WRT1.7 Paleg, B., Varley, E.; College of Agriculture and Natural Resources, University of Maryland; bp2@umail.umd.edu. **FOOD SAFETY RISK ANALYSIS E-LEARNING PROGRAM.**

A collaborative, interdisciplinary team from the University of Maryland and the Food and Drug Administration received a USDA grant to develop a global Food Safety Risk Analysis E-Learning program. Consisting of five professional development short courses; targeted at risk analysis, risk assessment, risk management, and risk communication issues, this program uses new and emerging information technologies to train food safety professionals in the fundamentals of risk analysis. We will discuss the uniqueness of the program, including the challenges of developing and delivering professional development e-learning. Piloting the program's courses to learners in three countries with an intent of developing a learning community through group activities led to both expected and unexpected experiences. Lessons learned from the feedback of the pilot enabled to team to redesign specific modules to minimize barriers to effective learning.

P3.9 Panko, J.M., Shay, E.C., Unice, K.M.; AMEC Earth & Environmental, Inc.; julie.panko@amec.com. **RISK PERCEPTION: THE REOCCUPANCY OF LOWER MANHATTAN OFFICE SPACE FOLLOWING THE NATIONAL TRAGEDIES OF SEPTEMBER 11, 2001.**

The collapse of the World Trade Center (WTC) on September 11th, 2001 destroyed or severely damaged nearly 15,000 businesses in its vicinity, and generated concern about potential human exposure to airborne pollutants in the ambient outdoor air, as well as in indoor air. An international bank occupied offices in One Liberty Plaza, a building adjacent to Ground Zero, that was severely damaged by the collapse, and wanted to reoccupy its space and resume work following the destruction of the WTC. To do so required extensive cleaning, renovation and IAQ monitoring to ensure the safety and comfort of the returning employees. The bank's offices experienced severe physical damage from the falling debris. The debris consisted of finely ground building materials from the two towers, some of which contained asbestos. Initial cleaning and renovation work included removal of all soft furnishings (i.e., upholstered items) and cleaning of all hard surface furnishings, office equipment, cabinets, interior structural/decorative items, HVAC ductwork (including perimeter units) and lighting fixtures] before reoccupancy to reduce asbestos levels. Although the initial evaluation focused on exposure to asbestos, the emphasis shifted to include other constituents that the EPA was monitoring in the outdoor ambient air (i.e. benzene, hexavalent chromium, lead, polychlorinated biphenyl (PCB), dioxin, PM 2.5 and PM 10). USEPA screening levels for outdoor air pollutants were established as the indoor reoccupancy standards. In addition to final clearance and follow-up air monitoring, other issues such as employee complaints of odor infiltration, various irritation effects, and concerns regarding drinking water, airborne particulates, and mold were evaluated and addressed. The education of company executives and addressing employee perceptions of air monitoring data from the EPA and NYC Department of Health, as well as news media reports were also part of the scope of work.

M15.3 Paoli, G.M.; Decisionalysis Risk Consultants, Inc.; gpaoli@decisionalysis.com. **A REVIEW OF THE INTEGRATION OF EPIDEMIOLOGY AND RISK ASSESSMENT FOR FOODBORNE MICROBIAL HAZARDS.**

The management of microbial hazards provides considerable opportunity to integrate epidemiological analysis with standard risk assessment techniques. This paper will review a variety of applications in which these complementary approaches have been employed. Examples include: the use of epidemiological data to derive and adjust dose-response relationships; the use of serotyping data together with risk assessment methodology to estimate attributable risk among commodities; incorporation of epidemiologically determined risk factors within risk assessment models; the use of molecular epidemiology and risk assessment to improve the understanding of sources of contamination; the use of surveillance data for validation of risk assessment predictions; and recent advances in computational epidemiology involving Bayesian inference combined with simulation to improve the detection of outbreaks or terrorist attacks. At times, risk assessment and epidemiological approaches have led to contradictory findings. Examples of these situations will also be described and assessed.

W7.1 Paoli, G.M., Fazil, A.; Decisionalysis Risk Consultants, Canada, Health Canada, Canada; gpaoli@decisionalysis.com. **PEELING THE ONION OF PERFORMANCE STANDARDS FOR FOODBORNE PATHOGENS.**

Internationally through the proposed use of Food Safety Objectives, and in domestic food policy, risk-based performance standards are frequently advocated for foodborne pathogens. To date, there has been limited detailed analysis of technical issues in developing and implementing a risk-based performance standard for pathogens. We suggest that the reality of the standard-setting process has far more complexity than is generally accounted for in current documentation and debate. Challenges in development stem from five main sources: (i) the need for formal valuation of the relative importance of avoiding diverse potential health outcomes; (ii) consideration of some limitation to the burden on food processors given the contribution of downstream food handling to the overall risk; (iii) the rare-event nature of foodborne illness on a per-serving basis and the potential futility of measuring and improving the "average" performance in food processing; and (iv) determination of the set of measurable outcomes in a food processing facility that would be truly representative of acceptable risk. In this paper, these challenges are explored using examples and potential solutions are offered.
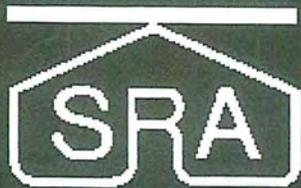
M24.2 Park, R.M., Bena, J.F., Stayner, L.T.; National Institute for Occupational Safety and Health; bcmcinci@fuse.net. **HEXAVALENT CHROMIUM AND LUNG CANCER IN THE CHROMATE INDUSTRY: A QUANTITATIVE RISK ASSESSMENT.**

The purpose of this investigation was to estimate excess lifetime risk of lung cancer death resulting from occupational exposure to hexavalent chromium-containing mists and dusts. The mortality experience in a previously studied cohort of 2357 chromate chemical production workers with 122 lung cancer deaths was analyzed with Poisson regression methods. Extensive records of air samples evaluated for water-soluble hexavalent chromium were available for the entire employment history of this cohort. Diverse models of exposure-response for hexavalent chromium were evaluated by comparing deviances and inspection of cubic splines. Pack-years of smoking imputed from data on cigarette use at hire was included as a variable. Lifetime risks of lung cancer death from exposure to hexavalent chromium were estimated using an actuarial calculation that accounts for competing causes of death. A linear relative rate model gave a good and readily interpretable fit to the data. The estimated rate ratio for 1 mg/m3-yr in cumulative exposure to hexavalent chromium (as CrO3), with a lag of 5 years, is RR = 2.44 (95% CI=1.54-3.83). The excess lifetime risk for exposure to respirable hexavalent chromium at the current OSHA Permissible Exposure Limit (0.10 milligram/m3) is estimated to be 255 per 1000 (95% CI: 109-416). This estimate is comparable to estimates of lung cancer exposure response to hexavalent chromium by U.S. EPA and OSHA using different occupational data. Current occupational standards for hexavalent chromium permit lifetime risks of lung cancer far in excess of that usually considered acceptable by OSHA (less than one in a thousand).

P3.23 Parker, F.L., Mahura A., Compton, K., Brown, K., Takano, M., Novikov, V., Baklanov, A., Sørensen, J.H.; Vanderbilt University, Danish Meteorological Institute, Institute of Northern Environmental Problems, Japan Atomic Energy Research Institute, Russian Research Center-Kurchatov Institute; parkerfl@vuse.vanderbilt.edu. **RUSSIAN FAR EAST NUCLEAR SUBMARINE COMPLEXES POTENTIAL IMPACT ON JAPAN AND ALASKA.**

An Assessment of the Impact of Russian Nuclear Fleet Operations on Far Eastern Coastal Regions has been performed as part of the Radiation Safety of the Biosphere Project (RAD) of the International Institute for Applied Systems Analysis (IIASA) of Laxenburg, Austria. We have evaluated the potential impact of accidents at the Russian Far East nuclear submarine sites near Vladivostok and Petropavlovsk. We have defined the actual and potential problems there based upon available information and studies commissioned by RAD in collaboration with Russian institutes. In our original work, together with members of the Danish Meteorological Institute (DMI) and the Japan Atomic Energy Research Institute, we have calculated the nuclide trajectories from these sites to nearby countries such as Japan, China and Alaska and the Aleutian Islands as well as Asiatic Russia. We then determined the depletion resulting from dilution, dispersion, deposition and decay. Finally, we have calculated the doses to these populations. Though not assuming a threshold for effects from radiation, we have calculated the risks for various cutoff doses suggested by a number of national and international organizations.

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