts, ionic liquids, were used in this study for solubilization of various foodstuffs, with subsequent molecular and microbiological quantification methods. This approach was applied to gram-positive *Listeria monocytogenes* and gram-negative *Salmonella enterica* serovar Typhimurium. By introducing the ionic liquid 1-ethyl-3-methylimidazolium thiocyanate into an existing food solubilization protocol, both molecular and microbiological quantification methods could be used subsequently without losing performance or prolonging the analysis. These experiments resulted in an average recovery of 87% of inoculated bacterial cells with real-time PCR, 85% recovery on nonselective agar plates, and 43% on selective medium.

Mycotoxin

Widespread Occurrence of the Mycotoxin Fumonisin B₂ in Wine

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Journal of Agricultural and Food Chemistry, Vol. 58, No. 8; pp 4853–4857, 2010

Significance: Wine may contain significant levels of fumonisin B₂, an important mycotoxin suspected of causing human and animal toxicoses.

The researchers developed a simple and quantitative cation-exchange-based purification method for the subsequent isotope dilution liquid chromatography–tandem mass spectrometry (LC–MS/MS) determination of fumonisins in wine. A comparative study of seven different solid-phase extraction (SPE) columns showed that polymeric mixed-mode reversed-phase (RP) cation-exchange columns were superior to classic silica-based cation and mixed-mode cation-exchange columns. A total of 77 wine samples from 13 countries were subsequently tested, and surprisingly, 18 (23%) were found to contain fumonisin B₂ in the range of 1–25 µg/L. These findings were further confirmed by immunoaffinity purification and re-analysis of the positive cation-exchanged extracts.

Infant Formula

Enzyme-Linked Immunosorbent Assay Detection of Melamine in Infant Formula and Wheat Food Products

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Significance: The ELISA kits provide an effective alternative for the analysis of samples suspected of containing melamine without relying on extensive sample preparation or expensive instrumentation.

The adulteration of food products with melamine to inflate the nitrogen content necessitates the establishment of analytical methods that can distinguish between proteinaceous ingredients and such adulterants. The specificity and ability to detect melamine by two commercial ELISA kits were evaluated along with three protocols for sample preparation. Both ELISAs displayed cross-reactivity with ammeline, but neither was able to detect ammelide or cyanuric acid, indicating either a requirement for the 4,6-diamino-1,3,5-triazine structure or inability to bind 1,3,5-triazine-4,6-diones. The limits of detection for melamine in powder infant formula ranged from 0.2-3 µg/g depending on the ELISA kit and the method used to prepare the sample. The limits of detection for melamine in liquid infant formula and wheat products were <1 µg/ml and <2.5 µg/g, respectively.

Caffeine

Caffeine (1, 3, 7-trimethylxanthine) in Foods: A Comprehensive Review on Consumption, Functionality, Safety, and Regulatory Matters

M.A. Heckman, J. Weil, E. Gonzalez de Mejia

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Significance: Despite reported benefits, the potential negative effects of excessive caffeine intake should be considered, particularly in children and pregnant women.

Caffeine ranks as one of the top most commonly consumed dietary ingredients throughout the world. It is naturally found in coffee beans, cacao beans, kola nuts, guarana berries, and tea leaves including yerba mate. The total daily intake, as well as the major source of caffeine varies globally; however, coffee and tea are the 2 most prominent sources. Soft drinks are also a common source of caffeine as well as energy drinks. Moderate caffeine consumption is considered safe and its use as a food ingredient has been approved, within certain limits. Performance benefits attributed to caffeine include physical endurance, reduction of fatigue, and enhancing mental alertness and concentration. Caffeine has also been recently linked to weight loss and consequent reduction of the overall risks for developing the metabolic syndrome. However, the caloric contribution of caffeine-sweetened beverages needs to be considered in the overall energy balance.