



720 South Colorado Blvd.
Suite 1000-N
Denver, Colorado 80246 - 1926
Phone (303) 756-9090
Fax (303) 691-9490
www.neha.org

2008 *Journal of Environmental Health* Abstracts

Copyright 2008, National Environmental Health Association.

January/February 2008

Environmental Health Specialists' Self-Reported Foodborne Illness Outbreak Investigation Practices

Carol A. Selman
Laura R. Green, Ph.D.

Abstract

To collect qualitative data on the investigation practices of environmental health specialists with respect to foodborne illness outbreaks, the authors convened six focus groups of randomly selected specialists working in public health agencies in eight states. Participants discussed their investigation activities, methods used to identify contributing factors, success in identifying contributing factors, and the difficulties they faced when conducting investigations. Findings revealed substantial variability in the type of activities in which participants engaged during investigations, and the amount and nature of the collaboration between epidemiologists and environmental health specialists during investigations. Many participants indicated that during investigations they often did not identify contributing factors associated with an outbreak. Participants also identified several difficulties associated with outbreak investigations, including difficulties associated with restaurant employees, restaurant customers, and environmental health organizations.

Septic Tank Additive Impacts on Microbial Populations

S. Pradhan, Ph.D.
M.T. Hoover, Ph.D.
G.H. Clark, M.S.
M. Gumpertz, Ph.D.
A.G. Wollum, Ph.D.
C. Cobb, M.S.
J. Strock, Ph.D.

Abstract

Environmental health specialists, other onsite wastewater professionals, scientists, and homeowners have questioned the effectiveness of septic tank additives. This paper describes an independent, third-party, field scale, research study of the effects of three liquid bacterial septic tank additives and a control (no additive) on septic tank microbial populations. Microbial populations were measured quarterly in a field study for 12 months in 48 full-size, functioning septic tanks. Bacterial populations in the 48 septic tanks were statistically analyzed with a mixed linear model. Additive effects were assessed for three septic tank maintenance levels (low, intermediate, and high). Dunnett's *t*-test for tank bacteria ($\alpha = .05$) indicated that none of the treatments were significantly different, overall, from the control at the statistical level tested. In addition, the additives had no significant effects on septic tank bacterial populations at any of the septic tank maintenance levels. Additional controlled, field-based research is warranted, however, to address additional additives and experimental conditions.

Randomized Controlled Trials in Environmental Health Research: Ethical Issues

David B. Resnik, J.D., Ph.D.

Abstract

Randomized controlled trials (RCTs) are becoming increasingly common in environmental health research. Like all studies involving human subjects, environmental health RCTs raise many ethical challenges, ranging from obtaining informed consent to minimizing risks to protecting privacy and confidentiality. One of the most important issues raised by these studies is whether it is ethical to withhold effective environmental health interventions from research subjects in order to satisfy scientific objectives. Although environmental health investigators usually do not have professional obligations to provide medical care to research subjects, they have ethical obligations to avoid exploiting them. Withholding interventions from research subjects can be ethical, provided that it does not lead to exploitation of individuals or groups. To avoid exploiting individuals or groups, investigators should ensure that research subjects and study populations receive a fair share of the benefits of research.

The Performance of UASB Reactors Treating High-Strength Wastewaters

Sibel Aslan, M.D.

Nusret Şekerdağ, Ph.D.

Abstract

In the study reported here, the authors investigated the influence of hydraulic loading rate, organic loading rate, and recycle rate on the performance of upflow anaerobic sludge blanket (UASB) reactors treating high-strength wastewaters. For this purpose, they used two identical reactors. The removal rates for chemical oxygen demand

(COD), total kjeldahl nitrogen (TKN), total phosphorus (TP), total solids (TS), total suspended solids (TSS), and volatile solids (VS) were investigated for various hydraulic loading rates, and COD removal rates were investigated for various organic loading rates. In Reactor 1, a COD removal rate of 84.75 percent was achieved at influent COD of 8,000 mg/L and a hydraulic loading rate of 0.121 cubic meters per cubic meter per day ($\text{m}^3/\text{m}^3\text{-d}$). In Reactor 2, a COD removal rate of 82.83 percent was achieved at influent COD of 12,000 mg/L and a hydraulic loading rate of 0.069 $\text{m}^3/\text{m}^3\text{-d}$. Although the COD removal rates of the reactors were high, TKN and TP removal rates were low. The removal rates usually decreased when hydraulic and organic loading rates were increased.

Health-Related Quality of Life and Recognition of Desertification Among Inhabitants of the Loess Plateau Region of China: Findings for City and Village Communities

Haosheng Mu, M.D.
Youichi Kurozawa, M.D., Ph.D.
Kazuhiko Kotani, M.D., Ph.D.
Guobin Liu, Ph.D.
Pulin Liu, Ph.D.
Atsushi Tsunekawa, Ph.D.
Shunichiro Nishino
Takehiko Y. Ito, Ph.D.

Abstract

This article elucidates the health-related quality of life (HRQOL) the recognition of desertification among people living in the semi-arid Loess Plateau of China. HRQOL was assessed with a three-dimensional survey of general health perception, vitality, and general mental health based on a 36-item short-form health survey (SF-36). Scores for general health perception were approximately the same in the city and the village communities. Vitality and mental health scores were significantly lower for women in the village communities than for other groups. In the village communities, HRQOL was significantly and positively correlated with income. The inhabitants of the village communities were more satisfied with their life situation than those in the city, in spite of the economic gap between them. Levels of recognition of desertification were lower in the village communities than in the city.

March 2008

Shipshape: Sanitation Inspections on Cruise Ships, 1990–2005, Vessel Sanitation Program, Centers for Disease Control and Prevention

Elaine H. Cramer, M.D., M.P.H.
Curtis J. Blanton, M.S.

Charles Otto, M.S.
Vessel Sanitation Program Environmental Health Inspection Team

Abstract

In the course of a successful collaboration between the Centers for Disease Control and Prevention (CDC) and the cruise ship industry on reducing common-source outbreaks, CDC's Vessel Sanitation Program (VSP) has expanded its training, education, and cruise ship inspection programs. The study reported here evaluated 15 years of ship sanitation inspection data from the National Center for Environmental Health and assessed performance in specific sanitation categories from 1996 to 2005. During the period 1990–2005, scores from cruise ship environmental sanitation inspections steadily improved. The percentage of inspections with violations decreased among five of nine categories. Those five categories were Washing Facilities, Contact Surfaces, Facility Maintenance, Food Handling, and Communicable Disease Practices. Inspection violations increased proportionally in the categories of Swimming Pools and Water System Protection/Chart Recording. Overall continued good performance in most sanitation categories is likely attributable to on-site training during inspections, improvements in ship construction, and a switch from hot-holding temperatures to time limits as a public health control for foods on display.

Determination of the Feasibility of Using a Portable X-Ray Fluorescence (XRF) Analyzer in the Field for Measurement of Lead Content of Sieved Soil

Andrea M. Markey, M.S.
C. Scott Clark, Ph.D., C.I.H.
Paul A. Succop, Ph.D.
Sandra Roda, M.S.

Abstract

Soil samples collected in housing areas with potential lead contamination generally are analyzed with flame atomic absorption spectrometry (FAAS) or other laboratory methods. Previous work indicates that field-portable X-ray fluorescence (XRF) analysis is capable of detecting soil lead levels comparable to those detected by FAAS in samples sieved to less than 125 μm in a laboratory. A considerable savings, both economical and in laboratory reporting time, would occur if a practical field method could be developed that does not require laboratory digestion and analysis. The XRF method also would provide immediate results that would facilitate the provision of information to residents and other interested parties more quickly than is possible with conventional laboratory methods. The goal of the study reported here was to determine the practicality of using the field-portable XRF analyzer for analysis of lead in soil samples that were sieved in the field. The practicality of using the XRF was determined by the amount of time it took to prepare and analyze the samples in the field and by the ease with which the procedure could be accomplished on site. Another objective of the study was to determine the effects of moisture on the process of sieving the soil. Seventy-eight samples were collected from 30 locations near 10 houses and were prepared and

analyzed at the locations where they were collected. Mean soil lead concentrations by XRF were 816 ppm before drying and 817 ppm after drying, and by laboratory FAAS were 1,042 ppm. Correlation of field-portable XRF and FAAS results was excellent for samples sieved to less than 125 μm , with R^2 values of .9902 and .992 before and after drying, respectively. The saturation ranged from 10 percent to 90 percent. At 65 percent saturation or higher, it was not feasible to sieve the soil in the field without a thorough drying step, since the soil would not pass through the sieve. Therefore the field method with sieving was not practical when the soil was 65 percent or more saturated unless a time-consuming drying process was included.

Survival and Growth of Foodborne Microorganisms in Processed and Individually Wrapped Cheese Slices

Richard H. Linton, Ph.D.
Nigel Harper

Abstract

The objectives of the research reported here were to determine the growth, survival, or inactivation of selected microorganisms on individually wrapped processed cheese (IWC) slices stored at 5°C and 22°C, and to compare quality indices. IWC slices were spot-inoculated with foodborne pathogenic bacteria (*Listeria monocytogenes*, *Staphylococcus aureus*, and *Salmonella* spp.), spoilage bacteria (*Pseudomonas* spp. and *Lactobacillus* spp.), and spoilage molds (*Penicillium* spp. and *Cladosporium* spp.). Each bacterium was inoculated at 10^5 CFUs/g for determination of growth, survival, or inactivation. Molds were inoculated at 10^2 spores per gram and observed for growth. Fifty percent of the inoculated product samples were held at 5°C (to simulate refrigeration), and the other 50 percent were held at 22°C (to simulate ambient temperature) throughout shelf life. Samples taken on days 0, 3, 7, 10, 14, and 28 and after 2, 3, 6, and 9 months, and were evaluated for surviving cells (by means of appropriate selective media), color (with the cheese color guide), and lipid oxidation (by means of peroxide values). Bacterial inactivation was observed in all conditions. At 14 days, a 5-log reduction was observed for *Listeria monocytogenes* and *Salmonella*, while a 3-log reduction was observed for *Staphylococcus aureus*. For *Pseudomonas* spp. and *Lactobacillus* spp., a 2-log reduction was observed within 3 days, with an additional 1-log reduction noted after several months. Mold levels showed no change during the first several weeks of storage. At 84 days, mold levels decreased at 5°C, but they showed growth at 22°C, to approximately 10^5 CFUs/g. Visual color was evaluated on a 10-point National Cheese Institute scale. During storage at 5°C or 22°C, color became darker and values increased from 4 to 5 and 4 to 7, respectively. Higher peroxide values were also obtained for the samples held at 22°C versus 5°C. From a microbiological standpoint, pathogenic and spoilage bacteria were unable to grow in this product; however, long-term storage at 22°C led to lower product quality and mold growth.

Antimicrobial Resistance in *Escherichia coli* Isolated in Wastewater and Sludge from Poultry Slaughterhouse Wastewater Plants

Paolo Martins da Costa, Ph.D.
Paulo Vaz-Pires, Ph.D.
Fernando Bernardo, Ph.D.

Abstract

The authors investigated the antimicrobial resistance of *Escherichia coli* isolates in 22 samples of crude inflow, treated effluent, and sludge collected at the wastewater treatment plants of eight poultry slaughterhouses in Portugal. A total of 549 *E. coli* strains were recovered and tested for resistance to 12 antimicrobial agents. Multidrug resistance was present in 55.7 percent of the isolates. Resistance to tetracycline, ampicillin, trimethoprim/sulfamethoxazole, streptomycin, and enrofloxacin was found in 80.7 percent, 56.5 percent, 47.5 percent, 39.2 percent, and 18.4 percent of the isolates, respectively. Resistance rates of *E. coli* to nearly all of the tested antibiotics were higher in the strains obtained from the six slaughterhouses that handled conventional broilers than in the two slaughterhouses that handled free-range broilers. Wastewater treatment resulted in an *E. coli* decrease of between 0.5 log and 3 log; nevertheless, an average of 5.2×10^5 CFUs/100 mL were present in the outflow of the plants. These data indicate that the use of antimicrobials in poultry production leads to the selection of a large pool of resistance genes and that wastewater treatment processes are unable to inactivate the bacteria and thus will result in dissemination of resistant *E. coli* into the environment.

A Novel Technology to Improve Drinking Water Quality Using Natural Treatment Methods in Rural Tanzania

Shaaban Aman Mbogo, Ph.D.

Abstract

It is estimated that one billion people worldwide do not have access to treated drinking water. This paper reports on an investigation into the potential of indigenous or natural water treatment methods as alternatives to conventional chemical water treatment methods. The seeds of five natural plant species—*Vigna unguiculata*, *Phaseolus mungo*, *Glycine max*, *Pisum sativum*, and *Arachis hypogea*—were evaluated for the removal of turbidity, and their efficiency was compared with that of alum. The use of a solar energy-saving method to disinfect drinking water—leaving it to heat under the sun to reduce bacteria colonies—also was evaluated. The study revealed that for raw water with turbidity of 482 nephelometric turbidity units, coagulation with seed extracts from natural plant species reduced natural turbidity by 96.7 to 100 percent when the seed extract was used as the primary coagulant and by 100 percent when it was used as a coagulant aid. The study showed further that natural coagulants were as effective as commercial alum [$\text{Al}_2(\text{SO}_4)_3$] and even superior for clarification because the optimum dosage was low compared with that of alum. Leaving samples of water clarified by natural coagulants on a black-painted roof for 8 hours achieved up to 100 percent bacteria kill.

April 2008

Differential Impacts of Smoke-Free Laws on Indoor Air Quality

Kiyoung Lee, Sc.D., C.I.H.
Ellen J. Hahn, Ph.D.
Nick Pieper
Chizimuzo T.C. Okoli, Ph.D.
James Repace, M.S.
Adewale Troutman, M.D.

Abstract

The authors assessed the impacts of two different smoke-free laws on indoor air quality. They compared the indoor air quality of 10 hospitality venues in Lexington and Louisville, Kentucky, before and after the smoke-free laws went into effect. Real-time measurements of particulate matter with aerodynamic diameter of 2.5 μm or smaller ($\text{PM}_{2.5}$) were made. One Lexington establishment was excluded from the analysis of results because of apparent smoking violation after the law went into effect. The average indoor $\text{PM}_{2.5}$ concentrations in the nine Lexington venues decreased 91 percent, from 199 to 18 $\mu\text{g}/\text{m}^3$. The average indoor $\text{PM}_{2.5}$ concentrations in the 10 Louisville venues, however, increased slightly, from 304 to 338 $\mu\text{g}/\text{m}^3$. $\text{PM}_{2.5}$ levels in the establishments decreased as numbers of burning cigarettes decreased. While the Louisville partial smoke-free law with exemptions did not reduce indoor air pollution in the selected venues, comprehensive and properly enforced smoke-free laws can be an effective means of reducing indoor air pollution.

Potential Health Effects Associated with Residential Proximity to Freeways and Primary Roads: Review of Scientific Literature, 1999–2006

Vickie L. Boothe
Derek G. Shendell, D.Env, M.P.H.

Abstract

This review presents epidemiologic evidence of adverse health effects associated with residential proximity to traffic. Of the 29 peer-reviewed studies that met the authors' defined criteria, 25 reported statistically significant associations with at least one adverse health effect across a broad range of exposure metrics and diverse geographical locations. Specific pollutants contributing to the associated health effects could not, however, be identified, and uncertainties existed because of the lack of individual exposure assessments that could rule out confounding by other factors. Improved exposure assessments and future studies should be considered for better identification of

contributing pollutants and mechanisms of action. In the meantime, additional policies, additional regulations, and improved land use and urban planning can better protect the public and limit exposure, especially for vulnerable populations such as pregnant women, children, and the elderly.

Role of Water-Saving Devices in Reducing Urban Water Consumption in the Mega-City of Tehran, Case Study: A Residential Complex

Gholamreza Nabi Bidhendi, Ph.D.

Touraj Nasrabadi, M.Sc.

Hamid Reza Sharif Vaghefi, M.Sc.

Hassan Hoveidi, M.Sc.

Hamid Reza Jafari, Ph.D.

Abstract

Iran is one of 27 countries that are likely to face increasing water shortage crises between now and 2025 unless action is taken to reduce currently high-per-capita urban water consumption. Accordingly, consumption control in the mega-city of Tehran will be an invaluable achievement. A study of Tehran water consumers has determined that household consumers are responsible for 70 percent of the total consumption. Keeping that figure in mind, the authors set out to assess rates of consumption by water fixtures, with an emphasis on household users, and to examine the effects of installing subcounters and reducers.

They selected an apartment complex in which it was possible to install water subcounters for each unit. The first step was to evaluate resident attitudes. Block 3, which had 10 units, was selected to cooperate with the project.

The second step was to install counters for all 10 units to determine consumption by different fixtures. (The counters were installed in kitchens, in bathrooms, on toilets, on washing machines, and on flash tanks). In the next step, data entry forms for fixture consumption were completed for a period of 10 days. Then single-handle faucets and reducers were installed, and the outcomes were logged for a period of 10 days. Counter readings were performed by the volunteer residents or by educated personnel every 24 hours, and the total volume of inside consumption was compared with the consumption registered by a base counter placed outside each unit. In the course of the project, the consumption per capita was calculated every 24 hours to yield a real and unbiased model that is applicable to city of Tehran.

The results showed a total reduction in water consumption of about 20 percent. Thus, with suitable planning and application of cultural and technical methods, it is possible to optimize consumption in Tehran in the near future.

Temperature and Direct Effects on Population Health in Brisbane, 1986–1995

Peng Bi, M.Med.Sci., Ph.D.

Kevin A. Parton, M.Sc., Ph.D.

Jian Wang, M.D., Ph.D.

Ken Donald, Ph.D., F.R.A.C.P.

Abstract

To assess the impact of weather on human mortality, particularly among elderly people and people with diseases, the authors conducted an ecological study in Brisbane, Australia. Correlation and autoregressive integrated moving average (ARIMA) regression analyses assessed the relationship between weather and mortality in the general population and the elderly population (65 years of age and older) over the period 1986–1995. In the summer, both cardiovascular diseases and all-cause mortality in the elderly population had significant positive correlations with monthly temperatures. In the winter, negative correlations were found between monthly mean maximum temperatures and cardiovascular-disease mortality, and between monthly mean minimum temperatures and respiratory-disease mortality. Regression models were developed for various target populations and produced similar results.

May 2008

Bedbug Infestations in the News: A Picture of an Emerging Public Health Problem in the United States

Alice L. Anderson, M.S., Ph.D.
Korin Leffler

Abstract

Bedbug (*Cimex lectularis*) infestations have become a major complaint in all but three states in the United States. Increasing infestations have also been reported in Asia, Australia, Europe, and Canada. Newspaper articles often herald the onset of a new health issue for the public, and they can be used for epidemiological tracking of increasing populations of irritating and potentially serious vectoring pests. This news coverage model is useful in validating the typical spread of a new contagious entity, or in predicting the waves of public reaction to the spread of a new pest or health problem. The authors' analysis covers the years 2001 to 2006, showing the incidence of bedbug news coverage from the East Coast, the Midwest, the South, and the West in the United States. Rural and urban examples are included in a four-year time frame starting with news in the Northeast and ending with an attempt to eradicate the pest from the state of Hawaii.

A Procedure for Detecting Childhood Cancer Clusters Near Hazardous Waste Sites in Florida

Greg Kearney, Dr.P.H., M.P.H., R.S.

Abstract

Despite over 20 years of research on childhood cancer clusters and hazardous waste sites, little evidence has been produced to indicate a causal relationship. Nevertheless, the perception of a childhood cancer cluster being located near a hazardous waste site can raise fear and uncertainty, and it demands attention from health officials. To investigate this public health concern, the author used the spatial-scan statistical software SaTScan to detect childhood cancer clusters and their proximity to National Priority List (NPL), or Superfund, sites in Florida. In the ecological study reported here, “most likely” clusters were defined as those with a p -value of $<.05$. Distance served as a proxy for exposure; a geographical information system (GIS) was used to determine the number of clusters within a predetermined distance of an NPL site. Spatial clusters were found to occur randomly throughout the state, with most clusters being identified in the more populated counties, and clusters less likely to occur near an NPL site. This article attempts to explain the utility of an emerging public health surveillance tool for detecting cancer clusters near hazardous waste sites. Despite several epidemiological limitations of the study, as well as the fact that there are other environmental exposure hazards such as Toxic Release Inventory facilities and landfills, the SaTScan program proved useful as a surveillance tool for generating more in-depth studies.

An Assessment of Lead Leachability from Lead-Glazed Ceramic Cooking Vessels

Robert Lynch, R.S., Ph.D.

Brenda Elledge, Dr.PH.

Christopher Peters, M.S.

Abstract

Since the early 1990s, numerous studies in Mexico have demonstrated an association between the use of lead-glazed ceramic cooking ware (LGC) and elevated blood lead levels. We sought to determine whether ceramic ware collected from the Hispanic community in Oklahoma City contained lead and to quantify the amount of lead that leached into foods cooked in those vessels. Lab results were combined with consumer intake levels for foods and compared with the provisional tolerable total intake level (PTTIL) for lead. The authors found that 52 percent of the vessels they tested exceeded the FDA action level for ceramic ware. Consumption of a low-pH food (tomatoes) cooked in 23 of 25 vessels would result in a dose of lead exceeding the PTTIL compared with 3 of 25 vessels and 5 of 25 vessels for a higher-pH foods (hominy and beans, respectively). The results of the study indicate that LGC is still used in the local community and represents a significant public health concern.

Health and Socioeconomic Effects of Groundwater Arsenic Contamination in Rural Bangladesh: New Evidence from Field Surveys

Nurun Nahar, M.A., M.Phil., Ph.D.

Faisal Hossain, M.Eng., Ph.D.

M. Delawer Hossain, Ph.D.

Abstract

This report discusses the health and socioeconomic problems that have recently emerged in the Bangladesh countryside because of arsenic contamination of the groundwater. A survey found that men in rural households are generally found to be more susceptible to arsenicosis than women. The survey also indicated that villagers with lower annual income are more likely to experience arsenicosis. About 60 percent of the respondents indicated a willingness to pay up to a dollar of their monthly income for safe water. More than 70 percent of women were found to be willing to walk for five minutes to collect safe water. Awareness campaigns conducted over the last decade seem to have been effective for villagers. Overall, findings from the survey paint a picture of a gradually evolving social and health scenario in rural Bangladesh that health officials must heed to safeguard the public health of the rural public.

Histological Alterations Observed in the Gills and Ovaries of *Clarias gariepinus* Exposed to Environmentally Relevant Lead Concentrations

Olanike K. Adeyemo, D.V.M., M.V.P.H., Ph.D.

Abstract

Sublethal levels of pollutants usually cause biochemical or physiological effects at the subcellular level in an organism. Death is too extreme a criterion for determination of whether a substance is harmful or not; it is therefore important to find biomarkers of health and sublethal toxicant effects. In the 11 local-government areas of Ibadan, a large metropolitan area in Nigeria, previous studies of lead levels in surface water and fish ponds revealed surface water levels in ranges of 0.5–2.35 mg/L (mean = 0.76 mg/L) during the dry season and 1.15–2.20 mg/L (mean = 1.34 mg/L) during the rainy season, and a range of 1.09–2.9 mg/L (mean = 1.88 mg/L) in fish ponds.

In the study reported here, *Clarias gariepinus* was exposed to environmentally relevant concentrations (0.0, 0.05, 0.1, 0.5, and 1 mg/L) of lead nitrate over a period of eight weeks. The goal was to assess histological alterations in the gills and ovaries. The lesions observed in the gills included epithelial hyperplasia, atrophy and fusion of gill filaments, and marked degeneration and necrosis of the epithelial cells, with hemorrhages and marked disorganization and rupture in the secondary lamellae. In the ovaries, diffuse mild degeneration and necrosis of the follicles were initially observed; subsequently, the groups exposed to higher concentrations of lead nitrate showed marked severe degeneration of ovarian follicles.

The results of this work clearly indicate that lead has adverse effects on the gills and ovaries of *Clarias gariepinus*. The severity of lesions caused by lead nitrate was positively correlated with the concentration.

Environmental Chemicals in People: Challenges in Interpreting Biomonitoring Information

Judy S. LaKind, Ph.D.
Leila BarraJ, Ph.D.
Nga Tran, Ph.D.
LesA L. Aylward, M.S.

Abstract

Biomonitoring, the measurement of chemicals in blood, urine, and other tissues or fluids, is becoming an increasingly common tool in the study of human exposure to environmental chemicals and the potential health effects of those chemicals. The National Health and Nutrition Examination Survey (NHANES) now includes biomonitoring data for hundreds of chemicals as well as information on other health and demographic endpoints for thousands of individuals in the United States. The NHANES databases provide valuable information for deriving reference ranges and trend information and can be used for hypothesis-generating analyses, but they cannot be used to establish causal relationships between environmental chemicals and health effects. This commentary examines issues unique to the use of such databases and the interpretation of biomonitoring-based epidemiological studies

June 2008

The Challenge of Multiple Chemical Sensitivity

Taylor R. Spencer, M.D., M.P.H.
Paul M. Schur, M.P.H., R.S.

Abstract

Environmental health professionals frequently come across a health-related problem with no clear cause-and-effect relationship. A typical case occurs when a person complains of experiencing symptoms, often in an indoor setting, that may vary from vague to severe. Multiple Chemical Sensitivity (MCS) may be a factor at play in some of these situations. The condition is characterized by persistent symptoms that follow exposure to chemically unrelated compounds at doses well below those that have been established individually to cause harmful effects. An understanding of MCS among environmental health and medical professionals is encouraged. The following article provides a review of the current literature about MCS and discusses the difficulties, from various sources, in resolving health complaints that may be caused by exposure to low doses of multiple chemicals.

The Practice of the 10 Essential Services and Abilities in the 14 Core Competencies of Alabama Environmental Health Practitioners

R. Kent Oestenstad, Ph.D., C.I.H.
Elizabeth H. Maples, Ph.D.
Christie McCullum-Hill, Dr.P.H.

Abstract

Leading public health agencies have developed guidelines for essential services and core competencies. The study described here was conducted to determine the level of practice of the 10 essential services and abilities in the 14 core competencies among environmental public health practitioners in Alabama. Questionnaires about the practice of the essential services, abilities in the core competencies, and demographics were collected from 255 (88%) practitioners and analyzed by statistical methods. According to the results of this study, these practitioners spent most of their time diagnosing, investigating, enforcing, educating, and linking people to public health services. They had increasing levels of practice as they were promoted to higher-level jobs, and the level of practice was greater in rural counties than in urban. They rated their skill in all of the core competencies to be at least *pretty good*. Practitioners with high school degrees had lower abilities than those with college degrees. Overall, these professionals were better educated, younger, and had better skills than expected.

PACE EH Post Project Assessment of Quality of Life Changes in a Florida Community Related to Infrastructure Improvements

Laurel Harduar-Morano, M.P.H.
Julianne R. Price, R.S.
Daniel Parker, M.S.P.
Carina Blackmore, D.V.M., Ph.D.

Abstract

The Indian River county health department, environmental health division (IRCHD EH) in Florida implemented the Protocol for Assessing Community Excellence in Environmental Health (PACE EH) in the low-income community of West Wabasso, Florida. Over two and a half years, IRCHD EH worked with the community and various governmental agencies to bring much-needed improvements to the area. At the end of the two and a half years, a survey was conducted to discover if the residents' quality of life had increased due to the community's improvements. The survey results yielded high satisfaction rates among residents. The general response was that their feelings of safety and overall well-being—attributed to infrastructure improvements in their community—had increased significantly. An unforeseen benefit realized by all parties involved was a renewed trust in government. The majority of surveyed residents (91%) felt that governmental agencies were better able to respond to their issues.

Characterization of Seasonal Indoor and Outdoor Bioaerosols in the Arid Environment of El Paso, Texas

Linda C. Mota, M.P.H.
Shawn G. Gibbs, M.S., Ph.D.
Christopher F. Green, M.S., Ph.D.
Fernanda Payan
Patrick M. Tarwater, M.S., Ph.D.
Melchor Ortiz, M.S., Ph.D.

Abstract

The authors conducted a study in the El Paso, Texas, region to assess the seasonal bioaerosol concentrations in a convenience sample of one-story residences. The authors sampled the same houses for each season over the course of a year (March 2005 to February 2006) to determine bacterial and fungal concentrations. They used a two-stage ambient culturable sampler system to collect the bioaerosol samples. They took indoor and outdoor bioaerosol samples and studied meteorological conditions for each house at each season. The study found that most of the measured bioaerosol concentrations differed statistically by season ($p < .05$). The greatest concentrations throughout the year were found to occur in fine-sized indoor bacteria during the winter. Meteorological conditions were found not to significantly influence bioaerosol concentrations throughout the year.

Inactivation of Surface Viruses by Gaseous Ozone

Chunchieh Tseng, Ph.D.
Chihshan Li, Ph.D.

Abstract

Environmental surfaces may be contaminated with viruses and contribute to their transmission. Concerns have arisen in trying to control viruses because of an increasing incidence of viral infections. Ozone is considered to be a promising method to inactivate viruses on surfaces. In this investigation, the effects of ozone concentration, contact time, different capsid architecture of viruses, and relative humidity (RH) on inactivating viruses by ozone were evaluated. The authors observed that the survival fraction of viruses on surfaces decreased exponentially with increasing ozone dose. Viruses required ozone doses of 20–112 min(mg/m³) (contact time [min] multiplied by ozone concentration [mg/m³]) for 90% inactivation and 47–223 min(mg/m³) for 99% inactivation. The ozone dose for 99% inactivation was two times higher than for 90% inactivation. The required ozone concentration at 85% RH was lower than at 55% RH. In summary, ozone should be an effective method for reducing the viral number between 1 and 3 logs on surfaces.

The Prevalence of Intestinal Parasites and Nasal *S. aureus* Carriage among Food Handlers

Turan Gündüz, M.D., Ph.D.
M. Emin Limoncu, M.D., Ph.D.
Sedat Çümen

Ali Arı
Serdağ Etiz, M.D.
Ziya Tay, M.D.

Abstract

Food handlers play a major role in the transmission of foodborne diseases. Nasal *Staphylococcus aureus* (*S. aureus*) carriage and intestinal parasitism are important risk factors in contamination. The purpose of the authors' study was to determine the prevalence of intestinal parasites and nasal *S. aureus* carriage among food handlers in Manisa, Turkey. The authors investigated 8,895 people for nasal *S. aureus* carriage and intestinal parasites. Nasal swab materials and stool samples were examined, and anal cellophane band method was performed. The authors found that *S. aureus* was isolated in 69 (0.77%) samples. All *S. aureus* strains were oxacilline sensitive. Intestinal parasites were found in 784 (8.8%) samples. The most common parasites were *Entamoeba histolytica* (69.9%) and *Giardia intestinalis* (24.6%). The authors conclude that food handlers should be screened and treated from time to time and that a periodic program of health education on food safety and hygiene should be given.

July August 2008

The Relevance of Problem-Based Instruction to Learning about Environmental Health

Tunde M. Akinmoladun, Ph.D., D.A.A.S., R.E.H.S./R.S., F.R.S.H

Abstract

This article examines the essence of problem-based instruction and its successful use in teaching classes in environmental health. The author describes experience gained from this style of teaching and recommends how to apply it in the academy to teach environmental public health courses.

The View-Master Health Study Focus Groups

Kathleen Krall, F.N.P., M.P.H.
Jae Douglas, M.S.W., Ph.D.
Nancy A. Perrin, Ph.D.
Donald Austin, M.D.
William E. Lambert, Ph.D.
Michael Heumann, M.P.H., M.A.

Abstract

Trichloroethylene (TCE), a common groundwater contaminant, was found at high levels at an Oregon work site in 1998. According to a recent report released by the National Research Council, “the evidence on carcinogenic risk and other health hazards from exposure to trichloroethylene has strengthened since 2001.” A convenience sample of thirteen former workers from the Oregon work site was recruited for a series of focus groups. Information obtained on plant processes, safety procedures, attitudes regarding medical record access, and opinions about proxy accuracy was subjected to qualitative content analysis. Workers recalled few safety policies and no training or support for control of safety. Most thought co-workers and family members would be the best source of proxy exposure information and favored granting access to medical records. Job-role mobility confirmed the importance of using a job or task exposure matrix. Information obtained will be used in development of an exposure assessment interview tool.

Role of Environmental Health Professionals in Improving the Built Environment

Paris Ponder, M.P.H.

Andrew L. Dannenberg, M.D., M.P.H.

Background

Environmental health professionals (EHPs) have always played a critical role in protecting the public’s health by preventing outbreaks, responding to environmental emergencies, and enforcing public health standards. Traditionally, this role has not focused on improving the built environment, which is the physical environment where people live, work, and play. The design of the built environment, however, affects physical activity and obesity, air pollution and respiratory diseases, injuries, mental health, social capital, and environmental justice (Frumkin, Frank, & Jackson, 2004). Therefore, EHPs can increase their impact on public health if they expand their role to address the built environment.

Case Studies

This issue of the *Journal of Environmental Health* presents four case studies (Roof & Glandon, 2008; Roof & Maclellan, 2008; Roof & Oleru, 2008; Roof & Sutherland, 2008) in which EHPs collaborated with internal and external partners to improve the built environment. EHPs and their colleagues successfully became involved in the land use planning process and implemented policy and community changes through strong leadership and teamwork. Each case study describes the significance of building a multidisciplinary team as a first step to becoming engaged in planning discussions. These partnerships include environmental health department staff, such as directors, health analysts, health educators, and program managers; urban planners; developers and builders; elected and appointed officials; planning commissions; planning agencies and consultants; university faculty; business owners; homeowners associations; realtor associations; park managers; and non-profit organizations, such as nature and water conservancy groups. In addition, having bankers and others who make financial decisions present at the discussion table would likely benefit the group. One study said

that “the creation of the multidisciplinary team early on in the process was key to their past and to their future success (Roof & Oleru, 2008).”

All four reports acknowledged formal and informal communications as significant factors that led to EHPs’ enhanced involvement in land use planning. Several reports mentioned that the formation of partnerships increased the likelihood of planners and developers considering the health implications of their plans and, consequently, seeking the input of environmental health professionals. For example, the Puget Sound Regional Council asked the Seattle and King County Health Department to write a health issue paper about the relationship among health and growth management, economic development, and transportation; as a result, public health language was added to the county’s Vision 2020 plan (Roof & Oleru, 2008).

Public Health: Seattle and King County’s Push for the Built Environment

Karen Roof, M.S.
Ngozi Oleru, Ph.D.

Introduction

In Seattle and King County, Washington, and nationwide, evidence shows that decisions about how we use land and build our environment have significant impacts on individual and population health, safety, and well-being. Land use and built environments also impact community networks, economic growth, environmental sustainability, and social justice. In the past century, awareness of the negative health effects and disparities due to impacts from the built environment has grown, but a lack of knowledge, recognition, and viable data remains about the connection between the built environment and health (Jackson, 2003).

Smart Growth and Health for the Future: “Our Course of Action” Delaware County, Ohio

Karen Roof, M.S.
Susan Sutherland, R.S.

Introduction

In 2004, Delaware County, Ohio, was the fastest growing county in Ohio and the eleventh fastest growing county in the nation. Even with a 71.4% increase in business establishments, less than 40% of Delaware County residents both live and work in the county. The population increased 30% from April 2000 to July 2004, when it reached 142,503. Delaware County, about 25 miles north of Columbus, has experienced challenges from rapid infrastructure development, subdivisions, and population increases. For the past 10 years, Delaware County has built new subdivisions in unincorporated areas being platted at approximately 3,000 new lots per year. In incorporated villages and cities another 1,000 lots are developed each year, adding up to 4,000 new homes, or approximately 10,000 new residents, to the county annually.

Tri-County Health Department in Colorado Does More Than Just Review a Development Plan

Karen Roof, M.S.
Carol Maclennan

Introduction

Are you involved in land use planning? Do you review applications for development? In Colorado, as in many other states, local public health agencies (LPHAs) do provide these services. When local planning departments want to know the public health impacts of a proposed project, they generally refer the development application to the LPHA's environmental health (EH) division. Typically, local EH officials limit their comments to regulatory requirements for air and water quality, waste and wastewater management, and sanitation. It is essential for LPHAs to identify these requirements for preventing human exposures to environmental hazards. However, LPHAs also work on preventing chronic illnesses (e.g., heart disease, diabetes) and promoting healthy behaviors such as physically active lifestyles. EH specialists have the opportunity to identify not only case-specific regulations to protect public health, but also non-regulatory approaches to promote health through planning and development activities. To advocate for public health in its broadest sense, LPHAs should also recommend the inclusion of public health policies in community master plans for land use, transportation and open space, trails and parks systems, and strategies to implement these policies in local codes and standards. In this way, LPHA input can educate planning professionals and policy makers about potential health impacts and benefits of land use choices and improve the quality of land use decision making.

Tool Created to Assess Health Impacts of Development Decisions in Ingham County, Michigan

Karen Roof, M.S.
Robert Glandon, Ph.D.

Introduction

This case study highlights Ingham County Health Department (ICHHD) in Lansing, Michigan, which teamed up with diverse partners to begin an environmental health assessment, leading to the development of innovative tools such as a Health Impact Planning Matrix. This effort was considered vital after survey data reflected a negative trend in health status in the region. Additionally, through the environmental health assessment process, citizens called for improvements in the environment, growth, traffic, and overall quality of life. The capital area of Lansing and surrounding metro area is a Tri-County region of nearly 500,000 people (Ingham, Clinton, and Eaton counties). In this region, population growth and development has shifted over the past 15 years from the urban centers to the rural farmlands. This major expansion of urbanized areas led to mass changes in land use and corresponding health consequences for urban, suburban, and rural residents.

September 2008

Assessing Emergency Response Training Needs of Local Environmental Health Professionals

Thomas M. Reischl, M.A., Ph.D.

Amy N. Sarigiannis, M.P.H.

John Tilden, Jr., D.V.M., M.P.H.

Abstract

The Michigan Center for Public Health Preparedness collaborated with environmental health (EH) professionals at the local, state, and national levels to develop and conduct a state-wide study to identify the preparedness-training needs of local EH professionals in Michigan. The specific aims of the study were first, to determine the self-rated level of confidence among Michigan's EH professionals regarding relevant emergency planning and response competencies; second, to determine the specific preparedness training topic preferences of Michigan's EH professionals; and third, to establish baseline needs assessment data to be used to track progress toward higher levels of readiness after implementation of planning, training, and other preparedness activities. The study recruited 400 EH professionals to complete the survey (61% of all EH professionals in 45 local health departments in Michigan). The top training topic preferences were "environmental health role in emergencies" followed by "water security" and "food security." The EH professionals rated their confidence in demonstrating relevant emergency planning and response competencies. Most of the average ratings (on a 5-point scale) were close to the scale's middle point (rating = 3), suggesting that EH professionals rate themselves as "somewhat confident" in performing important tasks in preparedness and response. Variations in specific ratings helped identify training needs. The discussion of these results focused on the implications of this study for the development of emergency response training for environmental health professionals.

Cryptosporidiosis Outbreak in a Nassau County, Florida, Return Travel Group from Ireland, May 24, 2006–June 4, 2006

Rebecca Lazensky, M.P.H.

Roberta M. Hammond, Ph.D., R.S.

Kathleen Van Zile, M.S.E.H., R.S.

Kim Geib, M.S.N., A.R.N.P.

Abstract

The Nassau County Health Department (NCHD) in Florida investigated an outbreak of gastrointestinal (GI) illness in a returning choral group who toured Ireland from May 24 to June 4, 2006. The travel group, consisting predominantly of retirees, had performed at several churches and at a dinner theater in Ireland. The NCHD administered a telephone questionnaire to 40 of the 41 group members to examine possible water exposures; common meals; and food, travel, and clinical histories. The results of the questionnaire showed that 29 people met the case definition for the outbreak. Five stool samples from travel group members tested positive for *Cryptosporidium parvum*, a species that is animal in origin and often spread through an environmental contamination with animal feces. All five positive samples were subtyped IlaA16G1R1b, a strain that scientists at the Centers for Disease Control and Prevention (CDC) Division of Parasitic Diseases detected twice in 2006 in other human specimens from Northern Ireland.

Making it Work: The Application of Time as a Public Health Control in the Field

Nyall Hislop, M.Sc., CPHI(C)

Abstract

Time as a public health control (TPHC) is increasingly being recognized as a viable alternative to temperature control for potentially hazardous foods in the developed world. This is reflected by recent changes to food regulations and other pertinent health legislation in both Canada and abroad. Considerable ambiguity remains, however, as to when and how TPHC should be applied at the field level.

The author reviewed pertinent legislation, regional standards, and guidelines in various jurisdictions. The author did not identify standardized methods for having health departments receive applications from food vendors, for evaluating such applications for approval or rejection once received, or for monitoring food products subsequent to such an approval. A 4-step process was then designed to help ensure a standardized application of TPHC principles at the field level.

Applications, representing a variety of potentially hazardous food products from both ethnic and North American cuisines, were reviewed and processed according to stated criteria. A structured format for the application, approval, monitoring, and evaluation of potentially hazardous ready-to-eat foods by management and field personnel helps improve consistency in the application of TPHC principles, demonstrate due diligence (for environmental public health departments), and relieve district environmental health officers (EHOs) from the pressures of having sole responsibility over the approval process.

The Role of Environmental Health in Disaster Management: A Qualitative Study of Australian Experiences

Deanna Eldridge

Thomas D. Tenkate, Dr.P.H.

Abstract

Even though environmental health is widely considered to be an integral component of disaster management, limited research on this topic has been conducted. Using a qualitative approach, the authors conducted in-depth interviews of practitioners in Queensland, Australia, to explore the role of environmental health in disaster management and determine how those internal and external to the profession perceive this role. The major themes that emerged described a process in which the “view of health” is socially constructed, and this process is instrumental in shaping perception of the environmental health role in disaster management. The authors also found that the role of environmental health in disaster management is experiencing renegotiation due to a complex process of challenging the socially constructed view of health, raising the profile of the profession, and achieving increased representation in disaster management. Ultimately, increased recognition and a heightened profile of environmental health will result in a more effective disaster management system and will carry over into day-to-day activities.

Relationship between Particulate Matter measured by Optical Particle Counter and Mortality in Seoul, Korea, during 2001

Yong-Sung Cho, M.Sc., Ph.D.

Jong-Tae Lee, M.Sc., Ph.D.

Chang-Hoon Jung, M.Sc., Ph.D.

Young-Sin Chun, M.Sc., Ph.D.

Yoon-Shin Kim, M.P.H., Dr.H.Sc., Ph.D.

Abstract

This study was performed to examine the relationship between particulate matter exposure and mortality in Seoul, Korea, during the year 2001. Particulate matter data were collected using an optical particle counter (OPC) and national monitoring stations in Seoul. The size-resolved aerosol number concentrations of particles 0.3–25 μm in diameter and mass concentrations of PM_{10} (particulate matter less than 10 μm in diameter) and $\text{PM}_{2.5}$ (less than 2.5 μm in diameter) were measured. Meteorological data such as air temperature and relative humidity were provided by the Korea Meteorological Administration. Daily mortality was analyzed using a generalized additive Poisson model, with adjustment for the effects of seasonal trend, air temperature, humidity, and day of the week as confounders, in a nonparametric approach. We used S-Plus for all analyses. Model fitness, using loess smoothing, was based on stringent convergence criteria to minimize the default convergence criteria in the S-Plus generalized additive models module. The IQR (interquartile range) increase of fine particle (10.21 number/ cm^3 [the total number of particles per cubic centimeter]) and respiratory particle (10.38 number/ cm^3) number concentration were associated with a 5.73% (5.03%–6.45%) and a 5.82% (5.13%–6.53%) increase in respiratory disease-associated mortality, respectively. Mortality effects in the elderly (aged over 65 years) were increased by more than 0.51% to 2.59%, and the relative risks of respiratory-related and cardiovascular-related mortality were increased by 0.51% to 1.06% compared with all-cause mortality.

These findings support the hypothesis that air pollution is harmful to sensitive subjects, such as the elderly, and has a greater effect on respiratory- and cardiovascular-

related mortality than all-cause mortality. However, our results using OPC data did not support the hypothesis that PM_{2.5} would have more adverse health effects than PM₁₀ in number concentration but not in mass concentration.

October 2008

Arsenic Exposure and Childhood Cancer—A Systematic Review of the Literature

Arnold Engel, M.D., M.P.H.
Steven H. Lamm, M.D., D.T.P.H.

Abstract

The literature on environmental arsenic exposure and childhood cancer risk comprises 1) studies seeking childhood cancers among arsenic-exposed populations, 2) studies seeking arsenic exposure among childhood cancer cases, and 3) studies seeking associations in populations with both arsenic exposures and childhood cancer cases. No skin cancers were found in dermal examinations of over 25,000 children in Southwest Taiwan or West Bengal, India, with high drinking-water arsenic levels. Childhood cancer types were not different for those living near a Swedish smelter. In Montreal, Canada, children with acute lymphoblastic leukemia did not have drinking-water arsenic more frequently either prenatal or postnatal, and British children with cancer did not have early exposure to environmental sources of airborne arsenic. Neither hair arsenic levels in Woburn, Massachusetts, nor water arsenic levels in Fallon, Nevada, were elevated for children with leukemia. The literature, while limited, does not seem to support an association between arsenic exposure and childhood cancers.

Outbreak of Giardiasis and Cryptosporidiosis Associated with a Neighborhood Interactive Water Fountain—Florida, 2006

Leah Eisenstein, M.P.H.
Dean Bodager, M.P.A., R.S., D.A.A.S.
Dawn Ginzl, M.P.H.

Abstract

An outbreak of giardiasis and cryptosporidiosis was identified in central Florida in September 2006. Environmental and epidemiological investigations indicated the likely source was a neighborhood interactive water fountain in a large upscale urban neighborhood. Forty-nine cases meeting the case definition were identified, of which 38 were giardiasis, nine were cryptosporidiosis, and two were co-infections. The median age of those affected was four years old, and 32 (65.3%) cases were male. This outbreak and other similar occurrences highlight the need to design and implement more stringent

disinfection practices and filtration requirements for treated interactive water venues. *Giardia* cysts and *Cryptosporidium* oocysts are small and chlorine-resistant, and they may require supplemental disinfection methods, such as ultraviolet light irradiation, ozonation, or chlorine dioxide. Individuals who use these types of venues also need to change their behavior to prevent disease transmission. This is the first documentation of a giardiasis outbreak associated with exposure to an interactive water fountain in the United States.

A Review of Enteric Outbreaks in Child Care Centers: Effective Infection Control Recommendations

Marilyn B. Lee, Sc.M., C.P.H.I.(c)
Judy D. Greig, R.N., M.Sc.

Abstract

Child care environments facilitate the spread of enteric infections because of diapering, confined spaces, and children's unhygienic habits. This study reviews documented outbreaks of enteric illness in daycare centers (DCCs) to identify infectious agents, modes of transmission, morbidity/mortality, ages, secondary cases, and practices found effective by investigators. A systematic review of the literature, including peer-reviewed journals and public health records, identified reports of DCC enteric outbreaks published in English occurring between January 1996 and November 2006. In the 75 studies reviewed, 1,806 children were reported ill and 104 were reported hospitalized (mainly associated with *Escherichia coli* O157:H7). For bacterial outbreaks, the modes of transmission were person-to-person (43%), food (29%), and animal contact (11%). The mode of transmission was largely unknown (51%) for viral outbreaks. One hundred twenty-six staff cases and at least 212 additional ill household contacts were identified. The most frequently identified effective management practices included management of symptomatic cases, enhanced hand hygiene, safe food handling practices, and improved environmental cleaning. Although most children recover quite uneventfully from enteric illness, some can be seriously affected, especially by *E. coli* O157:H7. Staff, family members, and the community may become ill from secondary spread; therefore, it is important for DCCs to have effective infection control procedures in place to prevent and control outbreaks.

Estimated Risks of Water and Saliva Contamination by Phthalate Diffusion from Plasticized Polyvinyl Chloride

Kira S. Corea-Télez, M.S.
Patricia Bustamante-Montes, M.D., Dr.P.H.
Magdalena García-Fábila, M.S.
María A. Hernández-Valero, Dr.P.H.
Flavio Vázquez-Moreno, Ph.D.

Abstract

Phthalates are additives commonly used to convert hard polyvinyl chloride (PVC) resins into flexible and workable plastics employed in the production of chewable rubber

toys and other soft-plastic products. In theory, phthalates can diffuse in small quantities to the surface of a product, and from there they can enter the environment and the human body. The purpose of this study was to determine the diffusion of phthalates from plasticized PVC in water and artificial saliva; to determine the migration of di(2-ethylhexyl) (DEHP) phthalate in human saliva using gas chromatography; to compare the experimental values with theoretical values calculated using a model based on the principles of molecular diffusion in fluids; and to use the experimental values to estimate daily doses of DEHP received by Mexican children and infants using plastic and soft-plastic products (e.g., pacifiers, chewable toys, and bottles). Our findings indicated phthalate diffusion of $0.36 \mu\text{g}/\text{cm}^2$ per hour and $4.10 \mu\text{g}/\text{cm}^2$ per hour, respectively, in water and artificial saliva. The average value of phthalate diffusion in vivo was $6.04 \mu\text{g}/\text{cm}^2$ per hour. The daily oral phthalate exposure in Mexican infants and toddlers from oral use of rubber toys and soft-plastic products is $18.12 \mu\text{g}/\text{kg}$. These daily doses are considerably lower than the maximum daily phthalate intake recommended by an international public health committee.

Arsenic and Bladder Cancer: Observations and Suggestions

Vladan Radosavljević, M.D., Ph.D.
Branko Jakovljević, M.D., Ph.D.

Abstract

Arsenic from drinking water is a well-known risk factor for bladder cancer. The purpose of this paper is to systematize some important yet often overlooked facts considering the relationship between arsenic exposure and the occurrence of bladder cancer. Since the exposure to inorganic arsenic from food, inhaled air, and skin absorption as well as arsenic methylation ability are not fully investigated, our assumption is that the exposure of arsenic only from drinking water is underestimated and its role as a risk factor is highly overestimated. This paper proposes some qualitative and quantitative parameters of arsenic as a risk factor for bladder cancer. The recommended qualitative parameters of arsenic intake are first, pathways of exposure, and second, toxicity and metabolism. The suggested quantitative parameters of arsenic intake include amounts of arsenic absorbed in the body, duration of arsenic exposure, and duration of arsenic presence in the urinary bladder. This approach can be implemented in a systematic classification and explanation of various risk factors and their mutual interactions for other types of cancer or diseases in general.

November 2008

Emerging Models for Nitrogen Removal in Treatment Wetlands

Scott Wallace, P.E., M.S.

David Austin, P.E., M.S.

Abstract

Engineering textbooks tell a simple story about nitrification and denitrification. Classic nitrification-denitrification theory begins with the bacterial genera *Nitrosomonas* and *Nitrobacter* performing ammonia and nitrite oxidation, respectively. Then facultative or obligate anaerobic bacteria denitrify by oxidizing organic carbon with nitrate. Recent advances in environmental microbiology have revealed previously unknown bacteria and pathways in the nitrogen cycle that tell a far more complex story. Classic theory has been successful for technologies that employ fast-growing bacteria, such as activated sludge, for almost a century. In contrast, nitrogen transformations in treatment wetlands are only partially explained by classic theory because they are ideal environments for slow-growing bacteria. Recently discovered bacterial processes, such as Anammox and heterotrophic nitrification, can be native to treatment wetlands. Other known nitrogen-cycle bacteria in nature occupy ecological niches similar to those that can exist in treatment wetlands, but their role in denitrification remains unexplored in a treatment context. The experience of treatment wetlands demonstrates that classic theory is no longer valid as a general model. We propose a broader model of nitrogen transformations in treatment wetlands that integrates recent discoveries. This general model is intended as a conceptual tool for those working with nitrogen pollution abatement.

Microbial Water Quality and Influences of Fecal Accumulation from a Dog Exercise Area

Lynell Garfield
Mark Walker, Ph.D.

Abstract

The risk of water contamination by fecal bacteria may be increased if a watershed includes areas where feces accumulate as a result of specific land uses, such as areas where owners frequently exercise dogs. This study examined the effects of a year-round dog exercise area in the Burke Creek Recreational Area (BCRA) in the arid alpine environment of Stateline, Nevada. Burke Creek drains a small, high relief watershed, flows through a sedimentation basin in the BCRA, and enters Lake Tahoe. Over the course of 14 months, we analyzed water samples from the creek for *Escherichia coli* and collected feces from plots to estimate fecal accumulation. We found that accumulation was highly localized within the study area, amounting to approximately 100.1 lbs (45.5 kg) of dry matter in 14 months. Statistical analysis indicated, however, that fecal bacteria in water decreased as the stream flowed through the area, presumably due to effects of the sedimentation basin, wetlands, and die-off of *E. coli* in feces from exposure to environmental stresses. These results are useful for managing heavily used sites and understanding the effects of this type of land use on water quality.

Evaluating the Vulnerability of Bored and Driven Wells in a Shallow Unconfined Aquifer

Hans Schmalzried, Ph.D., R.S.
Charles "Chris" Keil, Ph.D., C.I.H.

Abstract

Shallow unconfined aquifers are the only source of water for private wells in some rural areas. The Oak Openings region of Ohio is one such location. Wells are usually bored or driven in shallow aquifers and are more susceptible to contamination caused by human activities on the surface. To provide better protection for consumers developing shallow wells, local health departments have doubled the required minimum 50 feet distance for isolation from sources of contamination. The potential for contamination still exists, however. Over a two year period, 42 wells were tested in the region for a large suite of pesticides and inorganic chemicals. Results showed little evidence of persistent contamination. Data provided evidence, however, indicating that these wells are vulnerable. Sodium and chloride concentrations were higher in wells at households with water softeners, illustrating the potential for contaminant transport even with increased isolation distances. To ensure public health, regular monitoring of shallow wells is recommended.

Lifestyle and Mercury Contamination of Amerindian Populations along the Beni River (Lowland Bolivia)

Selma Ximena Luna Monrroy, M.Sc.
Ronald Wily Lopez, M.Sc.
Marc Roulet, Ph.D.
Eric Benefice, M.D., Ph.D.

Abstract

The objective of this paper was to document mercury contamination of Amerindian populations living along the Beni River in Bolivia and to examine risk factors related to their lifestyle. A cross-sectional survey was performed among 15 communities on the flood plains of the Beni River at the foothills of the Andes. Hair mercury content (H-Hg) served as a bioindicator of mercury contamination. Mercury values were available for 556 people. Four indicators of lifestyle were analyzed: community accessibility, subsistence activity, fish consumption, and ethnicity (i.e., members of the Tacana or Ese Ejja ethnic group). The median of H-Hg was equal to 4.0 $\mu\text{g/g}$ (95% *CI* [confidence interval] = 3.6–4.4). Approximately 86% of the subjects had H-Hg values lower than 10 $\mu\text{g/g}$. No significant differences existed in H-Hg between adult women and children, nor according to age group. Subjects belonging to the Ese Ejja ethnic group had higher H-Hg than subjects from the Tacanas ethnic group. Communities accessible only by canoe were more frequently contaminated than those accessible by road. Subjects who ate at least one serving of fish per day had higher H-Hg, and families who maintained substantial fishing activity were more strongly contaminated. Contamination levels were found to be low compared with other Amazonian studies. The most strongly affected groups, however, were those which preserved a traditional way of life and were the most economically and socially disadvantaged.

Microbial Quality Control of Raw Ground Beef and Fresh Sausage in Casablanca (Morocco)

Nozha Cohen, D.V.M., Ph.D.
Ingrid Filliol, D.Ph., Ph.D.
Bouchra Karraouan, Ph.D.
Samira Badri, Ph.D.
Isabelle Carle, Ph.D.
Hayat Ennaji, Ph.D.
Brahim Bouchrif, Ph.D.
Mohammed Hassar, D.H.M., M.D., Pr.
Hakim Karib, D.V.M., Ph.D., Pr.

Abstract

In this study, samples of raw ground beef ($n = 150$) and fresh sausage ($n = 100$) were collected randomly from butcheries, supermarkets, and fast-food shops, in Casablanca, Morocco. Two types of meat product samples were considered, one with spices ($n = 115$) and other without spices ($n = 135$). All the samples were analyzed for the presence of the following bacteria: *Escherichia coli*, *Staphylococcus*, *Clostridium perfringens*, *Salmonella*, and *Listeria monocytogenes*. *E. coli* strains were further typed by pulsed-field gel electrophoresis (PFGE), Operon O, and characterized for virulence genes by polymerase chain reaction (PCR). Results indicated that counts of *E. coli*, coagulase-positive *Staphylococcus*, and *C. perfringens* were 17%, 9.6%, and 8.7% in samples without spices, respectively; and 23.5%, 23.7%, and 29.6% in samples with spices, respectively. Two pathogenic genes, LT and EAST, were identified separately in four strains of *E. coli*. *Salmonella* and *L. monocytogenes* were isolated in 2.8% and 3.2% of the total samples, respectively.

Restaurant Inspection Frequency and Food Safety Compliance

K. Bruce Newbold
Marie McKeary
Robert Hart
Robert Hall

Abstract

Although food premises are regularly inspected, little information is available on the effect of inspections on compliance records, particularly with respect to the impact of the frequency of inspection on compliance. The following presents the outcome of a study designed to assess the impact of increased inspection frequency on compliance measures in Hamilton, Ontario, in the absence of any other changes to food handler/safety programs or legislation. High-risk food inspection premises were randomly assigned three, four, or five inspections per year. Results indicate that no statistical difference existed in outcome measures based on frequency of inspection. When premises were grouped based on the average time between inspections, premises with greater time between inspections scored better compliance measures relative to premises that were

inspected more frequently. The study was also unique for the level of consultation and collaboration sought from the public health inspectors (PHIs) assigned to the Food Safety Program. Their knowledge and experience with respect to the critical variables associated with compliance were a complementary component to the literature review conducted by the research team.

December 2008

Lead in Christmas Lights

Joseph Laquatra, Ph.D.
Lelia M. Coyne, Ph.D.
Mark R. Pierce, M.S.

Abstract

A recent California proposition led to awareness that lead is a stabilizer in the Polyvinyl Chloride (PVC) jacketing that covers conductors in Christmas lights. The objective of this study is to examine the level of accessible lead in Christmas lights. Following U.S. Environmental Protection Agency (U.S. EPA) Lead Inspectors' procedures, researchers at Cornell University and in Nebraska conducted wipe samples and total lead content samples of newly purchased and older Christmas light sets. Samples were analyzed for lead content. Lead was present in varying amounts on all samples. The amount of lead from the Nebraska samples, normalized to length of strings, was independent of analyzing laboratory, analysis method, age of string, and repeat sampling, both immediately and after extended storage. A later analysis of these same strings by the Cornell team showed diminished quantities. Amounts of surface lead normalized to crude estimates of the area of light string indicated surface concentrations in excess of U.S. EPA clearance level for lead on window sills. Whether exposure to lead in Christmas lights affects blood lead levels in humans is unknown. No standards exist for lead content in this product, and no protocols exist for conducting tests on it. Therefore, consumers may wish to exercise caution to reduce possible exposure.

Manganese in Madison's Drinking Water

Thomas Schlenker, M.D., M.P.H.
John Hausbeck, M.S., R.S.
Kirsti Sorsa, Ph.D.

Abstract

Public concern over events of manganese-discolored drinking water and the potential for adverse health effects from exposure to excess manganese reached a high level in 2005. In response, Public Health Madison Dane County, together with the

Madison Water Utility, conceived and implemented a public health/water utility strategy to quantify the extent of the manganese problem, determine the potential for adverse human health effects, and communicate these findings to the community. This strategy included five basic parts: taking an inventory of wells and their manganese levels, correlating manganese concentration with turbidity, determining the prevalence and distribution of excess manganese in Madison households, reviewing the available scientific literature, and effectively communicating our findings to the community. The year-long public health/water utility strategy successfully resolved the crisis of confidence in the safety of Madison's drinking water.

The Effects That Well Depth and Wellhead Protection Have on Bacterial Contamination of Private Water Wells in the Estes Park Valley, Colorado

Thomas R. Gonzales, M.P.H., R.E.H.S.

Abstract

Over the past five years, it is estimated that 10% of residential water wells have tested positive for total coliform and 2% for *E.coli* bacteria in the Estes Park Valley, Colorado. Many of these water wells are shallow or hand-dug in construction. In this study, samplings of 30 private untreated water wells were tested for total coliform bacteria in the Estes Park Valley. Water wells were classified into three categories for well depth (<99 feet [30.2 m], 100–199 feet [30.5–60.7 m], and >200 feet [61 m]) and for wellhead protection (poor, fair, and good). Results indicated that 71% of the wells less than 199 feet (60.7 m) tested positive for total coliform ($\chi^2 = 15.559, p < .0001$). Also, 71% of wells classified as having poor and fair wellhead protection tested positive for total coliform ($\chi^2 = 13.084, p = .001$). This study determined that wellhead protection and well depth does play a role in bacterial contamination of water wells.

Evaluating Citizen Attitudes and Participation in Solid Waste Management in Tehran, Iran

Touraj Nasrabadi, M.Sc.

Hassan Hoveidi, M.Sc.

Gholamreza Nabi Bidhendi, Ph.D.

Ahmad Reza Yavari, Ph.D.

Shahin Mohammadnejad, M.Sc.

Abstract

Recently, increasing attention has been paid to the environmental impact of solid waste in Iran. Consequently, solid waste management has become a remarkably important issue. Solid waste comprises a wide range of materials and comes from a variety of sources. Having a population of about 10 million (about 1/7 of Iran's total population), Tehran is among the most populated capitals in the world. With 22 different districts, this city generates approximately 7,000 metric tons of municipal waste per day that culminates in a total of 2.5 million tons annually. If no reduction strategy on the waste stream is implemented, this huge amount of waste will be buried in Kahrizak (the

exclusive landfill site of Tehran). Land and underground water resource degradation in the vicinity of the landfill site—as well as disease outbreaks in the area surrounding the site—may be considered alarming warnings for further catastrophic consequences of uncontrolled waste dumping. In this study, the composition of Tehran's solid wastes is analyzed. In order to physically analyze waste generated, waste sampling was carried out by trained workers of the Tehran organization of waste recycling and compost in 2004 for 10 successive days in the middle of each of four seasons. As a result of the study, some practical recommendations are made to reduce the waste stream load directed toward the land.

Furthermore, this study evaluated people's concern about the fate of the waste they generate. According to the data collected in a survey, citizens' participation is not remarkably high, but even the modest cooperation recorded may cause a great benefit if extrapolated to the whole city. By virtue of sharp decreases in the cost of total waste collection and transport, as well as the benefits of land and underground water resource preservation, separation of wastes at their source by individual households makes economic sense.

Pollution and Sanitation Problems as Setbacks to Sustainable Water Resources Management in Freetown

Senesie B. Kallon, M.Sc.

Abstract

The civil conflict in Sierra Leone (1991–2001) caused a dramatic increase in the population of Freetown. This population increase overstretched housing facilities, leading to the creation of camps and many squatter settlements with poor sanitation practices. Overcrowding has become a serious concern in light of the acute water shortage that struck Freetown in May and June 2006. Some of the numerous small water bodies that could have been used to augment the public water supply were contaminated by the disposal of solid and industrial waste and poor sewage management. Improper disposal practices have a direct impact on public health.

This paper recommends addressing the policy gap, establishing clear threshold criteria for all water bodies and wastewater discharge, and integrating the above issues in the ongoing review process of draft water sanitation policy. Public education of the negative consequences of poor waste management practices on water quality and public health can also positively affect general sanitation practices.

Drinking Grandma: The Problem of Embalming

Jeremiah Chiappelli, J.D.

Ted Chiappelli, Dr.P.H., M.H.A., M.S.S.M.

Abstract

The modern practice of embalming replaces organic blood with various toxic and carcinogenic chemicals, particularly formaldehyde. Then the embalmed body is placed

underground where, despite the casket, the body's fluids will inevitably leak into the groundwater. Alternatively, the body may be burned, releasing chemicals into the air. The initial reasons for the use of embalming and the rationale given for the continuance of the practice fail to justify the potential public health and environmental risks presented by embalming.