

Special Report

Red Meat, Dietary Nitrosamines, and Heme Iron and Risk of Bladder Cancer in the European Prospective Investigation into Cancer and Nutrition (EPIC)

P. Jakszyn, C.A. González, L. Luján-Barroso, M.M. Ros, H.B. Bueno-de-Mesquita, N. Roswall, et al.

Cancer Epidemiology, Biomarkers & Prevention, Vol. 20, No. 3; pp. 555-559, 2011

Link to full text: <http://cebp.aacrjournals.org/content/20/3/555.full.pdf+html>

Significance: This study does not support an effect of red meat intake, nitrosamines (endogenous or exogenous), or heme iron intake on bladder cancer risk.

The association between red meat consumption, dietary nitrosamines (NDMA: *N*-nitrosodimethylamine, and ENOC [endogenous nitroso compounds]), and heme iron and the risk of bladder cancer among participants of the European Prospective Investigation into Cancer and Nutrition (EPIC) were investigated. Data on food consumption and complete follow-up for cancer occurrence were available for 481,419 participants from 10 European countries. Estimates of HRs were obtained by proportional hazard models, stratified by age at recruitment, gender, and study center and adjusted for covariates. After a mean follow-up of 8.7 years, 1,001 participants were diagnosed with bladder cancer. No overall association between intake of red meat (\log_2 HR=1.06; 95% CI: 0.99–1.13), nitrosamines (\log_2 HR=1.09; 95% CI: 0.92–1.30 and HR=0.98; 95% CI: 0.92–1.05 for ENOC and NDMA, respectively) or heme iron (\log_2 HR=1.05; 95% CI: 0.99–1.12) and bladder cancer risk were found. The associations did not vary by sex, high- versus low-risk bladder cancers, smoking status, or occupation (high vs. low risk).

Food Allergy

Incidence, Prevalence, and Trends of General Practitioner-Recorded Diagnosis of Peanut Allergy in England, 2001 to 2005

D. Kotz, C.R. Simpson, A. Sheikh

Journal of Allergy and Clinical Immunology, Vol. 127, No. 3; pp. 623-630, 2011

Link to full text: http://www.sciencedirect.com/science?_ob=ShoppingCartURL&_method=add&_udi=B6WH4-51XWW0B-2&_acct=C000050221&_version=1&_userid=10&_ts=1301532195&md5=eb13049dc8ba71128684ff48e90afc1d

Significance: The general practitioner-recorded diagnosis of peanut allergy from a large general practice database suggests a much lower prevalence in peanut allergy than has hitherto been found.

The QRESEARCH database provided estimates for the incidence, prevalence, and trends of general practitioner (GP)-recorded diagnosis of peanut allergy in 2,958,366 patients who were registered with 422 United Kingdom general practices in the years 2001 to 2005. The primary outcome was a recording of clinician-diagnosed peanut allergy. The age-sex standardized incidence rate of peanut allergy in 2005 was 0.08/1000 person-years (95% CI, 0.07-0.08), and the prevalence rate was 0.51/1000 patients (95% CI, 0.49-0.54). This translated into an estimated 4000 incident cases (95% CI, 3500-4600) and 25,700 prevalent cases (95% CI, 24,400-27,100) of GP-recorded diagnosis of peanut allergy in England in 2005. During the study period, the incidence rate of peanut allergy remained fairly stable, whereas the prevalence rate doubled. In those <18 years of age, the crude lifetime prevalence rate was higher in males than females. A significant inverse relationship between prevalence and socioeconomic status was found.

Peanut Allergy: Clinical and Immunologic Differences Among Patients from 3 Different Geographic Regions

A. Vereda, M. van Hage, S. Ahlstedt, M.D. Ibañez, J. Cuesta-Herranz, J. van Odijk, et al.

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Significance: Peanut allergy has different clinical and immunologic patterns in different areas of the world.

This study describes the clinical and immunologic characteristics of patients with peanut allergy from 3 countries (Spain [n=50], the U.S. [n=30], and Sweden [n=35]) using a molecular component diagnostic approach. IgE antibodies to peanut extract and the peanut allergens rAra h 1, 2, 3, 8 and 9, as well as to cross-reactive birch (rBet v 1) and grass (rPhl p 1, 5, 7, and 12) pollen allergens were analyzed. American patients frequently had IgE antibodies to rAra h 1 to 3 (56.7%-90.0%) and often presented with severe symptoms. Spanish patients recognized these 3 recombinant peanut allergens less frequently (16.0%-42.0%), were more often sensitized to the lipid transfer protein rAra h 9 (60.0%), and typically had peanut allergy after becoming allergic to other plant-derived foods. Swedish patients detected rAra h 1 to 3 more frequently than Spanish patients (37.1%-74.3%) and had the highest sensitization rate to the Bet v 1 homologue rAra h 8 (65.7%), as well as to rBet v 1 (82.9%). Spanish and Swedish patients became allergic to peanut at ≥ 2 years, whereas the American children became allergic around 1 year of age.

A Randomized Controlled Study of Peanut Oral Immunotherapy: Clinical Desensitization and Modulation of the Allergic Response

P. Varshney, S.M. Jones, A.M. Scurlock, T.T. Perry, A. Kemper, P. Steele, et al.

Journal of Allergy and Clinical Immunology, Vol. 127, No. 3; pp. 654-660, 2011

Link to full text: http://www.sciencedirect.com/science?_ob=ShoppingCartURL&_method=add&_udi=B6WH4-529D67V-

[2&_acct=C000050221&_version=1&_userid=10&_ts=1301532238&md5=c9861b8a56325bd4212ca2f9bf30a651](http://www.sciencedirect.com/science?_ob=ShoppingCartURL&_method=add&_udi=B6WH4-529D67V-2&_acct=C000050221&_version=1&_userid=10&_ts=1301532238&md5=c9861b8a56325bd4212ca2f9bf30a651)

Significance: Peanut oral immunotherapy induces desensitization and concurrent immune modulation.

This study investigated the safety and effectiveness of oral immunotherapy (OIT) for peanut allergy in a multicenter, double-blind, placebo-controlled study. Children ages 1 to 16 years (n=28) with peanut allergy received OIT with peanut flour or placebo. Initial escalation, build-up, and maintenance phases were followed by an oral food challenge (OFC) at approximately 1 year. Three peanut OIT subjects withdrew early in the study. During the OFC, 16 peanut OIT subjects ingested the maximum cumulative dose of 5000 mg (approximately 20 peanuts), whereas 9 placebo subjects ingested a median cumulative dose of 280 mg (range, 0-1900 mg; $P<.001$). In contrast with the placebo group, the peanut OIT group showed reductions in SPT size ($P<.001$), IL-5 ($P=.01$), and IL-13 ($P=.02$) and increases in peanut-specific IgG₄ ($P<.001$). Peanut OIT subjects had initial increases in peanut-specific IgE ($P<.01$). The ratio of forkhead box protein 3 (FoxP3)^{hi}: FoxP3^{intermediate} CD4⁺ CD25⁺ T cells increased at the time of OFC ($P=.04$) in peanut OIT subjects.

Infant Formula

Evaluation of a New Enrichment Broth for Detection of *Cronobacter* spp. in Powdered Infant Formula

M.A. Al-Holy, J-H. Shin, T.M. Osaili, B.A. Rasco

Journal of Food Protection, Vol. 74, No. 3; pp. 387-393, 2011

Link to full text: <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000003/art00006>

Significance: Al-Holy-Rasco broth must be validated before it can be used for rapid detection and isolation of *Cronobacter* from powdered infant formula milk.

This study investigated the potential of using Al-Holy-Rasco (AR) medium, a novel broth for detection and isolation of *Cronobacter* spp. in infant formula milk (IFM). AR broth outperformed *Enterobacteriaceae* enrichment broth (EE), *Enterobacter sakazakii* enrichment broth (ESE), modified lauryl sulfate broth, and milk as enrichment media to stimulate the growth of a cocktail of 10 strains of *Cronobacter*. AR broth significantly suppressed the growth of competing non-*Cronobacter* *Enterobacteriaceae* as compared with EE, ESE, modified lauryl sulfate broth, and milk. The recovery of desiccated *Cronobacter* (1 to 5,000 CFU/100 g) from powdered IFM in the presence of competing non-*Cronobacter* *Enterobacteriaceae* was determined by EE, ESE, and AR broth with 10 and 15%

sucrose. AR broth with 15% sucrose outperformed all other examined broths and recovered *Cronobacter* from all samples tested at all *Cronobacter* concentrations.

Energy Drinks

Health Effects of Energy Drinks on Children, Adolescents, and Young Adults

S.M. Seifert, J.L. Schaechter, E.R. Hershorin, S.E. Lipshultz

Pediatrics, Vol. 127, No. 3; pp. 511-528, 2011

Link to full text:

<http://pediatrics.aappublications.org/cgi/content/full/127/3/511?maxtoshow=&hits=10&RESULTFORMAT=&fulltext=%22health+effects+of+energy+drinks&searchid=1&FIRSTINDEX=0&sortspec=relevance&resourcetype=HWC>

IT

Significance: Pediatricians need to be aware of the possible effects of energy drinks in vulnerable populations and screen for consumption to educate families.

This study reviewed the effects, adverse consequences, and extent of energy drink consumption among children, adolescents, and young adults. Articles related to energy drinks were identified through PubMed and Google using "energy drink," "sports drink," "guarana," "caffeine," "taurine," "ADHD," "diabetes," "children," "adolescents," "insulin," "eating disorders," and "poison control center." Energy drinks are consumed by 30-50% of adolescents and young adults. Frequently containing high and unregulated amounts of caffeine, these drinks have been reported in association with serious adverse effects, especially in children, adolescents, and young adults with seizures, diabetes, cardiac abnormalities, or mood and behavioral disorders or those who take certain medications. Of the 5448 U.S. caffeine overdoses reported in 2007, 46% occurred in those <19 years. Energy drinks have no therapeutic benefit, and many ingredients are understudied and not regulated. The known and unknown pharmacology of agents included in such drinks, combined with reports of toxicity, raises concern for potentially serious adverse effects in association with energy drink use.

Norovirus

Screening of Fruit Products for Norovirus and the Difficulty of Interpreting Positive PCR Results

A. Stals, L. Baert, V. Jasson, E. Van Coillie, M. Uyttendaele

Journal of Food Protection, Vol. 74, No. 3; pp. 425-431, 2011

Link to full text: <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000003/art00011>

Significance: No norovirus outbreaks related to the tested fruit product types were reported during the screening period.

Seventy-five fruit products were screened for norovirus (NoV) presence by using an evaluated in-house NoV detection methodology consisting of a NoV extraction method and a reverse transcription quantitative PCR assay.

The fruit samples were screened for bacterial pathogens and bacterial hygiene indicators. Results of the NoV screening showed that 18 of 75 samples tested positive for GI and/or GII NoV despite a good bacteriological quality. The recovery of murine norovirus 1 virus particles acting as process control was successful in 31 of 75 samples with a mean recovery efficiency of $11.32\% \pm 6.08\%$. The level of detected NoV genomic copies ranged between 2.5 and 5.0 log/10 g. NoV GI and/or GII were found in 4 of 10, 7 of 30, 6 of 20, and 1 of 15 of the tested raspberries, cherry tomatoes, strawberries, and fruit salad samples, respectively. These results may indicate a prior norovirus contamination of the tested food samples throughout the fresh produce chain.

Inactivation of a Human Norovirus Surrogate by High-Pressure Processing: Effectiveness, Mechanism, and Potential Application in the Fresh Produce Industry

F. Lou, H. Neetoo, H. Chen, J. Li

Applied and Environmental Microbiology, Vol. 77, No. 5; pp. 1862-1871, 2011

Link to full text: <http://aem.asm.org/cgi/content/full/77/5/1862>

Significance: High-pressure processing effectively inactivated a human norovirus surrogate in fresh produce with a minimal impact on food quality.

This study systematically investigated the effectiveness of high-pressure processing (HPP) on inactivating murine norovirus (MNV-1), a surrogate for human norovirus, in aqueous medium and fresh produce. MNV-1 was effectively inactivated by HPP. Pressure, pH, temperature, and food matrix affected the virus survival in foods. MNV-1 was more effectively inactivated at 4°C than at 20°C in both medium and fresh produce, and it was more sensitive to HPP at neutral than acidic pH. Disruption of viral capsid structure, but not degradation of viral genomic RNA, is the primary mechanism of virus inactivation by HPP. However, HPP does not degrade viral capsid protein, and the pressurized capsid protein was still antigenic. Overall, HPP had a variable effect on the sensorial quality of fresh produce, depending on the pressure level and type of product.

Salmonella

2008 Outbreak of Salmonella Saintpaul Infections Associated with Raw Produce

C.B. Behravesh, R.K. Mody, J. Jungk, L. Gaul, J.T. Redd, S. Chen, et al. for the Salmonella Saintpaul Outbreak Investigation Team

New England Journal of Medicine, Vol 364, No. 10; pp. 918-927, 2011

Link to full text: <http://www.nejm.org/doi/full/10.1056/NEJMoa1005741>

Significance: The nationwide outbreak that occurred in 2008 highlights the importance of preventing raw-produce contamination.

A nationwide outbreak of salmonellosis from raw produce that occurred in 2008 was investigated. A case was defined as diarrhea in a person with laboratory-confirmed infection with the outbreak strain of *Salmonella enterica*

serotype Saintpaul. In three case-control studies of cases not linked to restaurant clusters, illness was significantly associated with eating raw tomatoes (matched odds ratio [MOR]=5.6; 95% CI 1.6 to 30.3); eating at a Mexican-style restaurant (MOR=4.6; 95% CI, 2.1 to ∞) and eating pico de gallo salsa (MOR=4.0; 95% CI, 1.5 to 17.8), corn tortillas (MOR=2.3; 95% CI, 1.2 to 5.0), or salsa (MOR=2.1; 95% CI, 1.1 to 3.9); and having a raw jalapeño pepper in the household (MOR=2.9; 95% CI, 1.2 to 7.6). In nine analyses of clusters associated with restaurants or events, jalapeño peppers were implicated in all three clusters with implicated ingredients, and jalapeño or serrano peppers were an ingredient in an implicated item in the other three clusters. Raw tomatoes were an ingredient in an implicated item in three clusters. The outbreak strain was identified in jalapeño peppers collected in Texas and in agricultural water and serrano peppers on a Mexican farm.

Identification of a Salmonellosis Outbreak by Means of Molecular Sequencing

E.K. Lienau, E. Strain, C. Wang, J. Zheng, A.R. Ottesen, C.E. Keys, et al.

New England Journal of Medicine, Vol. 364, No. 10; pp. 981-982, 2011

Link to full text: <http://www.nejm.org/doi/full/10.1056/NEJMc1100443>

Significance: Next-generation sequencing can be used to reveal subtle genotypic differences essential to the traceback of bacterial pathogens as they emerge in the food supply.

Next-generation sequencing (NGS) of microbiologic isolates was used in the molecular tracking of an outbreak source. The investigation focused on isolates of *Salmonella enterica* serotype Montevideo that were associated with red and black pepper used in the production of Italian-style spiced meats in a New England processing facility. A NGS approach was applied to resolve this outbreak on the basis of shotgun sequencing 1 of 35 genomes of *S. enterica* subtype Montevideo collected from ingredient suppliers, patients who consumed finished products, and historically and geographically disparate food sources. Although isolates from pepper were recovered from packages in the plant, the only Montevideo serotype isolate that was recovered from the processing facility came from a drain swab. This isolate (clade E) clustered more closely to the outbreak swarm than to any other isolate in the study. It has long been accepted that food facilities can become endemically contaminated with resident pathogens and that pathogenic reservoirs within a facility may serve as regular sources of contamination.

E. Coli

Determination of Free Chlorine Concentrations Needed To Prevent *Escherichia coli* O157:H7 Cross-Contamination during Fresh-Cut Produce Wash

Y. Luo, X. Nou, Y. Yang, I. Alegre, E. Turner, H. Feng, et al.

Journal of Food Protection, Vol. 74, No. 3; pp. 352-358, 2011

Link to full text: <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000003/art00001>

Significance: Rewashing is not an effective way to correct for process failure, and maintaining a sufficient free chlorine concentration in the wash solution is critical for preventing pathogen cross-contamination.

The effect of free chlorine concentrations in wash water on *Escherichia coli* O157:H7 reduction, survival, and transference during washing of fresh-cut lettuce was investigated. The effectiveness of rewashing for inactivation of *E. coli* O157:H7 on newly cross-contaminated produce previously washed with solutions containing an insufficient amount of chlorine also was assessed. Results indicate that solutions containing a minimum of 0.5 mg/L free chlorine were effective for inactivating *E. coli* O157:H7 in suspension to below the detection level. However, the presence of 1 mg/L free chlorine in the wash solution before washing was insufficient to prevent *E. coli* O157:H7 survival and transfer during washing. When the prewash free chlorine concentration was increased to ≥ 10 mg/L, no *E. coli* O157:H7 transfer was detected. Furthermore, although rewashing newly cross-contaminated lettuce in 50 mg/L free chlorine for 30 s significantly reduced ($P=0.002$) the *E. coli* O157:H7 populations, it failed to eliminate *E. coli* O157:H7 on lettuce.

A Simple PCR-Based Macroarray System for Detection of Multiple Gene Markers in the Identification of Priority Enterohemorrhagic *Escherichia coli*

B.W. Blais, A. Martinez-Perez

Journal of Food Protection, Vol. 74, No. 3; pp. 365-372, 2011

Link to full text: <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000003/art00003>

Significance: The clothbased hybridization array system is useful for the identification of priority enterhemorrhagic *E. coli* colonies isolated from foods by using enrichment culture techniques.

Enterohemorrhagic *Escherichia coli* (EHEC) strains bearing the O antigenic determinants O157, O26, O111, O103, and O145 have a high rate of association with foodborne illness worldwide. A clothbased hybridization array system (CHAS) was developed for the identification and characterization of priority EHEC. Multiplex PCR products incorporating a digoxigenin label were detected by hybridization with an array of specific oligonucleotide probes immobilized on a polyester cloth support, with subsequent immunoenzymatic assay of the captured amplicons. This method identified the relevant markers in 85 different strains bearing various combinations of the target genes (virulence and priority O-antigen markers). None of the target genes was detected in 26 different strains of other *E. coli* and non-*E. coli* bacteria. The CHAS demonstrated 100% inclusivity and 100% exclusivity characteristics, with respect to detection of the various markers among different bacterial strains. The CHAS demonstrated 100% inclusivity and 100% exclusivity characteristics, with respect to detection of the markers among various target and nontarget bacteria.

Microbead-Based Immunoassay for Simultaneous Detection of Shiga Toxins and Isolation of *Escherichia coli* O157 in Foods

L.M. Clotilde, C. Bernard IV, G.L. Hartman, D.K. Lau, J.M. Carter

Journal of Food Protection, Vol. 74, No. 3; pp. 373-379, 2011

Link to full text: <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000003/art00004>

Significance: The microbead-based immunoassay is useful for the identification of priority enterohemorrhagic *E. coli* colonies isolated from foods by using enrichment culture techniques.

There has been an increased food safety concern with the Shiga toxin-producing *Escherichia coli* (STEC) since 1982. Therefore, developing a reliable, sensitive, and rapid assay capable of detecting *E. coli* O157 and the main toxins produced by STEC (i.e., Shiga toxins 1 [Stx₁] and 2 [Stx₂]) will directly benefit regulatory agencies by minimizing analysis time. Luminex technology was used to detect multiple analytes in a single 50-ml sample. An immunoassay capable of simultaneously serotyping *E. coli* O157 and detecting Stx₁ and/or Stx₂ was developed. The specificity and sensitivity of this immunoassay was tested against a collection of 34 *E. coli* isolates belonging to various O serogroups phenotypically different for Stx. The results were compared with microplate sandwich enzyme-linked immunosorbent assay (ELISA), and no cross-reactivity was observed for any of the monoclonal antibodies used. An increased sensitivity up to 1,000 times was observed in the microbead-based immunoassay when compared with the microplate sandwich ELISA. Luminex technology has the potential to simultaneously detect multiple targets without loss of specificity and/or sensitivity.

Prevalence and Characterization of Non-O157 Shiga Toxin-Producing *Escherichia coli* Isolates from Commercial Ground Beef in the United States

J.M. Bosilevac, M. Koohmaraie

Applied and Environmental Microbiology, Vol. 77, No. 6; pp. 2103-2112, 2011

Link to full text: <http://aem.asm.org/cgi/content/full/77/6/2103>

Significance: Ten Shiga toxin-producing *E. coli* isolates were identified that may be considered a significant food safety threat.

This study reports on the prevalence and characterization of non-O157 Shiga toxin (*stx*)-producing *E. coli* (STEC) in 4,133 commercial ground beef samples obtained from numerous manufacturers across the U.S. over 24 months. *Stx* genes were present in 24.3% of the samples. Culture isolation of a STEC isolate from all samples that contained *stx*₁ and/or *stx*₂ was attempted. Of the positive ground beef samples screened for *stx*, 7.3% were confirmed to have at least one strain of STEC present by culture isolation. In total, 338 unique STEC isolates were recovered from the 300 samples that yielded an STEC isolate. All unique STEC isolates were serotyped and were characterized for the presence of known virulence factors. These included Shiga toxin subtypes, intimin subtypes, and accessory virulence factors related to adherence (*saa*, *iha*, *lifA*), toxicity (*cnf*, *subA*, *astA*), iron acquisition (*chuA*), and the presence of the large 60-MDa virulence plasmid (*espP*, *etpD*, *toxB*, *katP*, *toxB*). The isolates were also characterized by use of a pathogenicity molecular risk assessment.

Listeria

Biofilms of *Listeria monocytogenes* Produced at 12 ° C either in Pure Culture or in Co-Culture with *Pseudomonas aeruginosa* Showed Reduced Susceptibility to Sanitizers

A. Lourenço, H. Machado, L. Brito

Journal of Food Science, Vol. 76, No. 2; pp. M143–M148, 2011

Link to full text: <http://onlinelibrary.wiley.com/doi/10.1111/j.1750-3841.2010.02011.x/full>

Significance: The temperature used for biofilm formation is important when susceptibility to disinfectants is being assessed, as biofilms produced at lower temperature were less susceptible to sanitizers.

The biofilm-forming ability of 21 *Listeria monocytogenes* isolates from different origins was evaluated using the Calgary Biofilm Device® at 37°C. Biofilms of 4 selected strains were also produced either on pure cultures or on co-cultures with *Pseudomonas aeruginosa* (PAO1) at 12°C and at 37°C. *Listeria monocytogenes* biofilms grown either at 37°C or 12°C were able to achieve similar cell densities by using different incubation periods (24 h and 7 d, respectively). In co-culture biofilms, *P. aeruginosa* was the dominant species either at 37°C or at 12°C, representing 99% of a total biofilm population of 6-7 log CFU/peg. Co-culture biofilms were generally less susceptible than *L. monocytogenes* pure cultures. The biofilms produced at 12°C were usually less susceptible to the sanitizers than when produced at 37°C. Single or co-culture biofilms of *L. monocytogenes* and PAO1 retrieved minimum biofilm eradication concentration values for agents T99 and BP that were, at times, above the maximum in-use recommended concentrations for these agents.

Evaluation of a Serotyping Scheme Using a Combination of an Antibody-Based Serogrouping Method and a Multiplex PCR Assay for Identifying the Major Serotypes of *Listeria monocytogenes*

L.S. Burall, A.C. Simpson, A.R. Datta

Journal of Food Protection, Vol. 74, No. 3; pp. 403-409, 2011

Significance: The combination scheme appears to be a simple and rapid way to identify the predominant *L. monocytogenes* serotypes found in food, environmental, and clinical samples.

Link to full text: <http://www.ingentaconnect.com/content/iafp/jfp/2011/00000074/00000003/art00008>

To evaluate a simplified serotyping scheme, a combination of an antibody-based serogrouping assay that identified only type 1 and type 4 strains and a multiplex PCR-based serogrouping assay to analyze 362 *L. monocytogenes* isolates collected over more than 20 years was used. The multiplex PCR assay also incorporated a set of primers specific for *L. monocytogenes hlyA* gene to verify the species identification of these isolates. A subset ($n=120$) of these isolates were also serotyped with the Denka Seiken serotyping scheme, which is often considered the “gold standard” for serotyping of *L. monocytogenes*. The results indicated that the multiplex PCR-based assay, in combination with an antibody-based serogrouping assay, correctly identified serotypes of 96% of the previously serotyped isolates. Compared with the Denka Seiken method, the combination method also performed better in identifying serotypes of 120 previously unserotyped *L. monocytogenes* isolates.

Foodborne Diseases

Foodborne Disease in 2011 — The Rest of the Story

M.T. Osterholm

New England Journal of Medicine, Vol. 364, No. 10; pp. 889-891, 2011

Link to full text: <http://www.nejm.org/doi/full/10.1056/NEJMp1010907>

Significance: Food safety in the United States cannot be expected to improve in more than an incremental manner.

Recent media headlines might have one believe that our food supply is substantially more safe than it was a decade ago and about to get even safer. On December 15, 2010, the CDC announced a reanalysis of the burden of foodborne illness in the U.S. and reported a substantial decrease in the estimated incidence of foodborne disease between 1999 and 2011. On January 4, 2011, President Obama signed into law the Food Safety Modernization Act (FSMA), the first major legislation related to the food-safety authority of the FDA since 1938. Since 1996, the Foodborne Disease Active Surveillance Network (FoodNet) of the CDC's Emerging Infections Program supports active, population-based surveillance in 10 states for all laboratory-confirmed infections with selected pathogens that are commonly transmitted through food. According to a 2010 FoodNet report, rates of infection with shigella, yersinia, Shiga-toxin-producing *Escherichia coli* O157, campylobacter, and listeria were at least 25% lower than they were a decade ago; the rate of infection with salmonella was only 10% lower. On the basis of FoodNet data for the past 14 years, the improvements made in the late 1990s in the safety of our food supply are still having a positive effect. Will the FSMA result in immediate improvements in food safety? The FSMA gives the FDA new forms of authority that will substantially enhance its ability to prevent foodborne disease and respond more effectively when an outbreak occurs. However, the new law has a major shortcoming: dollars. The actual effect of this important law will at best be extremely limited if Congress and the administration don't appropriate and sign additional legislation providing the necessary funds to carry out its mandates.

Foodborne Pathogens

Comprehensive Approaches to Molecular Biomarker Discovery for Detection and Identification of *Cronobacter* spp. (*Enterobacter sakazakii*) and *Salmonella* spp.

X. Yan, J. Gurtler, P. Fratamico, J. Hu, N.W. Gunther IV, V. Juneja, et al.

Applied and Environmental Microbiology, Vol. 77, No. 5; pp. 1833-1843, 2011

Link to full text: <http://aem.asm.org/cgi/content/full/77/5/1833>

Significance: PCR and array-based biomarker verification studies of *Cronobacter* and *Salmonella* and other foodborne pathogens are currently being conducted.

Cronobacter spp. and *Salmonella* spp. are increasingly implicated internationally as important microbiological contaminants in low-moisture food products, including powdered infant formula. A systematic approach, combining literature-based data mining, comparative genome analysis, and the direct sequencing of PCR products of specific biomarker genes, was used to construct an initial collection of genes to be targeted. These targeted genes, particularly genes encoding virulence factors and genes responsible for unique phenotypes, have the potential to

function as biomarker genes for the identification and differentiation of *Cronobacter* spp. (formerly *Enterobacter sakazakii*) and *Salmonella* spp. from other food-borne pathogens in low-moisture food products. In this study, a total of 58 unique *Salmonella* gene clusters and 126 unique potential *Cronobacter* biomarkers and putative virulence factors were identified. A chitinase gene was used to confirm this approach. It has very low sequence variability and/or polymorphism among *Cronobacter*, *Citrobacter*, and *Salmonella*, while differing significantly in other food-borne pathogens, either by sequence blasting or experimental testing, including PCR amplification and direct sequencing.

Phytochemicals

Physical and Antibacterial Properties of Edible Films Formulated with Apple Skin Polyphenols

W-X. Du, C.W. Olsen, R.J. Avena-Bustillos, M. Friedman, T.H. McHugh

Journal of Food Science, Vol. 76, No. 2; pp. M149–M155, 2011

Link to full text: <http://onlinelibrary.wiley.com/doi/10.1111/j.1750-3841.2010.02012.x/full>

Significance: Apple skin polyphenols can be used to prepare apple-based antimicrobial edible films with good physical properties for food applications by direct contact.

Edible films made from fruits or vegetables containing apple skin polyphenols (ASPs) have the potential to be used commercially to protect food against contamination by pathogenic bacteria. This study evaluated physical properties as well as antimicrobial activities against *Listeria monocytogenes*, *Escherichia coli* O157:H7, and *Salmonella enterica* of ASPs at 0% to 10% (w/w) concentrations in apple puree film-forming solutions formulated into edible films. Commercial ASPs powder had a water activity of 0.44 and high total soluble phenolic compounds and antioxidant capacity (995.3 mg chlorogenic acid/100 g and 14.4 mg Trolox/g, respectively). Apple edible film with ASPs was highly effective against *L. monocytogenes*. The minimum concentration needed to inactivate *L. monocytogenes* was 1.5%. ASPs did not show any antimicrobial effect against *E. coli* O157:H7 and *S. enterica* even at 10% level. The presence of ASPs reduced water vapor permeability of films. ASPs increased elongation of films and darkened the color of films.