JOURNAL OF

Environmental Health

twelve dollars

Dedicated to the advancement of the environmental health professional

Volume 76, No. 8 April 2014

WHERE'S THE CATCH?

How the Loss of Funding for Mosquito Control Programs Impacts Public Health

Published by the National Environmental Health Association

www.neha.org

RETAIL FOOD SAFETY TRAINING SOLUTIONS

UL delivers online training solutions to the food industry consistent with the goals of the FDA Retail Food Safety Initiative and the requirements of the FDA Food Code.

UL's FDA Food Code Courses were created in cooperation with FDA and provide insight and understanding of the requirements, while the Food Manager and Food Handler courses provide industry with a unique and engaging approach to training.

ULEDUNEERING.COM/FOODSAFETY
foodsafetytraining@ul.com

JOURNAL OF

Environmental Health

Dedicated to the advancement of the environmental health professional

Volume 76, No. 8 April 2014

ABOUT THE COVER

Public and environmental health departments have been feeling the effects of budget cuts for several years now on important programs such as mosquito control. The public and legislators want to be protected from mosquito-borne diseases like West Nile virus but don't always support funding to ensure that protection. The objective of the authors' study discussed in this month's cover feature, "Current Status of Mosquito Control Programs in North Carolina: The Need for Cost-Effectiveness Analysis," was to investigate the extent to which budget shortfalls have impacted mosquito control programs in North Carolina, noting that human illness from mosquito-borne diseases is more expensive than a preventative approach.

See page 8.

ADVERTISERS INDEX

ADVANCEMENT OF THE SCIENCE

ADVANCEMENT OF THE PRACTICE

ADVANCEMENT OF THE PRACTITIONER

YOUR ASSOCIATION

don't miss

in the Next *Journal of Environmental Health*

- Distribution and Public Health Consequences of Releases of Chemicals Intended for Pool Use
- Environmental Survivability and Surface Sampling Efficiencies for *Pseudomonas aeruginosa*
- National Expenditures, Jobs, and Economic Growth Associated With Indoor Air Quality
- Use of Household Bleach for Emergency Disinfection of Drinking Water

Erratum

In "Place-Based Exposure and Cataract Risk in the Beaver Dam Cohort," published in the *Journal of Environmental Health*, 76(6), 34–40, the credentials for authors Barbara E.K. Klein and Ronald Klein were incorrectly listed. The correct credentials for both are "MPH and MD."

Official Publication

Journal of Environmental Health
(ISSN 0022-892)

Nelson Fabian, MS, Managing Editor
Kristen Ruby, Content Editor
Elizabeth Donoghue-Armstrong, PhD, Copy Editor
Hughes design|communications, Design/Production
Cognition Studio, Cover Artwork
Soni Fink, Advertising
For advertising call 303.756.9090, ext. 314

Published monthly (except bimonthly in January/February and July/August) by the National Environmental Health Association, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246-1926. Phone: (303) 756-9090; Fax: (303) 691-9490; Internet: www.neha.org. E-mail: kruby@neha.org. Volume 76, Number 8. Subscription rates in U.S.: $135 per year and $250 for two years. International subscription rates: $160 per year and $300 for two years (airmail postage included). Single copies: $12, if available. Reprint and advertising rates available at www.neha.org/JEH. CPM Sales Agreement Number 40045946.

Full text of this journal is available through Bigchalk.com at www.bigchalk.com and from ProQuest Information and Learning, (800) 521-0600, ext. 3781; (734) 973-7007; or www.umi.com/proquest. The *Journal of Environmental Health* is indexed by Current Awareness in Biological Sciences, EBSCO, and Applied Science & Technology Index. It is abstracted by Wilson Applied Science & Technology Abstracts and EMBASE/Excerpta Medica.

All technical manuscripts submitted for publication are subject to peer review. Contact the content editor for Instructions for Authors, or visit www.neha.org/JEH.

To submit a manuscript, visit http://jeh.msubmit.net. Direct all questions to Kristen Ruby, content editor, kruby@neha.org.

Periodicals postage paid at Denver, Colorado, and additional mailing offices. POSTMASTER: Send address changes to *Journal of Environmental Health*, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246-1926.

Printed on recycled paper.

PRINTED WITH SOY INK

PRESIDENT'S MESSAGE

Alicia Enriquez Collins, REHS

Good Night, Sleep Tight, Don't Let the Bed Bugs Bite

Good Night, Sleep Tight, Don't Let the Bed Bugs Bite ♦ Mad as a Hatter ♦ Nitpicking ♦ Raining Cats and Dogs ♦ Ring Around the Rosie ♦ Wrong End of the Stick

Each of these familiar expressions has one thing in common: a link to environmental health is in each of their origins. After researching several idioms, I found it interesting to note the varied stories, controversies, and folklore involved. It was a challenge to verify the true origin of each expression; nonetheless, it was an educational and entertaining exercise. If you find yourself in an environment where endless metaphors and workplace clichés are used throughout the day, I think you will appreciate this discussion. I don't think most of us question the origin of such common expressions, but it is fun to reflect upon those that have had an environmental health foundation.

As I was discussing these snippets with NEHA colleagues, we agreed that this is yet one more way to connect with the public in our day-to-day activities. They can provide opportunities to share a bit of history, a bit of folklore, or a story, and continue to educate members of the public about what we do and who we are as environmental health professionals. This column is intended to share some colloquialisms with the hope that these will prompt further conversation and even serve as an "ice-breaker" for you in a given situation.

The frequent discussion of foodborne disease outbreaks, bed bugs, disaster response, and other high-profile environmental health topics has prompted me to think about how we often seek ways to connect with the general public about what we do as environmental health professionals. For many years, we have been subjected to unfortunate terms such as "the invisible profession." With the field of environmental health encompassing so many aspects of our lives and our environment and making headline news, it is perplexing to think that what we do may still be unknown and unrecognized by the general public. Environmental health is actually at the tip of our tongues quite frequently.

> *It is perplexing to think that what we do may still be unknown and unrecognized by the general public. Environmental health is actually at the tip of our tongues quite frequently.*

Good Night, Sleep Tight, Don't Let the Bed Bugs Bite

In this *Journal of Environmental Health* issue, you will find a feature article about a bed bug infestation in an office building. Like many environmental health issues, bed bugs have reemerged as nuisance pests and have entered a variety of our living environments, including hotel rooms, homes, college dormitories, airplanes, cars, buses, passenger trains, and workplaces. Taxicabs and police squad cars have been especially implicated.

Many of us fondly recall our parents' nighttime blessing each night, "Good night, sleep tight, don't let the bed bugs bite." Many believe "sleep tight" is linked to mattress designs prior to the invention of box springs. Ropes were tied firmly to the bed frame underneath the mattress to keep it tight. It is difficult to determine, however, whether the antique design of mattresses and bed frames and the term "sleep tight" are connected. It has also been said that the term referred to wearing tight clothing at night so as to keep the bed bugs from biting. We know scientifically that this is not a preventative measure for preventing bed bug bites, but it's not hard to imagine that this might have been one of those old world remedies so dearly believed and passed down by our ancestors. It's also interesting to note that the words "tight" or "tightly" were used in the 1800s to mean soundly or properly. While not able to pinpoint this phrase's origin, we can clearly see the association between the home environment and good health—primitive healthy homes concepts that we continue to carry on in our work in ensuring homes are safe from pests, chemicals, and other hazards.

Raining Cats and Dogs

There are several theories for this one. One theory that is likely false, but worth mentioning, is that dogs would retreat into thatch roofs and then be washed out during rain storms. The implication is that after flood waters receded, dead animals would be found in the streets. Because it would be difficult and unlikely for a dog or cat to burrow into a thatch roof that is angled and properly maintained, this explanation is doubtful.

Playwright Jonathan Swift wrote "Complete Collection of Genteel and Ingenious Conversation," a satire on the conversations of the upper class, in the early 1700s. One of the characters in the satire forecasts that it will "rain cats and dogs." Swift also authored "City Shower" in 1710, which described floods that occurred after heavy rains. The resulting floods left behind dead animals in the streets, which may have also led to the popular use of the phrase.

It may be that the origin of this phrase wasn't based upon environmental health, but as environmental health professionals, we understand the public health threat of dead animal carcasses as well as the other environmental health threats caused by heavy flooding. Flooding has become an ever-occurring disaster and environmental health services are called upon when this type of disaster strikes.

Ring Around the Rosie

"Ring-a-ring o' roses, a pocket full of posies, ashes! Ashes! We all fall down!" This Mother Goose nursery rhyme was first put into print in 1881. The idea that this innocent nursery rhyme makes reference to the bubonic plague (caused by *Yersinia pestis)* or the "Black Death" that struck Europe in the mid-1300s is often rejected. Folklore or not, I believe it is an interesting and an extremely dark reflection of the disease that took a devastating toll on a population in the 14th century and reemerged in London in 1665. The "ring around the rosie" makes reference to the red buboes around the neck of an infected person (swollen lymph nodes); "posies" refer to the herbs or flowers that people carried in their pockets and physicians of the era placed in the beaks of their masks in hopes that it would mask the odor or would protect them from the disease; and "ashes" refer to the incineration of bodies of those who succumbed to the disease. "Atchoo" can be found in alternate versions of the rhyme (instead of "ashes") and refers to a sneeze that was the sign of coming illness. "All fall down" describes the sudden death that occurs within days of onset of illness. It wasn't until 1894 that the disease was conclusively connected to fleas carried by rats. Even today we still see outbreaks of plague and environmental health is often called upon to investigate these outbreaks.

Mad as a Hatter

This phrase is believed to have originated sometime in the early 1800s and is associated with felt hat makers. Mercurous nitrate was used in curing felt for hats and the prolonged exposure to the vapors caused mercury poisoning. Symptoms include muscular tremors and twitching with hallucinations and psychosis for advanced cases. This brings to mind the fictional character "Mad Hatter" from Lewis Carroll's classic children's book, *Alice's Adventures in Wonderland*. Fortunately, strict regulations have been put into place in North America and Europe to protect workers handling such compounds. Environmental health professionals have played a key role in ensuring that this type of colloquialism will never occur again through their endeavors in making workplaces safe.

Wrong End of the Stick or Short End of the Stick

In ancient Rome, the public toilets were communal and included an elongated bench with several holes carved in it. The communal toilet was a gathering place for people of all ages and genders to not only take care of their physiological needs, but also catch up on politics and local gossip. Sticks with sea-sponge tips would be used in place of modern-day toilet paper. The sponge was rinsed between uses. If a person wasn't paying close attention when the stick was being passed along, however, he or she could grab the "wrong end of the stick." I am not sure how this saying evolved into "short end of the stick," but we can easily realize the environmental health ramifications of grabbing the wrong end! This ancient practice should make us all very grateful for modern plumbing and sanitation practices (both of which environmental health continues to strive to ensure). In thinking of the stick and sponge method, I couldn't help but ask myself, "What was wrong with using fig leaves?"

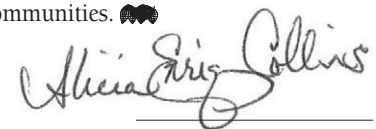
Nitpicking

Are you a meticulous and detail-oriented person? If so, how often have you been called "nitpicky"? I would suggest this descriptor can be accepted as a compliment and viewed as an attribute for environmental health professionals. Nitpicking is a term used to define the removal of nits or the eggs of parasites (usually lice) from a host's hair or fur. This was a common method employed to remove nits in the early 1900s prior to medicated shampoo products. It is also a common practice used among primates while they are grooming one another. It is to the public's benefit that environmental health professionals are "nitpicky" when it comes to their responsibilities of interpreting regulations, reviewing official documents, and conducting assessments and investigations. So, while the origin of the word may be a bit gross, I say that we should wear the label of "nitpicky" with pride!

In Summary

These are just a few colloquialisms from the past in use today that have an environmental health origin. My goal was simply to provide a sampling to provoke thought about making a connection between familiar phrases already in our vernacular and what we do as environmental health professionals. Many other expressions are in use today, which may or may not have validity behind them. What other colloquialisms can you name with an environmental health connection? What popular phrases used now have that connection? Imagine what future phrases environmental health may inspire. I invite you to send me an e-mail with your responses, mythical findings, and creative ideas.

At the start of this column I mentioned how we have been perceived as an invisible profession. In my personal opinion, we are not invisible, but ever present in both the old and the new world. The longevity of these colloquialisms and their environmental health connections is testament to the importance of our work. Perhaps sharing these explanations with the public when we have the opportunity can help them understand how extensive and vital our role is in protecting public health and our environment, especially in our local communities.



enriqueza@comcast.net

Current Status of Mosquito Control Programs in North Carolina: The Need for Cost-Effectiveness Analysis

Katie L. Del Rosario, MSEH
Stephanie L. Richards, MSEH, PhD
Alice L. Anderson, PhD
Jo Anne G. Balanay, PhD, CIH
Department of Health Education and Promotion
East Carolina University

Abstract **Mosquito control in the U.S. is both technically specialized and labor intensive with mosquito control programs (MCPs) carrying out services at federal, state, and local levels. The scope of each MCP varies depending on the needs of the region. In the 1970s, the North Carolina Department of Environment and Natural Resources formed the Public Health Pest Management (PHPM) section to play an active leadership role in training and support for local mosquito control programs across the state. PHPM was disbanded, however, in July 2011 due to state budget cuts. The extent to which recent budget shortfalls have impacted services provided by MCPs is largely unknown. Consequently, the primary objectives of the study described in this article were to 1) assess the current status of MCPs in North Carolina, 2) evaluate the extent to which the operational status of local MCPs affects public health, and 3) evaluate the impacts of losing the PHPM section in North Carolina.**

Introduction

The primary objectives of mosquito control programs (MCPs) are to reduce populations of mosquitoes involved in disease cycles, as well as to suppress nuisance pests impacting residents and tourists. To accomplish this, a well-organized MCP uses a multifaceted approach including surveillance, source reduction, biological control, public education, larvicides, and adulticides (Conlon, 2011). The structure of MCPs in U.S. communities depends largely on dynamic state resources and legislative priorities (Challett, 1988, 1991, 1994; Dale, Carlson, & Easton, 2008; Hazeltine, 1988). The most successful MCPs are those with reliable sources of funding (Challett, 1988, 1994; Conlon, 2011) that allow continuity of staff and long-term surveillance of potential vectors. Budgets for MCPs range from $40,000 to $6.5 million annually, depending on regional needs, funding, and program goals (Challett, 1988, 1994; Conlon, 2011).

Mosquito control is often facilitated by government agencies such as public works, agriculture, public health, and environmental health. In some U.S. states, however, MCPs are publicly funded and legislatively mandated to carry out control. Florida has an organized and successful MCP with 56 currently active mosquito control districts (Florida Department of Agriculture and Consumer Services [FDACS], 2012). The Florida Coordinating Council on Mosquito Control and the Florida Mosquito Control Association facilitate communication between state agencies and stakeholders involved with mosquito control (FDACS, 2012). Mosquito control in Florida has likely been successful due to public and political involvement and support (Dale et al., 2008; Mulrennan & Sowder, 1954).

California has a network of MCPs known for implementing integrated pest management practices with strong public outreach and involvement (California Department of Public Health, 2011). Urban MCPs are often funded at a higher rate than rural MCPs, largely depending on personnel and pesticide costs (Challett, 1988, 1994; Conlon, 2011). In some cases, MCPs are not in place, primarily due to budget constraints or lack of public awareness. A lack of published studies exists that evaluates the cost-benefit relationship for MCPs; hence, MCPs are often underutilized and their importance to public health underestimated (Tomerini, 2005).

A variety of agencies from the global (e.g., World Health Organization) and federal (e.g., U.S. Environmental Protection Agency, Centers for Disease Control and Prevention [CDC], and National Institutes of Health) levels supports mosquito control research. The North Carolina Division of Public Health and Department of Environment and Natu-

ral Resources (NCDENR) through the Public Health Pest Management (PHPM) section have historically been involved in mosquito control. These state agencies worked in close collaboration with the American Mosquito Control Association and North Carolina Mosquito and Vector Control Association (NCMVCA) to meet the needs of stakeholders and communities.

The emergence of West Nile virus (WNV; Flaviviridae family, *Flavivirus* genus) in the U.S. in 1999 brought increased attention to mosquito-borne diseases and public health. In 1999, 62 human cases of West Nile encephalitis (WNE) occurred in New York with seven fatalities (Centers for Disease Control and Prevention [CDC], 2013). Five years later, in 2004, 2,539 human WNE cases and 100 fatalities occurred in the U.S. (CDC, 2013). Ten years later, in 2009, 1,021 human WNE cases and 32 fatalities occurred in the U.S. (CDC, 2013). The rapid and continued spread of WNV across the U.S. facilitated an increase in state and federal funding for MCPs (Herring, 2010).

As human cases of WNE waned, however, budgets for MCPs also decreased, due in part to lack of concern for mosquito-borne disease and a struggling U.S. economy. In 2010, the federal government proposed cutting $26.7 million from the 2011 budget for the vectorborne disease surveillance program at CDC (Couzin-Frankel, 2010). Numerous scientific societies, public health agencies, and mosquito control professionals objected to this budget cut, citing hindrance of outbreak response efforts; therefore, the budget was tentatively reinstated at a reduced rate (Couzin-Frankel, 2010; LaBeaud & Aksoy, 2010; Vazquez-Prokopec, Chaves, Ritchie, Davis, & Kitron, 2010). WNV showed a strong resurgence in the U.S. in 2012. As of December 2012, 5,387 human cases for the year were reported over 48 states, with 243 deaths (CDC, 2013). In 2012, the U.S. experienced the highest incidence of WNV disease reported since 2003 (CDC, 2013).

Sustained mosquito-borne disease surveillance, along with control measures targeted to potentially dangerous vector populations, is necessary to protect public health (Herring, 2010; Kelly, 2011; Tomerini, Dale, & Sipe, 2011; Vazquez-Prokopec et al., 2010). Abundant and widespread mosquito populations increase the likelihood that pathogens causing disease will be transmitted to humans (Kelly, 2011). Tomerini and co-authors (2011) showed that preemptive rather than reactive MCPs resulted in a lower Ross River virus (RRV; Togaviridae family, *Alphavirus* genus) rate in Queensland, Australia. Hopkins and co-authors (1975) showed that areas utilizing ultra-low-volume aerial adulticide spraying experienced a reduced infection rate of Saint Louis encephalitis virus (SLEV; Flaviviridae family, *Flavivirus* genus) in Texas. In Illinois, a negative correlation occurred between active MCPs and human WNE cases (Tedesco, Ruiz, & McLafferty, 2010). Barat (2006) reviewed the success of MCPs in Brazil, Eritrea, India, and Vietnam in reducing malaria incidence. That same study showed that MCPs reduced disease by strengthening surveillance, targeting control efforts, and increasing community involvement (Barat, 2006). These studies illustrate the necessity of sustained mosquito surveillance and control for substantial reductions in mosquito-borne disease.

In a 2007 survey conducted by the Association of State and Territorial Health Officials (ASTHO), U.S. health officials were asked about the status of their MCPs and reported the following: 1) 74% have an insufficient number of workers, 2) 38% indicated that lack of funding was the most challenging aspect, and 3) 80% of respondents reported having taken no action about preparing for the effects of climate change on mosquito-borne diseases (ASTHO, 2007). Limited resources reduce the capacity of MCPs to function effectively, and this could have negative consequences on public health. From a public health standpoint, the prevention of mosquito-borne disease is preferable to responding to an epidemic.

Surveillance and control of mosquito populations in North Carolina can be effective in protecting the public from mosquito-borne disease. As state funds are currently the primary source of support for North Carolina MCPs (i.e., NCDENR/PHPM), budget cuts across North Carolina have resulted in many MCPs becoming reactive rather than preemptive in their control efforts.

The primary objective of our study was to investigate the extent to which budget shortfalls have impacted MCPs in North Carolina. Accordingly, the current status of MCPs was assessed for North Carolina counties. We also report perceived impacts of budget cuts and the disbanding of the PHPM section of NCDENR. The potential impacts of the reductions in mosquito-borne disease surveillance and control are discussed in the context of public health risk assessments.

Materials and Methods

Study Area

North Carolina is comprised of 100 counties, with a population of approximately 9,535,483 people (U.S. Census Bureau, 2010). The approximate land and water areas of North Carolina are 126,161 km^2 and 13,217 km^2, respectively. The state of North Carolina is divided into three topographical regions: coastal plain (eastern), Piedmont Plateau (central), and Appalachian Mountains (western). Each region is geographically distinct and varies in mosquito fauna. More than 60 species of mosquitoes are found in North Carolina, though not all act as pathogen vectors (Harrison, 2008). Information on the relevant mosquito-borne pathogens affecting humans in each region is provided in Table 1 published online at www.neha.org/pdf/JEH/Table1.pdf.

Western North Carolina is composed of 26 counties with a population of 1,399,954 (U.S. Census Bureau, 2010). The most common arboviral disease detected in western North Carolina is La Crosse encephalitis (LACE), which primarily affects children under the age of 15 but is rarely fatal (CDC, 2013; Haddow & Odoi, 2009). Western North Carolina has also experienced cases of WNE and Eastern equine encephalitis (EEE) (U.S. Geological Survey [USGS], 2011).

Central North Carolina is composed of 33 counties with a population of 5,394,428 (U.S. Census Bureau, 2010). Some of the largest cities are found in the Piedmont region, including Raleigh (the state capital). Central North Carolina has experienced a combination of LACE, EEE, WNE, and Saint Louis encephalitis (SLE) (CDC, 2013; USGS, 2011).

Eastern North Carolina is composed of 41 counties with a population of 2,741,101 (U.S. Census Bureau, 2010). An occasional cause of human illness in eastern North Carolina is EEE, which rarely occurs in humans but causes 33% mortality in those infected (CDC, 2010). Eastern North Carolina has also experienced cases of WNE, SLE, and LACE (CDC, 2013; USGS, 2011).

Survey Design

A 50-question survey on the status of MCPs in North Carolina was distributed to personnel within departments of public and environmental health, public works, and vector control in all North Carolina counties (ecu.qualtrics.com/SE/?SID=SV_bfrmauDVYSId96Q). The Qualtrics program was used to create the survey, and it was distributed via hard copy, electronic copy, or facsimile. Approval by the Eastern Carolina University institutional review board (IRB) was obtained prior to distributing the survey (IRB no. UMCIRB 11-001016).

An Internet search was conducted to identify the MCP director in each county and a survey link was e-mailed to each existing director. If no MCP existed, or contact information could not be found via the Internet, a copy of the survey was emailed to the county's environmental health department director or the public health department director. In addition, hard copies of the survey were distributed at the NCMVCA annual meeting (October 24–26, 2011) in Greenville, North Carolina. Efforts were made to ensure that a survey was distributed to at least one person in each county who may have knowledge of mosquito control activities in his/her respective county. Accompanying each survey invitation was a cover letter explaining the research question about the current structure of pest management programs in the state of North Carolina, and the impact budget cuts are having on these programs as well as on public health.

The survey assessed the history and current status of MCPs, surveillance and control measures utilized, and opinions regarding the disbanding of the PHPM section. Opinion questions were formed using a five-point Likert format (Allen & Seaman, 2007) with responses ranging from strongly disagree (a) to strongly agree (e) to gauge the intensity of opinions.

In addition to responding to our survey, Mr. Jeff Brown (Brunswick County MCP manager) provided us with supplementary economic data for North Carolina MCPs. Mr. Brown had compiled 2009 MCP budget details for all existing North Carolina MCPs as part of an effort to quantify the economic impact of the new National Pollution Discharge Elimination System permit requirements. The population of each county was confirmed using the 2010 U.S. Census Bureau statistics. The percentage of budget spent on salaries versus chemicals was calculated based on the total program budget. In addition, the total budget based on the population was used to calculate the cost per person of implementing an MCP.

We collected information on reportable mosquito-borne disease in humans (CDC, 2013; North Carolina Division of Public Health [NCDPH], 2006; USGS, 2011). Mosquito-borne viruses causing diseases that affect public health in North Carolina included Eastern equine encephalitis virus (EEEV; Togaviridae family, *Alphavirus* genus), La Crosse encephalitis virus (LACEV; Bunyaviridae family, *Orthobunyavirus* genus), SLEV, and WNV. Our analyses were limited to federally reportable diseases affecting humans; therefore, we did not include data from infected mosquito pools or veterinary cases (e.g., horses, birds, or sentinel chickens).

Results

A total of 188 surveys were distributed and 56 (30%) responses were received and tabulated from a total of 34 counties. We supplemented our survey data with records from the NCMVCA provided by Mr. Jeff Brown. A summary of the current status of MCPs and 2009 budgets is presented in Table 1 published online at www.neha.org/pdf/JEH/Table1.pdf.

Mosquito Control

MCPs in North Carolina are currently protecting 4,485,228 people or 48% of the state population (McKeithan, 2011). As of December 2011, 86 MCPs in North Carolina were operating, covering 39 of the 100 counties. Programs are supervised by municipal public works (n = 63 programs), county environmental health (n = 16 part-time, 4 full-time programs), and county public works (n = one part-time, two full-time programs). Due to budget shortfalls, many county MCPs have reduced staff, thereby reducing surveillance and control conducted. Our study provides a snapshot that assesses the current status of North Carolina MCPs; however, further changes could affect the status of this dynamic issue.

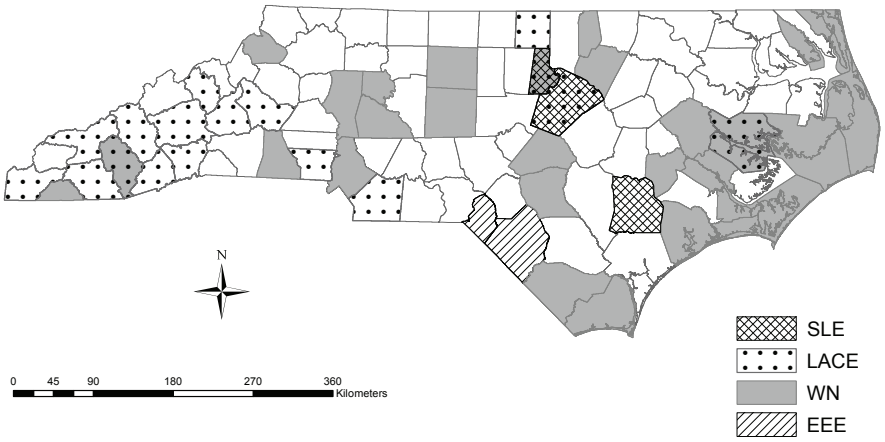
Most (71/86; 83%) of North Carolina MCPs are located in the coastal region, while 12% (10/86) are in the Piedmont and 2% (2/86) are in the Appalachian region. This is most likely due to the need for sustained management of salt-marsh mosquitoes in seasonal tourist areas (Anderson, O'Brien, & Hartwell, 2007).

Survey results were used as an indication of the main characteristics and priorities of MCPs in North Carolina. The majority of respondents (11/20; 55%) prioritized both nuisance mosquitoes and disease prevention. Most respondents (20/25; 80%) kept records of constituent calls, but not of surveillance and control activities. Fourteen of the 22 respondents (64%) had less than two employees. This aligns with ASTHO (2007), which also reported staff shortages in MCPs.

The MCPs in North Carolina utilize surveillance methods to monitor mosquito populations and public education to encourage community participation in disease prevention. In 2009 and 2011, 19% and 52% of MCPs, respectively, carried out public education campaigns. Other control methods reported in the current survey included using mosquito fish (26%) and drainage ditches (11%). The adulticide most frequently used by MCPs in 2011 was pyrethroid (86%) while larvicide use varied widely among insect growth regulators (26%), monomolecular film (26%), and *Bacillus thuringiensis* subspecies *israelensis* (35%). The majority of programs used landing counts (24%) and light traps (24%) as the main surveillance activities. The Brunswick County MCP maintains publicly available surveillance records, including information about mosquito species (www.brunswickcountync.gov/Departments/OperationServices/MosquitoControl.aspx). A large proportion of the 2011 responses indicated that some surveillance and control methods previously used by MCPs are no longer in use due to budget cuts, e.g., sentinel chicken serological monitoring (14%). Mosquito-borne disease cycles involving avian hosts (e.g., WNE, SLE, EEE) are tracked in sentinel chickens as a precursor to human health risks. From 1986 to 2005, 3–60 sentinel chicken flocks had been in use, primarily in eastern North Carolina (Public Health Pest Management, unpublished data). As state funding is limited, few MCPs will continue maintaining flocks and the North Carolina State Laboratory of Public Health no longer accepts serum samples for testing (NCMVCA, 2011).

FIGURE **1**

Geographic Distribution of Human Cases of Mosquito-Borne Disease in North Carolina Reported to the Centers for Disease Control and Prevention, 2002–2011



SLE = Saint Louis encephalitis; LACE = La Crosse encephalitis; WN = West Nile; EEE = Eastern equine encephalitis.

Mosquito-Borne Disease

The most common mosquito-borne pathogens in North Carolina are LACEV, EEEV, and WNV (Figures 1 and 2). Yearly reports of infections may be misleading as many infections produce flu-like symptoms and are often misdiagnosed (Utz et al., 2003). A discrepancy occurred in the number of human cases reported to CDC resulting from mosquito-borne pathogens and those reported by respondents in our survey, likely due to the wording of our questions. We asked respondents to identify past or current mosquito-borne disease in their region, but not specifically human cases. Therefore, respondents may have identified disease in vertebrate animals or mosquitoes.

EEEV is more common in equines than humans (NCDPH, 2009). The enzootic cycle of this virus is maintained between birds and mosquitoes (primarily *Culiseta melanura*) and then transmitted to mammals by mosquitoes that blood feed on both avian and mammalian hosts (NCDPH, 2009). Equine illness usually precedes human illness by about two to three weeks (Hanley & Ray, 1992). LACE cases occur primarily in western North Carolina, West Virginia, and eastern Tennessee (Haddow & Odoi, 2009). In 2005 there were 32 LACE cases reported in North Carolina, which accounted for 46% of U.S. cases (NCDPH, 2009; Figure 2). This is a pediatric disease, primarily affecting children <15 years old (Haddow & Odoi, 2009; Roos, 1999; Utz, Apperson, & Dietz, 2005). The enzootic LACEV cycle is maintained by *Ochlerotatus triseriatus* and the primary reservoirs are small mammals (e.g., chipmunks) (Utz et al., 2005). The socioeconomic burden of LACE has been studied in North Carolina. Findings indicate the range of total direct and indirect medical costs for 24 patients was $7,521–$175,586, with an average medical cost per patient (± standard deviation) being approximately $32,974.00 ± $34,793.00, with the majority of the burden borne by families of patients suffering long-term neurologic sequelae (Utz et al., 2003). Therefore, prevention of LACE in North Carolina is necessary from both a public health and economic standpoint.

West Nile virus was first detected in North Carolina in 2000 via infected migratory birds, and infections have been detected in all regions of North Carolina (Figure 1). A number of mosquito species are competent vectors of WNV but the most common are *Culex* spp. (Truemper & Romero, 2007). West Nile virus is maintained enzootically between mosquitoes and birds (Truemper & Romero, 2007) with occasional human and horse cases. A reduction in the incidence of WNE in humans occurred in North Carolina after 2008; however, in 2011, two human cases were detected in central North Carolina (Alamance and Guilford counties) (CDC, 2013; Figure 2). As of September 2012, human WNE cases had been detected in Cabarrus, Mecklenburg, Pitt, Scotland, and Wayne counties in North Carolina (USGS, 2012). Human cases of SLE have been detected in three North Carolina counties (Duplin, Durham, and Wake Counties) (CDC, 2013; USGS, 2011) and the SLEV transmission cycle is similar to WNV (CDC, 2009).

Twenty-eight counties in North Carolina with no MCPs and 15 counties with MCPs have reported human cases of mosquito-borne disease. Eleven counties with MCPs have reported no human cases of arboviral disease. From an epidemiological standpoint, counties without an MCP can be considered at greater risk of disease exposure than those with an MCP due to lack of surveillance and control.

Disbanding of the PHPM Section

Due to the disbanding of the PHPM section, North Carolina no longer employs medical entomologists to support local MCPs. The majority (>70%) of survey respondents reported that the disbanding of this division would have negative consequences on their MCP, including an increase in mosquito-borne diseases (Figure 3). Most respondents (>80%) reported needing improvements to MCPs in their counties (Figure 3). The PHPM section served as a central uniting mosquito control agency and its disbandment has negative implications both from the standpoint of loss of support funding as well as loss of expert resources.

One of our study's limitations is that an inherent bias in opinions probably exists as a result of the survey being distributed to those who actively work and participate in mosquito control. The survey respondents are probably more likely to be opposed to the disbanding of the PHPM as it directly affects their livelihood.

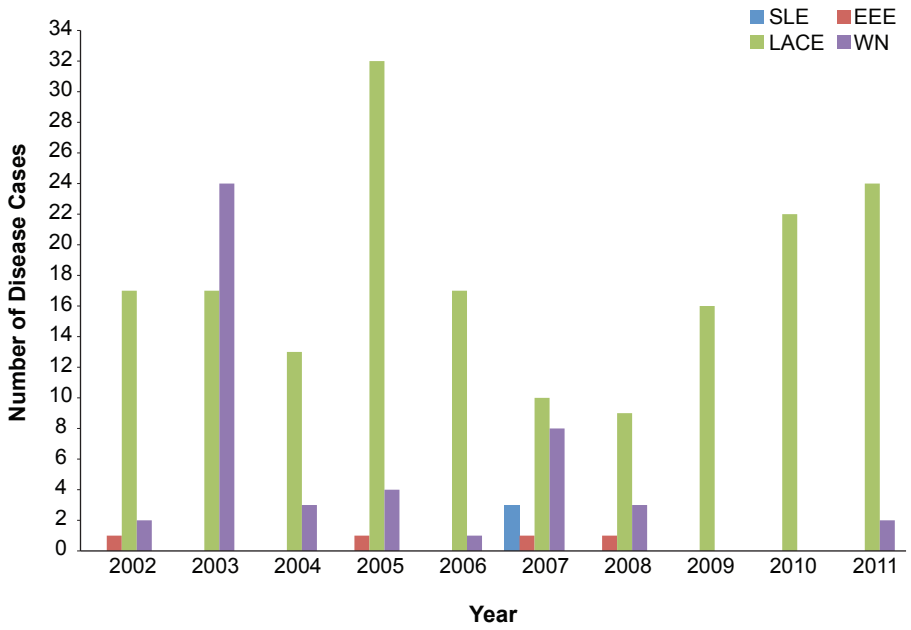
MCP Economic Analysis

The two highest MCP budgets reported in North Carolina in 2009 were Onslow County (Jacksonville, $921,017) and Brunswick County ($568,581). The lowest reported

budget was the town of Sandy Creek in Brunswick County ($938). The average 2009 budget for MCPs in North Carolina was $66,303.45. Table 1 (published online at www.neha.org/pdf/JEH/Table1.pdf) shows the percentage of the total budget spent on chemicals versus employee salaries, where data were available. Of the 47 programs that provided budget breakdowns, 30 spent >50% of their budget on salaries while 17 programs spent >50% of their budget on chemicals. No data were available on where the remainder of the budget was spent if the chemical/salary breakdown did not add up to 100%. The cost per person was calculated by dividing the total budget for each MCP by the population in the respective county/city/town. The cost per person ranged from $0.02 (Buncombe and Cumberland counties) to $68.07 (town of Newport in Carteret County). Survey results indicated that 11/20 (55%) of respondents reported their current budget as "just barely functional." Two (10%) of the 20 respondents reported "highly functional" budgets.

FIGURE **2**

Number of Human Cases of Mosquito-Borne Disease in North Carolina Reported to the Centers for Disease Control and Prevention, 2002–2011



SLE = Saint Louis encephalitis; EEE = Eastern equine encephalitis; LACE = La Crosse encephalitis; WN = West Nile.

Discussion

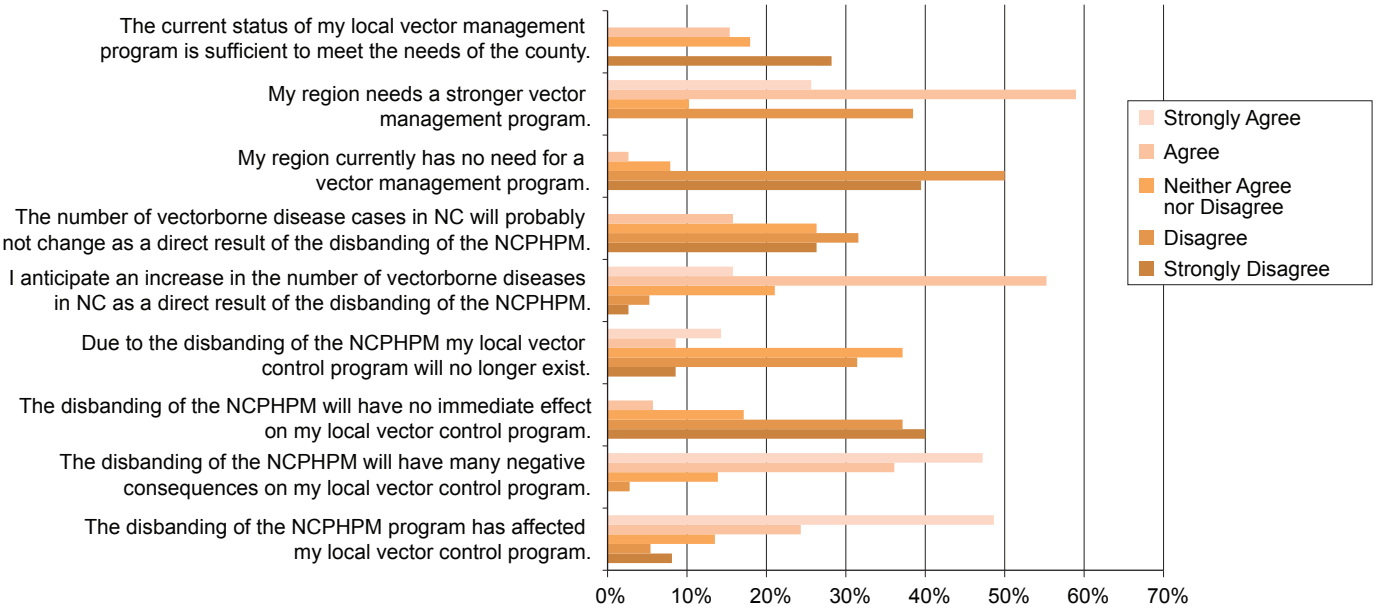
Mosquito control is a facet of environmental health that is often underutilized, likely because, in part, its effectiveness is difficult to measure. The most successful MCPs are those with long-term funding (Challet, 1988, 1994; Conlon, 2011) that allow programs to maintain records of surveillance and control activities, thereby improving risk predictions. It is unfortunate that with the disbanding of the PHPM section a need may no longer exist to aggregate statewide budget information, which would allow for a more thorough comparison of MCP budgets between both programs and years. Such data would facilitate comparisons between MCPs, help determine the cost of protection from mosquito-borne disease, and the extent to which cost and disease are related. In North Carolina, Brunswick County Mosquito Control is an example of a successful MCP where public involvement has encouraged state government funding for decades. Counties that have historical data on mosquito control efforts and effectiveness can justify their existence when legislators inevitably reduce budgets (Challet, 1994; Hazeltine, 1988).

Much can be learned from global models of MCPs targeting dengue virus (DENV; Flaviviridae family, *Flavivirus* genus). Horstick and co-authors (2010) reviewed the global status of DENV control. That same study interviewed stakeholders in Brazil, Guatemala, the Philippines, and Vietnam to assess MCPs. Findings indicate a lack of research evaluating control measures in communities and insufficient operational funding (Horstick et al., 2010). A study in Cuba compared the cost of routine mosquito control versus DENV outbreak response and showed that routine control suppressed mosquito population levels and disease (Baly et al., 2011). Another study modeled the cost-effectiveness of sustained larval control of DENV vectors in Puerto Rico versus emergency control during an epidemic (McConnell & Gubler, 2003). That same study concluded that measuring efficiency was important in determining cost-benefit results. A study in Wisconsin showed that residents in Dane County were willing to pay (>$100 per person per year) to control nuisance mosquito species at a greater rate than targeting control only to potential WNV vectors ($0) (Dickenson & Paskewitz, 2012). That same study indicated that residents in the surveyed county pay <$0.06 per person per year for mosquito control. This is comparable to the lowest cost per person ($0.02) reported from two North Carolina counties in our study. Consequently, when analyzing the economic feasibility of MCPs, it is important to assess aspects of public opinion, political will, and effectiveness of control methods as this could impact disease prevention, insecticide resistance, and budget constraints (Dickenson & Paskewitz, 2012; Luz, Vanni, Medlock, Paitel, & Galvani, 2011).

Cost-effectiveness studies could help streamline MCPs by ensuring that resources are used efficiently. Clearly, legislators and the public want to decrease both nuisance mosquitoes and mosquito-borne disease, hence MCPs should target control activities to high-risk areas. Future studies should investigate cost-effective control strategies for MCPs as a component of risk assessment. Human illness resulting from mosquito borne disease is more expensive than a preventative mosquito control approach (LaBeaud & Aksoy,

FIGURE **3**

Survey Results of Mosquito Control Personnel Opinions on the Disbanding of the Public Health Pest Management Section of the North Carolina Department of Environment and Natural Resources



NCPHPM = North Carolina Public Health Pest Management.

2010; Utz et al., 2005; Vazquez-Prokopec et al., 2010). Lack of sustained surveillance activities may result in less effective, reactive, rather than proactive MCPs (Couzin-Frankel, 2010). It is likely that the disbanding of the PHPM section and recent MCP budget cuts have suppressed mosquito-borne disease prevention capabilities in North Carolina.

Conclusion

Much important work remains for MCPs in North Carolina, especially with regard to economic evaluations of risk (e.g., Utz et al., 2003). The disparities in mosquito control budgets across North Carolina may reveal, in part, differences in value placed on mosquito control. Future studies should analyze the socioeconomic costs (including medical expenses due to mosquito-borne diseases such as WNE, LACE, and EEE) of reducing MCP budgets versus the benefits of mosquito control. In addition, more work is needed to assess the relationship between public health and mosquito control. It remains uncertain what future role MCPs will play in North Carolina.

Acknowledgements: We would like to thank Jeff Brown for his willingness to share his knowledge and data regarding MCPs in North Carolina. We also thank the many respondents from local MCPs in North Carolina who took the time to answer our lengthy survey, especially the members of the NCMVCA. We thank the comments of two anonymous reviewers who significantly improved the content of the manuscript.

Corresponding Author: Stephanie L. Richards, Environmental Health Sciences Program, Department of Health Education and Promotion, College of Health and Human Performance, East Carolina University, 3403 Carol Belk Building, 300 Curry Court, Greenville, NC 27858. E-mail: richardss@ecu.edu.

References

Allen, I.E., & Seaman, C.A. (2007). Likert scales and data analyses. *Quality Progress, 40*(7), 64.

Anderson, A.L., O'Brien, K., & Hartwell, M. (2007). Comparisons of mosquito populations before and after construction of a wetland for water quality improvement in Pitt County, North Carolina, and data-reliant vectorborne disease management. *Journal of Environmental Health, 69*(8), 26–33.

Association of State and Territorial Health Officials. (2007). *State public health vector control conference: Workforce and disease priori-*

continued on page 14

References *continued from page 13*

ties needs assessment summary. Retrieved from http://www.astho.org/Programs/Environmental-Health/Natural-Environment/vector-control-conference/

Baly, A., Toledo, M.E., Rodriguez, K., Benitez, J.R., Rodriguez, M., Boelaert, M., Vanlerberghe, V., & Van der Stuyft, P. (2012). Costs of dengue prevention and incremental cost of dengue outbreak control in Guantanamo, Cuba. *Tropical Medicine and International Health, 17*(1), 123–132.

Barat, L.M. (2006). Four malaria success stories: How malaria burden was successfully reduced in Brazil, Eritrea, India, and Vietnam. *The American Journal of Tropical Medicine and Hygiene, 74*(1), 12–16.

California Department of Public Health. (2011). *Best management practices for mosquito control in California.* Retrieved from http://www.cdph.ca.gov/HealthInfo/discond/Documents/CDPHBMPMosquitoControl6_08.pdf

Centers for Disease Control and Prevention. (2009). *Saint Louis encephalitis transmission*. Retrieved from http://www.cdc.gov/sle/technical/transmission.html

Centers for Disease Control and Prevention. (2010). *Eastern equine encephalitis*. Retrieved from http://www.cdc.gov/EasternEquineEncephalitis/

Centers for Disease Control and Prevention. (2013). *Statistics, surveillance, and control archive*. Retrieved from http://www.cdc.gov/westnile/statsMaps/final.html

Challet, G.L. (1988). Problem-solving at the local level: Organization and management of mosquito control districts. *Journal of Environmental Health, 51*(2), 79–80.

Challet, G.L. (1991). Elements of a vector control program. *Journal of the American Mosquito Control Association, 7*(1), 103–106.

Challet, G.L. (1994). Mosquito abatement district programs in the United States. *Journal of Medical Science, 10*, S67–S73.

Conlon, J. (2011). Control of mosquitoes in the United States. *Outlooks on Pest Management, 22*(1), 32–37.

Couzin-Frankel, J. (2010). Fears of lax surveillance if CDC program cut. *Science, 328,* 1088.

Dale, P.E.R., Carlson, D.B., & Easton, C.S. (2008). Four degrees of latitude: Mosquito control on the "right" coasts of Australia and Florida, USA. *The American Mosquito Control Association, 24*(3), 427–437.

Dickinson, K., & Paskewitz, S. (2012). Willingness to pay for mosquito control: How important is West Nile virus risk compared to the nuisance of mosquitoes? *Vector-Borne and Zoonotic Diseases*, *12*(10), 886–892.

Florida Department of Agriculture and Consumer Services. (2012). *Bureau of entomology and pest control*. Retrieved from http://www.freshfromflorida.com/Divisions-Offices/Agricultural-Environmental-Services/Bureaus-and-Sections2/Bureau-of-Entomology-and-Pest-Control

Haddow, A.D., & Odoi, A. (2009). The incidence risk, clustering, and clinical presentation of La Crosse virus infections in the eastern United States, 2003–2007. *PLoS ONE, 4*(7), e6145.

Hanley, D.F., & Ray, G. (1992). Viral encephalitis: When it's likely. *Patient Care, 15,* 293.

Harrison, B. (2008). *Mosquito species confirmed as occurring in North Carolina.* Retrieved from http://www.ces.ncsu.edu/depts/ent/notes/Urban/pdf/08MosqSpConfirmedNC.pdf

Hazeltine, W.E. (1988). The impact of environmental and legislative constraints on vector control operations. *Bulletin of the Society for Vector Ecology, 13*(1), 108–112.

Herring, M.E. (2010). Where have all the vector control programs gone? Part one. *Journal of Environmental Health*, *73*(4), 30–32.

Hopkins, C.C., Hollinger, F.B., Johnson, R.F., Dewlett, H.J., Newhouse, V.F., & Chamberlain, R.W. (1975). The epidemiology of Saint Louis encephalitis in Dallas, Texas, 1966. *American Journal of Epidemiology*, *102*(1), 1–15.

Horstick, O., Runge-Ranzinger, S., Nathan, M.B., & Kroeger, A. (2010). Dengue vector-control services: How do they work? A systematic literature review and country case studies. *Transactions of the Royal Society of Tropical Medicine and Hygiene, 104*(6), 379–386.

Kelly, R. (2011). *The demise of small mosquito control programs.* Retrieved from http://www.gamosquito.org/resources/papers/DemiseofSmallPrograms.pdf

LaBeaud, A.D., & Aksoy, S. (2010). Neglected funding for vectorborne diseases: A near miss this time, a possible disaster the next time. *Public Library of Science Neglected Tropical Diseases, 4*(10), e847.

Luz, P.M., Vanni, T., Medlock, J., Paitel, A.D., & Galvani A.P. (2011). Dengue vector control strategies in an urban setting: An economic modeling assessment. *Lancet, 377*, 1673–1680.

McConnell, K.J., & Gubler, D.J. (2003). Guidelines on the cost-effectiveness of larval control programs to reduce dengue transmission in Puerto Rico. *Pan-American Journal of Public Health, 14*(1), 9–16.

McKeithan, T. (2011). *NCMVCA's response to EPA information request to office of management and budget regarding the costs associated with the reporting requirements as set forth in the NPDES proposed pesticide general permit* (Docket ID No: EPA-HQ- OW-2010-0852). Retrieved from http://federal.eregulations.us/rulemaking/document/EPA-HQ-OW-2010-0852-0006

Mulrennan, J.A., & Sowder, W.T. (1954). Florida's mosquito control system. *Public Health Reports, 69*(7), 613–618.

North Carolina Division of Public Health. (2006). *Disease tables: Reported communicable disease cases, by county and by year, 2000–2005*. Retrieved from http://epi.publichealth.nc.gov/cd/figures/CDbyCountybyYear2000-2005.pdf

North Carolina Division of Public Health. (2009). Encephalitis or meningitis, arboviral: Notes about the disease. *North Carolina Communicable Disease Manual*. Retrieved from http://epi.publichealth.nc.gov/cd/lhds/manuals/cd/diseasenotes/ENCEPHALITIS_ARBOVIRAL_DN.pdf

References

North Carolina Mosquito and Vector Control Association. (2011). *The biting times summer 2011 newsletter.* Retrieved from http://www.ncmvca.org/sitebuildercontent/sitebuilderfiles/btsummer11.pdf

Roos, K.L. (1999). Encephalitis. *Neurologic Clinics, 17*(4), 813–833.

Tedesco, C., Ruiz, M., & McLafferty, S. (2010). Mosquito politics: Local vector control policies and the spread of West Nile virus in the Chicago region. *Health & Place*, *16*(6), 1188–1195.

Tomerini, D. (2005). Economic analysis of mosquito control: A review of the literature. *Arbovirus Research in Australia, 9*, 363–367.

Tomerini, D.M., Dale, P.E., & Sipe, N. (2011). Does mosquito control have an effect on mosquito-borne disease? The case of Ross River virus disease and mosquito management in Queensland, Australia. *Journal of the American Mosquito Control Association*, *27*(1), 39–44.

Truemper, E.J., & Romero, J.R. (2007). West Nile virus. *Pediatric Annals, 36*(7), 414–422.

U.S. Census Bureau. (2010). *2010 census interactive population search.* Retrieved from http://www.census.gov/2010census/popmap/ipmtext.php

U.S. Geological Survey. (2011). *Disease maps*. Retrieved from http://diseasemaps.usgs.gov/index.html

Utz, J.T., Apperson, C.S., & Dietz, E.J. (2005). Social impacts of La Crosse encephalitis in North Carolina. *Human Organization, 64*(2), 135–146.

Utz, J.T., Apperson, C.S., MacCormack, J.N., Salyers, M., Dietz, E.J., & McPherson, J.T. (2003). Economic and social impacts of La Crosse encephalitis in western North Carolina. *The American Journal of Tropical Medicine and Hygiene*, *69*(5), 509–518.

Vazquez-Prokopec, G.M., Chaves, L.F., Ritchie, S.A., Davis, J., & Kitron, U. (2010). Unforeseen costs of cutting mosquito surveillance budgets. *Public Library of Science Neglected Tropical Diseases*, *4*(10), e858.

Did You Know? National Public Health Week is April 7–13. Visit www.nphw.org for more information.

An Outbreak of Bed Bug Infestation in an Office Building

Jane A. Gwira Baumblatt, MD
Centers for Disease Control and Prevention
Tennessee Department of Health

John R. Dunn, DVM, PhD
William Schaffner, MD
Tennessee Department of Health
Vanderbilt University School of Medicine

Abelardo C. Moncayo, PhD
Annica Stull-Lane
Tennessee Department of Health

Timothy F. Jones, MD
Tennessee Department of Health
Vanderbilt University School of Medicine

Abstract **Since 2000, resurgence in bed bugs has occurred in the U.S. Reports of infestations of homes, hospitals, hotels, and offices have been described. On September 1, 2011, complaints of itching and bites among workers in an office were reported to the Tennessee Department of Health. A retrospective cohort study and environmental assessments were performed in response to the complaints. Canines certified to detect live bed bugs were used to inspect the office and arthropod samples were collected. Of 76 office workers, 61 (80%) were interviewed; 39 (64%) met the case definition. Pruritic maculopapular lesions were consistent with arthropod bites. One collected arthropod sample was identified as a bed bug by three entomologists. Exposures associated with symptoms included working in a cubicle in which a canine identified bed bugs (risk ratio [*RR*]: 1.8; 95% confidence interval [*CI*]: 1.3–3.6), and self-reported seasonal allergies (*RR*: 1.6, 95% *CI*: 1.0–2.4). Bed bugs represent a reemerging and challenging environmental problem with clinical, psychological, and financial impacts.**

Introduction

During the last decade, the hematophagous arthropod *Cimex lectularius*, known commonly as the bed bug, has undergone a major resurgence in the U.S. and worldwide (Kruger, 2000; Pinto, Cooper, & Kraft, 2007). The number of infestations is increasing, creating clinical and pest control problems (Doggett, Dwyer, Peñas, & Russell, 2012). Data from the National Pest Management Association (NPMA) reveal increasing numbers of calls regarding bed bugs, from 11% to 99% during the past 10 years (NPMA, 2012). Bed bug infestations have also been reported more commonly in public places. The number of pest control professionals reporting treatment of office complexes for bed bugs increased from 18% in 2010 to 38% in 2011. On September 1, 2011, the Tennessee Department of Health (TDH) was notified about complaints of itching and insect bites among workers in Office A for the previous three months. These symptoms caused substantial anxiety without an obvious diagnosis.

Methods

A retrospective cohort study was conducted to identify risk factors for symptoms among employees. A case was defined as unexplained skin lesions or itching during June 1–September 1, 2011, in a worker in Office A. A questionnaire was administered to employees to assess symptoms and exposures in the work environment. Workers present in the office while investigators were on site were interviewed in person. Absent workers were not interviewed. Questions addressed demographics, symptoms, dates of onset, perceptions about the office environment, and a brief medical history. A modified Likert scale of 1 (low) to 10 (high) was used to assess worker anxiety about the situation in the office and overall job satisfaction. Telephone interviews were conducted with clinicians who had evaluated workers to confirm symptom reports and diagnoses.

An environmental investigation was conducted and included visual inspection of the facility and canine bed bug inspection (Doggett et al., 2012). A canine certified to detect bed bugs by scent alerted its handler to the presence of bed bugs by sitting down in cubicles in which live bed bugs were present. Cubicles were defined as canine-alert positive if the canine alerted while in the cubicle or an adjacent one. Investigators then inspected the canine-alerted cubicles. A dry ice trap was set up in an attempt to attract and capture bed bugs overnight (Wang, Tsai, Cooper, & White, 2011). Suspect insect samples were transported to the TDH state laboratory for microscopic inspection by a medical entomologist. Data were analyzed by using SAS version 9.1 and SaTScan version 7.0. The investigation protocol underwent human subjects review at the Centers for Disease Control and Prevention and was determined to be public health outbreak evaluation and control.

FIGURE **1**

Number of Office Workers With Onset of Itching or Unexplained Skin Lesions by Week, June 1–September 1, 2011

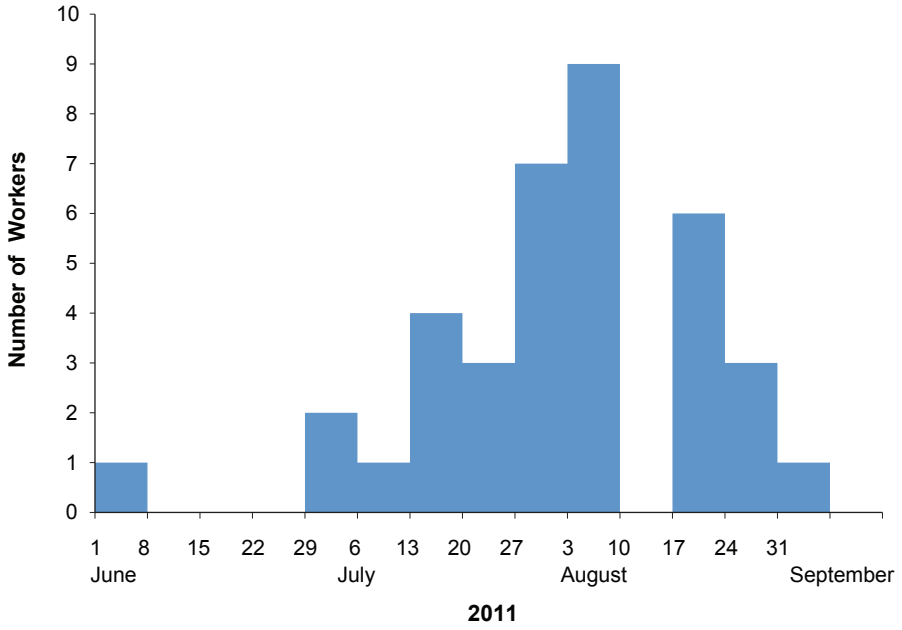
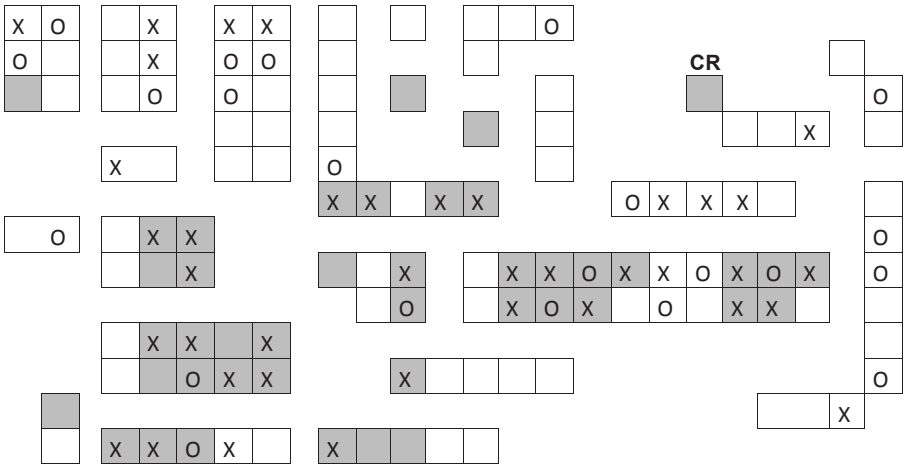


FIGURE **2**

Map of the Office Indicating Cubicle Occupancy Superimposed With Canine Alerts



X = cubicle with a worker reporting symptoms; O = cubicle with a worker reporting no symptoms; blank = unoccupied cubicle; gray = canine-alert-positive cubicle; CR = room containing donated clothing.

Results

Office A is a single-story brick building housing children's social services workers. Workers' job activities included home visits, transporting children, and handling donated clothing. Of 76 employees, 61 (80%) were available and interviewed. The mean age was 43 years (range: 23–62 years); 53 (87%) were female. Of 61 workers interviewed, 39 (64%) complained of symptoms and met the case definition. Symptom onset occurred from June through August and peaked during the first week of August (Figure 1). The two most frequently reported symptoms were itching (90%) and rash (77%). Less commonly reported were feeling a crawling sensation on the skin (21%), welts (18%), burning (13%), and tingling (13%). Six (15%) workers sought care from medical providers. None had presented to emergency departments and none were hospitalized. Thirty-two (52%) of the 61 workers interviewed reported having seasonal allergies, and 36 (59%) had pets. Dermatologic evaluation of four workers indicated that their rashes were consistent with arthropod bites.

Of 32 workers with canine-alert-positive cubicles, 26 (81%) complained of symptoms. By contrast, of 29 workers with canine-alert-negative cubicles, 13 (45%) had symptoms (risk ratio [*RR*]: 1.8; 95% confidence interval [*CI*]: 1.3–3.6). A canine also alerted in the room that contained donated clothing. Spatial analysis did not reveal a statistically significant clustering of cases in any one area of the office (Figure 2). Of 32 workers with a history of seasonal allergies, 25 (78%) reported symptoms, compared with 14 (48%) of 29 workers without seasonal allergies (*RR*: 1.6; 95% *CI*: 1.0–2.4). Other factors (e.g., sex, pet ownership, and having symptoms at home) were not significantly associated with case status. A modified Likert scale revealed the median anxiety and job satisfaction levels to be 4.0 and 8.0, respectively. Environmental inspection did not reveal live bed bugs or visual evidence of bed bug presence (e.g., fecal spotting). The dry ice trap did not capture any bed bugs. An arthropod specimen from the office submitted by a worker was identified, however, as a bed bug nymph by three entomologists.

A pest control company evaluated the office and recommended steam cleaning, application of a pyrethroid-based pesticide, and evaluation of worker homes. Seven (78%) of nine workers were determined to have bed bug infestations in their homes by canine alerts and visual inspection. The total estimated cost of this outbreak to the business was $127,991, which includes the canine inspection (~$4,630) pest control company evaluation and treatment (~$22,841), and lost productivity costs (~$100,520).

Discussion

This outbreak of bites and itching in an office was caused by a bed bug infestation affecting two-thirds of the workforce. Infestations in offices are unusual but are becoming increasingly common because bed bugs travel to and from infested homes and public places on personal items (Pinto, Kraft, & Cooper, 2011). Office A might have been exposed to bed bugs through workers' trips to multiple homes and contact with donated clothing. In residential settings, bed bugs usually infest sleeping areas. In offices, however, they frequently move around the office looking for a blood meal. In addition, bed bugs often hide in crevices and walls, coming out only to feed. These adaptations decrease the relative density of bed bug populations in offices, making visual inspection difficult (Pinto et al., 2011). Canine inspection methods have become the industry standard for bed bug detection, and well-trained and certified dogs can identify live bed bugs with 95%–98% accuracy (Pfiester, Koehler, & Pereira, 2008). Canine inspection is often necessary to detect bed bugs, although costs associated with their use often are prohibitive (Doggett et al., 2012)

Workers with seasonal allergies were more likely to report symptoms than those without seasonal allergies. Whether having seasonal allergies is a marker of sensitivity to bed bugs is unknown, however. No reports in the literature link seasonal allergies with increased likelihood of manifesting symptoms from bed bug bites, but allergic reactions to bed bug bites have been reported, with 20%–25% exposed persons remaining asymptomatic (Reinhardt, Kempke, Naylor, & Siva-Jothy, 2009; Sansom, Reynolds, & Peachey, 1992). Our analysis also identified a moderately elevated level of anxiety among this cohort, consistent with reports of bed bug infestations causing anxiety and stress (Benac, 2010; Doggett et al., 2012).

Conclusion

This investigation was a public health response to complaints of bites and itching without a clear explanation at the time of initial report. Hypotheses included psychogenic illness, a communicable disease, sick building syndrome, or arthropod infestation. After the bed bug infestation was confirmed, the public health response was to educate workers about bed bugs not being disease vectors (Doggett et al., 2012) and to recommend pest control evaluation and treatment.

Bed bugs should be considered in the differential diagnoses of building-related illnesses. Although not disease vectors, they are an emerging public health problem with substantial clinical and financial impact. A concerted effort from departments of health, the pest management industry, and the general public is required to address the resurgence of this parasite.

Acknowledgements: The authors thank Jerome Goddard, PhD, and Karen Vail, PhD, for their help with specimen identification; Carley the German Shepherd and Mattie the Dutch Shepherd of Dog Inspectors, LLC, for their help with bed bug detection; and the office staff and management for their full cooperation with our investigation.

Disclaimer: The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Corresponding Author: Jane A. Gwira Baumblatt, Medical Officer, Agency for Healthcare Research and Quality, 540 Gaither Rd, Rockville, MD 20850.
E-mail: Jane.Baumblatt@ahrq.hhs.gov.

References

Benac, N. (2010). Bed bug bites becoming a bigger battle. *Canadian Medical Association Journal, 182*(15), 1606.

Doggett, S.L., Dwyer, D.E., Peñas, P.F., & Russell, R.C. (2012). Bed bugs: Clinical relevance and control options. *Clinical Microbiology Review, 25*(1), 164–192.

Kruger, L. (2000). Don't get bitten by the resurgence of bed bugs. *Pest Control, 68*(3), 58–64.

National Pest Management Association. (2012). *2011 bugs without borders survey*. Retrieved from http://www.pestworld.org/news-and-views/press-releases/press-releases/bed-bugs-in-america-new-survey-reveals-impact-on-everyday-life/

Pfiester, M., Koehler, P.G., & Pereira, R.M. (2008). Ability of bed bug–detecting canines to locate live bed bugs and viable bed bug eggs. *Journal of Economic Entomology, 101*(4), 1389–1396.

Pinto, L.J., Cooper, R., & Kraft, S.K. (2007). *Bed bug handbook: The complete guide to bed bugs and their control*. Mechanicsville, MD: Pinto & Associates.

Pinto, L.J., Kraft, S.K., & Cooper, R. (2011). Bed bugs in office buildings. Retrieved from http://www.pctonline.com/FileUploads/file/bedbugs-office-buildings.pdf

Reinhardt, K., Kempke, D., Naylor, R.A., & Siva-Jothy, M.T. (2009). Sensitivity to bites by the bed bug, *Cimex lectularius*. *Medical and Veterinary Entomology, 23*(2), 163–166.

Sansom, J.E., Reynolds, N.J., & Peachey, R.D. (1992). Delayed reaction to bed bug bites. *Archives of Dermatology, 128*(2), 272–273.

Wang, C., Tsai, W.T., Cooper, R., & White, J. (2011). Effectiveness of bed bug monitors for detecting and trapping bed bugs in apartments. *Journal of Economic Entomology, 104*(1), 274–278.

Outbreak of Norovirus Illness in a College Summer Camp: Impact of Cleaning on Occurrence of Norovirus on Fomites

Sonia L.M. Fankem, MS, MPH, PhD
Department of Soil, Water and Environmental Science
University of Arizona

Stephanie A. Boone, MS, PhD
U.S. Department of Agriculture

Marlene Gaither, MPA, ME, RS
Department of Health Sciences
Coconino Health Department

Charles P. Gerba, PhD
Department of Soil, Water and Environmental Science
University of Arizona

Abstract **During the summer of 2005 an outbreak of norovirus acute gastroenteritis occurred in a residential college summer camp and was reported to the local health department. The outbreak spread rapidly to several other groups concurrently sharing the same facilities. During the investigation, fomites were sampled at different times in dorm rooms and tested for norovirus. The number of norovirus-positive rooms increased after the first room cleaning, from 40% to 73%. After the initial cleaning, the staff was instructed on proper cleaning and disinfection procedures and provided with disposable disinfecting wipes to reduce cross contamination, and the number of norovirus-positive rooms decreased to 30%. These findings reinforce the need for appropriate cleaning and disinfection procedures during a norovirus outbreak.**

Introduction

Norovirus is the leading cause of nonbacterial gastroenteritis worldwide. Norovirus was formerly known as the Norwalk-like virus or small round structured virus, and is a member of the *Norovirus* genus in the Caliciviridae family of viruses. They are nonenveloped, positive-sense, icosahedral, single-stranded RNA viruses. Human norovirus is genetically diverse and belongs to one of three genogroups (GI, II, or IV), each of which is further divided into more than 25 genetic clusters (Centers for Disease Control and Prevention [CDC], 2013a; Estes, Prasad, & Atmar, 2006). Outbreaks of norovirus gastroenteritis occur most frequently in various settings such as schools, daycare centers, nursing homes, hospitals, and cruise ships (Andersen, Storvold, & Vainio, 2003; Bohnker & Thornton, 2003; Calderon-Margalit et al., 2005; Cooper & Blamey, 2005; Cotterelle et al., 2005; Drinka, 2005; Hoebe, Vennema, de Roda Husman, & van Duynhoven, 2004; Lopman, Reacher, Vipond, Sarangi, & Brown, 2004; Navarro et al., 2005; Widdowson et al., 2005; Wu et al., 2005).

Noroviruses are transmitted via the fecal-oral route. The average incubation period for norovirus-induced gastroenteritis is 12–48 hours with symptoms that usually resolve in 12–72 hours. Illness is characterized by acute-onset projectile vomiting, watery nonbloody diarrhea with abdominal cramps, low grade fever, headache, and malaise (CDC, 2013a; Estes et al., 2006; Lopman, Reacher, Vipond, Hill, et al., 2004). The very low infectious dose of norovirus may be one reason why it is the most common cause of diarrheal illness (Mead et al., 1999; Teunis et al., 2008); norovirus may also remain viable on surfaces for more than a month. Our study investigated a summer camp–associated outbreak of norovirus illness to identify the source of infection and the causes of disease spread and to recommend strategies for prevention of future outbreaks in such settings.

Methods

Background

On July 20, 2005, the local health department communicable disease program coordinator received a call from the infection control practitioner at Flagstaff Medical Center about three emergency department patients with similar symptoms: vomiting, diarrhea, and dehydration. All three patients (two participants and a staff member) were also members of Camp A (wrestling camp) from an area summer camp. Further investigation by the communicable disease staff identified 40 other Camp A members with similar symptoms. On July 21, 2005, an outbreak investigation was initiated. An employee from the health department interviewed participants attending the summer camps on July 21. They were given questionnaires to determine personal demographic information and symptoms associated with the gastrointestinal illness. Outbreak investigation participant selection is shown in Figure 1.

Outbreak Case Definition

A retrospective cohort study of all persons attending the summer camp from July 18, 2005, to July 31, 2005, inclusive, was conducted. The case definition for norovirus illness was acute onset of nausea, vomiting, or diarrhea (i.e., no prodromal period before gastrointestinal symptoms). The inclusion criteria into the study were as follows:

FIGURE **1**

Flow Chart of Study Participation

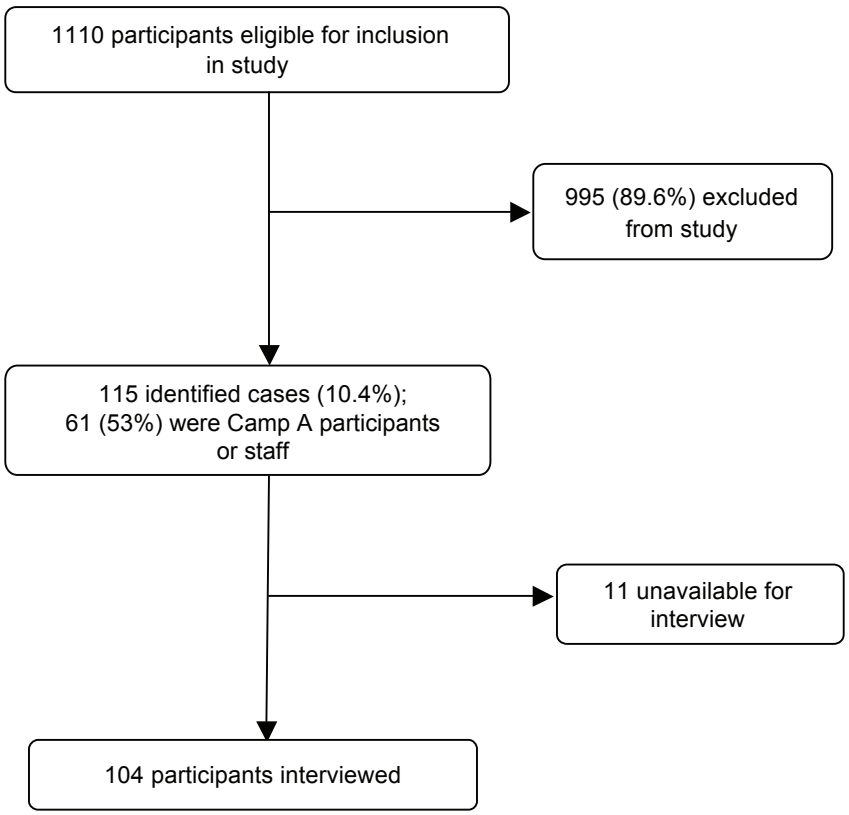


TABLE **1**

Timeline of Environmental Investigation and Disinfection

Date	Action
July 20	Local health department contacted
July 21 and 22	Outbreak investigation initiated • Participant questionnaires • Fomite and fecal samples collected
July 31	Cleaning with soap and water
August 1	Fomite samples collection
August 14	Cleaning and disinfection with soap and water followed by 5000 mg/L free chlorine and disposable disinfecting wipes
August 15	Resampling of fomites that tested positive for norovirus on August 1

1) participation at any of the four summer camps (A, B, C, D), or
2) having contact with members of the camps within 48 hours before illness onset, or
3) visiting one of a variety of locations at the summer camp within 48 hours before onset of illness.

Environmental Investigation and Disinfection

Samples were collected on July 21 and 22 and August 1 and 15. Table 1 shows the dates of the environmental investigation and cleaning/disinfection interventions. Ten fomites (doorknobs and toilet seats) were sampled during July 21–22 before any cleaning took place by facilities management personnel.

The residence halls that housed norovirus cases from Camp A, a multipurpose athletic facility, and the student union were cleaned on July 30. The cleaning crew did not have specific cleaning instructions and used their common cleaning solutions composed of soap and water. After the cleaning, 51 fomites in residence halls and Camp A facilities were swabbed for norovirus again on August 1. The surfaces included toilet handles and seats, bathroom sink faucet handles, bathroom doorknobs, walls, mattresses, urinal handles, chairs, drinking fountains, and floors.

After review of the results, the environmental health program manager (EHPM) for the local health department instructed facilities management personnel to again clean and disinfect contaminated fomites. The EHPM advised the summer camp facilities staff to clean and disinfect surfaces in bathrooms, bedrooms, and common areas using a bleach (sodium hypochlorite) solution containing 5,000 mg/L free chlorine. The surfaces were cleaned with detergent (soap and water) prior to disinfection. Separate disinfecting wipes (containing a quaternary ammonium disinfectant) were used for each surface to reduce the possibility of cross contamination, and the chlorine solution was often refreshed after cleaning each room. The final fomite sample collection (10 samples) took place on August 15 after cleaning of fomites as per instructions of the EHPM. Only the surfaces that tested positive for norovirus from the fomite sampling on August 1 were resampled.

Virus Concentration From Stool

Noroviruses were concentrated from stool by suspending 1 g of stool in 7 mL phosphate buffered saline. Suspensions were then vortexed for 60 seconds and centrifuged for 30 minutes. The supernatant was removed and aliquoted for storage at -20°C until further processing.

Virus Concentration From Fomites

Methods for virus detection on fomites were previously described by Boone and Gerba (2005). Briefly, the fomite samples were obtained by swabbing each individual surface with a sterile, polyester-fiber-tipped transport system collection swab moistened in transport medium. All samples were transported to the laboratory on ice and frozen at -80°C until assayed. Samples were homogenized using a vortex mixer followed by viral RNA extraction.

RNA Extraction

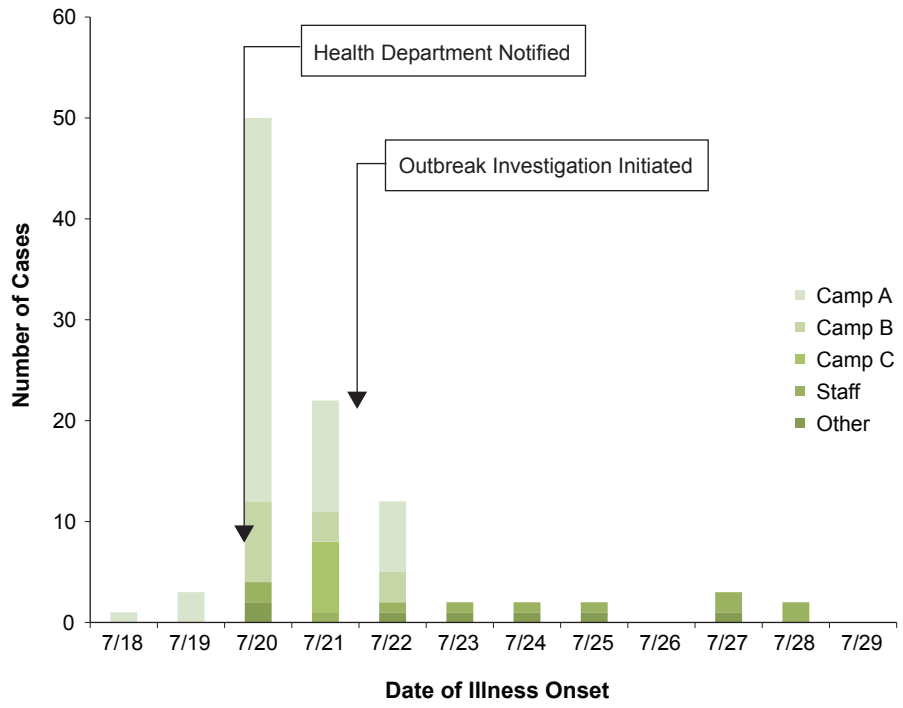
Viral RNA was purified from fomite and stool samples using QIAamp Viral RNA Mini Kit (Qiagen, 2005). The Mini Spin Protocol was followed with the following modifications (due to large sample volume): the total sample volume was doubled to 280 µL and a double elution using two consecutive 40-µL volumes of buffer AVE was performed. The purified viral RNA samples were stored at -20°C.

Reverse Transcription-Polymerase Chain Reaction (RT-PCR)

RT-PCR was performed on the purified viral RNA using Qiagen OneStep RT-PCR kit. The primers MJV12 (5'-TAY CAY TAT GAT GCH GAY TA-3') and RegA (5'-CTC RTC ATC ICC ATA RAA IGA-3') (Vinjé et al., 2003), modified JV12/JV13 primers (Vinjé et al., 2003), are specific for human norovirus genogroup GI and GII originating from region A of the NV capsid gene. PCR was performed using 22.25 µL of Rnase-free water, 5.0 µL of 25 mM magnesium chloride solution, 0.25 µL of 5 unit/mL Amplitaq gold, 5 µL of GeneAmp 10 × PCR buffer, 4.0 µL of 2.5 mM of dNTP mix, 1.0 µL of 50 µM (upstream and downstream) primers (Reg A and MJV12), 0.5 µL of 50 nM random hexamers, 0.5 µL of 20 units/µL Rnase inhibitor, and 0.5 µL of 50 units/µL RT per sample. A 10-µL volume of purified RNA template was used in a total reaction volume of 50 µL. The reverse transcriptase reaction mixture was placed in a gene amp PCR system 9700 thermacycler. Thermal cycling conditions were as follows: reverse transcription of viral RNA for 60 minutes at 42˚C; activation of Taq polymerase for 15 minutes at 95˚C; 40 cycles: 30 seconds at 94˚C, 30 seconds at 50˚C, 30 seconds at 72˚C; and final extension for 10 minutes at 72˚C.

FIGURE **2**

Epidemiological Curve of the Outbreak



Semi-Nested PCR

Semi-nested PCR was performed using 5.0 µL of 10 x PCR gold buffer, 5.0 µL of 2.5 mM MgCl, 4.0 µL of 2.4 mM dNTP, 1.0 µL of 50 mM of internal primer MP 290 and primer Reg A, 0.25 µL of 5 units/ml of Amplitaq Gold, and 2 µL volume of PCR product from RT-PCR in a total reaction volume of 50 µL. The reaction mixture was placed in an gene amp PCR system 9700 thermacycler. The standard thermal cycling conditions were as follows: five minutes at 95°C, 40 cycles of 30 seconds at 94°C, 30 seconds at 49°C, 30 seconds at 72°C, and a final elongation step for 10 minutes at 72°C.

Rnase-free water negative controls and known positive norovirus controls were done concurrently with the unknown samples. The semi-nested PCR product was visualized using ethidium bromide stained 2% agarose gel run in 0.5X tris borate EDTA buffer. An Alpha Imager 2000 was used to visualize the resulting product bands. Norovirus-positive semi-nested PCR product was purified using the QIAquick PCR purification kit and sequenced at the University of Arizona's Genomic Analysis Technical Center using a 377 ABI sequencer. Sequencing is a commonly used method for the confirmation of PCR positive products to prevent false-positive results (Vinjé et al., 2003).

Sequences were compared to known sequences in the National Center for Biotechnology Information's nucleotide-nucleotide BLAST database for confirmation of positive samples as human norovirus. All amplicons reported as norovirus positive were confirmed as human noroviruses by sequencing.

TABLE **2**

Demographics of Individuals

Gender	# (%)
Male	79 (77)*
Female	24 (23)*
Symptoms	
Nausea	20 (19.4)
Vomiting	83 (80.6)
Diarrhea	91 (88.3)
All symptoms	14 (13.6)

*Based on 103 available surveys.

TABLE **3**

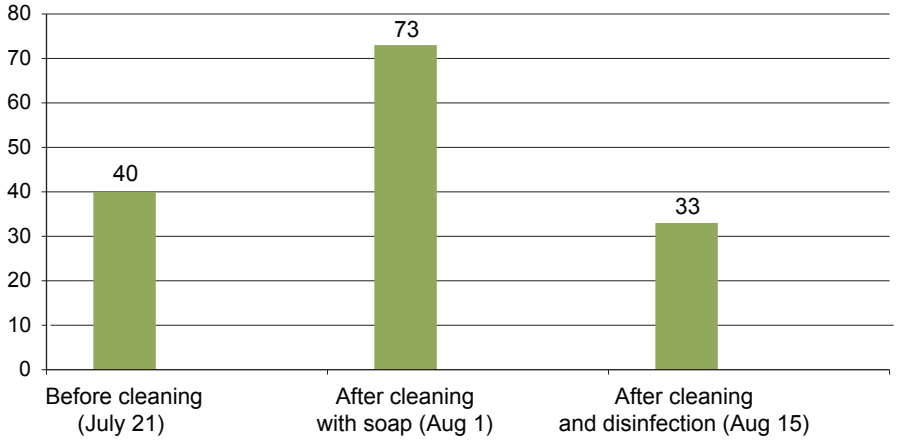
Attack Rates Among Camp Participants

Camp	Ill (n = 84)	Total (N = 1,026)	Attack Rate (% Ill)
A*	61	201	30
B	14	683	2
C	7	75	9
D	2	67	3

*Includes only camp A that began on July 17.

FIGURE **3**

Percentage of Rooms in Which Norovirus Was Detected on Fomites



Results

Epidemiological Findings

From July 18 to July 28, the illness affected a total of 115 individuals, 61 (53%) of which were participants or staff of Camp A that began on July 17. During the investigation, 104 cases were interviewed. Eleven of the 115 left the state before they could be interviewed. Figure 2 shows the epidemiological curve starting on July 18 and ending on July 29. No cases were reported to have onset dates before July 18 or after July 28. The single case on July 18 is the probable index case. The "other" category includes regular students at the camp's location and two health department employees who interviewed cases in person. Among the 11 employees who reported being ill, two worked in the food service department.

The outbreak peaked on July 20 with 50 cases and subsided after that date. After July 23, the 0–2 cases per day may have been part of the normal background of acute gastroenteritis for a college campus with dormitory housing. This is difficult to prove, because not all causes of acute gastroenteritis are reportable diseases, and most cases do not seek medical attention.

Out of the 103 cases for which gender information was available, 24 were female (23%) and 79 were male (77%). Patients' ages ranged from 14 to 54 years old. Out of the 103 people for which symptom information was available, the symptoms included nausea in 20 (19.4%), vomiting in 83 (80.6%), and diarrhea in 91 (88.3%). Nausea, vomiting, and diarrhea were reported by 14 (13.6%) of the individuals (Table 2); these data are based on 103 available surveys. Four individuals required emergency care for severe dehydration, one of whom was hospitalized for two days. No fatalities occurred during this outbreak.

Environmental Findings

The summer camps at the highest risk of infection included Camp A that began on July 17 and other camps that shared a residence hall or dining facility with the wrestlers. The attack rate among participants of Camp A was higher at 30.3% than for all other affected summer camps (Table 3). The high number and rate of acute gastroenteritis in Camp A was used to verify the existence of an outbreak.

Laboratory Findings

Of the fomites samples collected on July 21 and 22, norovirus was only detected on 17% of the samples. More extensive sampling took place on August 1 after cleaning with rags, soap, and water, of which 11 (22%) were positive for norovirus. Forty-five percent (45%) of the fomite samples of August 1 from toilet seats and toilet handles in the wing of the residence hall that housed ill individuals from Camp A were positive for norovirus. Surfaces that were supposed to be cleaned and disinfected still tested positive for norovirus. The second cleaning and disinfection occurred on August 14 before resampling of the same fomite locations on which norovirus was detected on August 15. After this round of cleaning and disinfecting, the percentage of dorm rooms testing positive was reduced to less than 35% (Figure 3).

Discussion

This outbreak of noroviruses in a summer camp was associated with attack rates varying from 3% to 30% that may have resulted from poor disinfection procedures or cross contamination from the use of the same cleaning/disinfecting tools (e.g., clothes, rags, mops, etc.) during the outbreak.

A total of 115 cases were identified as part of this outbreak, but complete data were available for only 84 cases; 31 potential cases were excluded because they declined to be interviewed or had missing data. Over half of the cases occurred among participants and staff of Camp A, which also had the highest attack rate (30%). Stool specimens were collected from four Camp A par-

ticipants, and three of them (75%) tested positive for norovirus confirming this virus as the presumptive causative agent of the outbreak. The illness spread very quickly through this group (with three participants ill on one day, and 38 more ill on the next day). The close physical contact that takes place during camp activities and associated mats in the wrestling camp probably led to much of the spread to other participants. The virus also spread to a limited degree to three other summer camp groups who shared space with Camp A. Other cases included college employees and students. Other sources of spread may have included being in close proximity to someone who was vomiting (during which the virus can become airborne and contaminate fomites over a large area), and touching contaminated surfaces in the dormitory, Camp A facilities, or other locations on campus. Sink faucet handles, toilet handles, and toilet seats in the dormitory that housed Camp A participants tested positive for the virus.

A study by Barker and co-authors (2004) found that 28% of surfaces cleaned and sanitized using 5,000 mg/L free chlorine were still positive for norovirus. In our study, after the second round, the following steps were undertaken to reduce the number of surfaces on which norovirus was detected.

1. All surfaces that had previously tested positive for norovirus were washed with a detergent solution prior to disinfection (to improve the effectiveness of the disinfectant).
2. A solution of 5,000 mg/L free chlorine was used to disinfect surfaces by mixing two cups of bleach with one gallon of water.
3. The chlorine solution was kept at 5,000 mg/L by frequently making fresh solutions. The summer camp employees were instructed on the cleaning and disinfection procedure but were not closely monitored.

Separate chlorine solutions and disposable disinfecting wipes (to reduce cross contamination) were used to clean the toilet surfaces, lavatory surfaces, and doorknobs.

The number of dorm rooms testing positive for norovirus increased from 40% at initial sampling to 73% after the first cleaning and then decreased to 33% after proper cleaning and disinfection (Figure 3). The increase in toilet handles testing positive (Table 4) might also have been due to improper initial disinfection of surfaces with 5,000 mg/L free chlorine; the cleaning solution may not have been appropriately refreshed, or the wiping cloths or sponges may have been indiscriminately used to clean or disinfect surfaces that could lead to cross contamination.

TABLE **4**

Detection of Norovirus (% Positive) on Fomites After Cleaning/Disinfection

Fomites	Before Cleaning (July 21)	After Cleaning With Soap and Water (August 1‡)	After Cleaning With Soap, Water, Chlorine, and Disinfecting Wipes (August 15*)
Toilet seat	50	NT[a]	NT
Toilet handle	NT	27	67
Lavatory handle (tap)	NT	64	29
Total	50	45	40

[a]NT = not tested.
‡Sampling after cleaning with rags, soap, and water.
*Sampling after cleaning and disinfecting with soap and water followed by 5,000 mg/L free chlorine and disinfecting wipes.

No common food or meal was shared by the cases prior to the first illnesses. The index case, who came to the camp that evening from out of state, got ill before having dinner that evening. A dining facility was shared by Camps A and B, however. At least one participant in Camp A was reported to have vomited during dinner. Thus, the most likely means of viral spread was airborne spread from vomiting and fomites contaminating surfaces in the dining room or bathrooms.

The viral RNA was sequenced and found to be GII.2. This included the probable index case, who became ill on July 18 right after arriving to the camp. This was the first report of this norovirus genotype in Arizona. Thus, the virus was most likely brought to Arizona from someone, probably the index, who was infected in another state prior to coming to the camp.

The Centers of Disease Control and Prevention have previously reported that norovirus may be spread via fomites (CDC, 2013b). The virus may also be aerosolized during vomiting and when diarrhea stools are flushed in a toilet. This virus has a very low infective dose and may remain viable on surfaces for more than one month (Doultree, Druce, Birch, Bowden, & Marshall, 1999). This virus is also resistant to free chlorine concentrations of 1,000 parts per million in laboratory studies using feces (Doultree et al., 1999).

During the outbreak, two health department employees became ill 24–36 hours after interviewing cases of Camp A in their residence hall. Several of the cases were vomiting at the time of the interviews or had recently vomited. One of the two health department employees entered a bathroom to sample fomites very soon after an individual vomited. Exposures may have occurred from ingestion of airborne virus particles due to close proximity of bathrooms to bedrooms. Contaminated surfaces in the residence hall rooms could have been another source of exposure. To prevent future norovirus illness among staff, health department employees were directed, in the future, to wear gloves and masks when interviewing cases who are vomiting or have recently vomited.

The health department's recommendations for outbreak control included the following:

1. Confining ill camp participants to their rooms.
2. Confining all participants of the affected summer camps to their residence halls.
3. Recommending frequent hand washing by camp participants and university employees.
4. Excluding food service employees experiencing acute gastroenteritis symptoms from work.
5. Thorough cleaning and disinfection of the affected areas.

On July 23, university officials canceled all remaining summer conference camps on campus. The summer camp staff thoroughly disinfected all residence halls and facilities that were likely to have been contaminated with norovirus. These infection control measures likely slowed the spread of the virus. No cases of norovirus illness connected to this outbreak were reported after July 28.

Measures taken to prevent future norovirus outbreaks included the following: summer camp officials reviewing contracts with summer conference camp organizers to determine the feasibility of excluding sick camp participants; the summer camp adopting new disinfection protocols based on the recommendations described above; multiple press releases about the outbreak; the health department developing and distributing a norovirus informational brochure; and the inclusion of a norovirus article in the summer issue of the health department's epidemiology newsletter.

Our study was limited by several factors. In outbreaks of norovirus illness, the onset of secondary cases often overlaps the late onset of primary cases, which may lead to misclassification of primary and secondary cases. We were not able to sequence stool- and fomite-positive samples in order to ascertain whether or not the outbreak was due to a single source. Although the summer camp employees were instructed on the cleaning and disinfection procedures, they were not closely monitored. Also, given that 30% of norovirus cases are asymptomatic, the full extent of the outbreak might have been underestimated. Mild and self-limiting infections were probably not reported.

Conclusion

This outbreak of norovirus illness in a summer camp underscores the importance of understanding the spread of the virus via fomites, especially in areas where people tend to congregate. The closed environment of summer camp, combined with inadequate cleaning procedures, spurred the spread of this outbreak. When outbreaks occur in institutional settings, such as a college summer camp, it is important to reinforce the advice about proper hygiene in order to curtail the spread of the outbreak to other settings such as households. Our study has produced evidence that fomites are important in the transmission of norovirus and that using a combination of standard cleaning procedures and 5,000 mg/L free chlorine can effectively reduce cross contamination of fomites due to cleaning during a norovirus outbreak.

Corresponding Author: Charles P. Gerba, Professor, Department of Soil, Water and Environmental Science, University of Arizona, Tucson, AZ 85721. E-mail: gerba@ag.arizona.edu.

References

Andersen, B.M., Storvold, G., & Vainio, K. (2003). Norovirus gastroenteritis at the Ulleval university hospital [Article in Norwegian]. *Tidsskr Nor Laegeforen, 123*(9), 1239.

Barker, J., Vipond, I.B., & Bloomfield, S.F. (2004). Effects of cleaning and disinfection in reducing the spread of norovirus contamination via environmental surfaces. *Journal of Hospital Infection, 58*(1), 42–49.

Bohnker, B.K., & Thornton, S. (2003). Explosive outbreaks of gastroenteritis in the shipboard environment attributed to norovirus. *Military Medicine, 168*(5), iv.

Boone, S.A., & Gerba, C.P. (2005). The occurrence of influenza A virus on household and daycare center fomites. *The Journal of Infection, 51*(2), 103–109.

Calderon-Margalit, R., Sheffer, R., Halperin, T., Orr, N., Cohen, D., & Shohat, T. (2005). A large-scale gastroenteritis outbreak associated with norovirus in nursing homes. *Epidemiology and Infection, 133*(1), 35–40.

Centers for Disease Control and Prevention. (2013a). *Norovirus in health care settings*. Retrieved from http://www.cdc.gov/HAI/organisms/norovirus.html

Centers for Disease Control and Prevention. (2013b). *For food handlers: Norovirus and working with food.* Retrieved from http://www.cdc.gov/norovirus/food-handlers/work-with-food.html

Cooper, E., & Blamey, S. (2005). A norovirus gastroenteritis epidemic in a long-term-care facility. *Infection Control and Hospital Epidemiology, 26*(3), 256–258.

Cotterelle, B., Drougard, C., Rolland, J., Becamel, M., Boudon, M., Pinede, S., Traoré, O., Balay, K., Pothier, P., & Espié, E. (2005). Outbreak of norovirus infection associated with the consumption of frozen raspberries, France, March 2005. *Euro Surveillance, 10*(4), E050428.1.

Doultree, J.C., Druce, J.D., Birch, C.J., Bowden, D.S., & Marshall, J.A. (1999). Inactivation of feline calicivirus, a Norwalk virus surrogate. *Journal of Hospital Infection, 41*(1), 51–57.

Drinka, P.J. (2005). Norovirus outbreaks in nursing homes. *Journal of the American Geriatrics Society, 53*(10), 1839–1840.

Estes, M.K., Prasad, B.V., & Atmar, R.L. (2006). Norovirus everywhere: Has something changed? *Current Opinion in Infectious Diseases, 19*, 467–474.

Hoebe, C.J., Vennema, H., de Roda Husman, A.M., & van Duynhoven, Y.T. (2004). Norovirus outbreak among primary schoolchildren who had played in a recreational water fountain. *The Journal of Infectious Diseases, 189*(4), 699–705.

Lopman, B.A., Reacher, M.H., Vipond, I.B., Hill, D., Perry, C., Halladay, T., Brown, D.W., Edmunds, W.J., & Sarangi, J. (2004). Epidemiology and cost of nosocomial gastroenteritis, Avon, England, 2002–2003. *Emerging Infectious Diseases, 10*(10), 1827–1834.

Lopman, B.A., Reacher, M.H., Vipond, I.B., Sarangi, J., & Brown, D.W. (2004). Clinical manifestation of norovirus gastroenteritis in health care settings. *Clinical Infectious Diseases, 39*(3), 318–324.

Mead, P.S., Slutsker, L., Dietz, V., McCaig, L.F., Bresee, J.S., Shapiro, C., Griffin, P.M., & Tauxe, R.V. (1999). Food-related illness

continued on page 26

References *continued from page 25*

and death in the United States. *Emerging Infectious Diseases, 5*(5), 607–625.

Navarro, G., Sala, R.M., Segura, F., Arias, C., Anton, E., Varela, P., Peña, P., Llovet, T., Sanfeliu, I., Canals, M., Serrate, G., & Nogueras, A. (2005). An outbreak of norovirus infection in a long-term-care unit in Spain. *Infection Control and Hospital Epidemiology, 26*(3), 259–262.

Qiagen. (2005). *QIAamp viral RNA mini handbook* (2nd ed.). Valencia, CA: Author.

Teunis, P.F., Moe, C.L., Liu, P., Miller, S.E., Lindesmith, L., Baric, R.S., Le Pendu, J., & Calderon, R.L. (2008). Norwalk virus: How infectious is it? *Journal of Medical Virology, 80*(8), 1468–1476.

Vinjé, J., Vennema, H., Maunula, L., von Bonsdorff, C.H., Hoehne, M., Schreier, E., Richards, A., Green, J., Brown, D., Beard, S.S., Monroe, S.S., de Bruin, E., Svensson, L., & Koopmans, M.P. (2003). International collaborative study to compare reverse transcriptase PCR assays for detection and genotyping of noroviruses. *Journal of Clinical Microbiology, 41*(4), 1423–1433.

Widdowson, M.A., Glass, R., Monroe, S., Beard, R.S., Bateman, J.W., Lurie, P., & Johnson, C. (2005). Probable transmission of norovirus on an airplane. *The Journal of the American Medical Association, 293*(15), 1859–1860.

Wu, H.M., Fornek, M., Schwab, K.J., Chapin, A.R., Gibson, K., Schwab, E., Spencer, C., & Henning, K. (2005). A norovirus outbreak at a long-term-care facility: The role of environmental surface contamination. *Infection Control and Hospital Epidemiology, 26*(10), 802–810.

neha.org

- Journal of Environmental Health
- e-Learning
- **R&D Programs**
- NEHA in Action
- Credentials
- Continuing Education
- NEHA Food Safety Training
- Awards & Sabbaticals
- Endowment Fund
- Scholarships
- Position Papers
- Affiliated Organizations
- Links
- Students Section

Information and opportunities abound behind the research and development (R&D) button on NEHA's homepage. Visit neha.org/research to obtain the latest on the following NEHA federally funded programs, many of which include free or low-cost training and educational opportunities:

- Biology and Control of Vectors and Public Health Pests Program
- Environmental Public Health Tracking Program
- Epi-Ready Team Training Program
- Food Safe Schools Program
- Industry-Foodborne Illness Investigation Training and Recall Response (I-FIIT-RR) Program
- Land Use Planning and Design Program
- Onsite Wastewater Treatment Systems Program
- Radon/Indoor Air Quality Program
- Workforce Development Program

GUEST COMMENTARY

2012 NEHA/UL Sabbatical Report

Vulnerability to Potential Impacts of Climate Change: Adaptation and Risk Communication Strategies for Environmental Health Practitioners in the United Kingdom

Dhitinut Ratnapradipa, MSc, MPA, PhD
Department of Health Education and Recreation
Southern Illinois University

Abstract **Climate change risk assessment, adaptation, and mitigation planning have become increasingly important to environmental health practitioners (EHPs). The NEHA/UL Sabbatical Exchange Award allowed me to investigate how EHPs in the UK are incorporating climate change planning and communication strategies into their work. Projected climate change risks in the UK include flooding, extreme heat, water shortages, severe weather, decreased air quality, and changes in vectors. Despite public perception and funding challenges, all the local government representatives with whom I met incorporated climate change risk assessment, adaptation, and mitigation planning into their work. The mandated Community Risk Register serves as a key planning document developed by each local government authority and is a meaningful way to look at potential climate change health risks. Adaptation and sustainability were common threads in my meetings. These often took the form of "going green" with transportation, energy efficiency, conserving resources, and building design because the efforts made sense monetarily as future cost savings. Communication strategies targeted a variety of audiences (EHPs, non-EHP government employees, politicians, and the general public) using a broad range of communication channels (professional training, lobbying, conferences and fairs, publications, print materials, Internet resources, social media, billboards, etc).**

Introduction

In the recent past, scientific uncertainty fueled political debate about global climate change. In 1988, the United Nations Intergovernmental Panel on Climate Change (IPCC) was established to provide comprehensive assessments of scientific information related to anthropogenic climate change risk and to write policy reports regarding adaptation and mitigation (IPCC, 2013). Since then, climate change is widely acknowledged to be caused in large part by human activity, and the conversation has changed to be not so much *if* it is happening but *how* humans can impact it, *what* the health implications might be, and *how to mitigate and adapt* to predicted climate change scenarios.

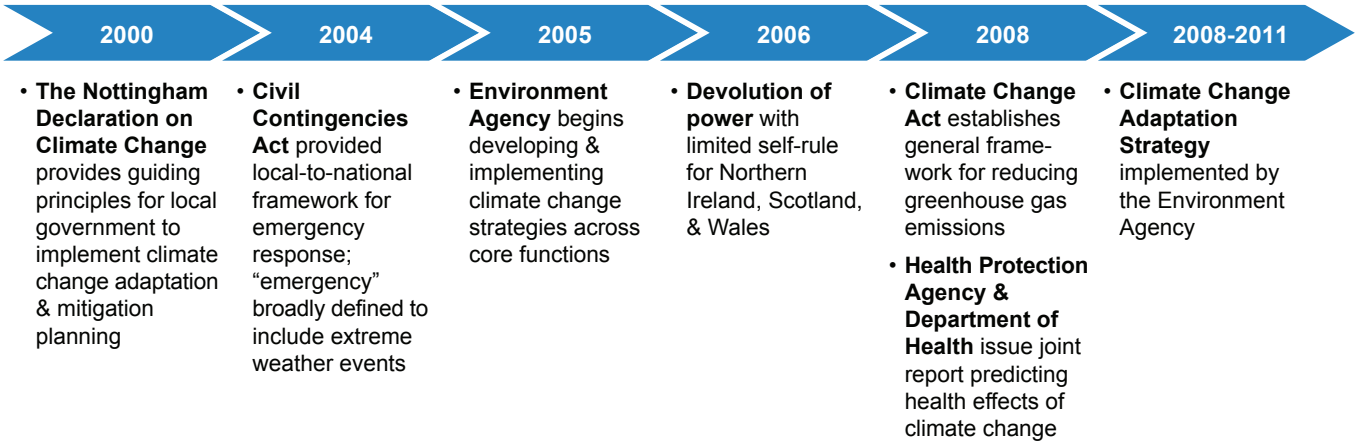
The 1992 Rio de Janeiro Earth Summit led to the creation of the United Nations Framework Convention on Climate Change (UNFCCC), establishing baseline measurements of greenhouse gas emissions (UNFCCC, 2013a). Agenda 21, or Local Agenda 21 (LA21), encouraged local, national, and international focus on sustainable development for the 21st century (United Nations Environment Programme, 2013). Following the establishment of UNFCCC, annual meetings have been held to assess progress on climate change. The 1997 Kyoto Protocol set legally binding target reductions on greenhouse gas emissions for industrialized countries, with the first commitment period effective from 2008 to 2012 (UNFCCC, 2013b). Although the U.S. did not ratify the Kyoto Protocol, the UK did (UNFCCC, 2013c).

LA21 provided a framework for local authorities in the UK to examine sustainable development. In 2000, the Nottingham City Council developed the Nottingham Declaration on Climate Change to provide guiding principles for local government to implement climate change adaptation and mitigation planning. The document addresses the need for local government to examine service delivery. Fuel efficiency, fuel poverty, and reduction of greenhouse gases were specifically highlighted as important planning factors. The Nottingham Declaration has been signed by numerous local entities in the UK (Nottingham City, 2011).

The Civil Contingencies Act provided a local-to-national framework for emergency response. "Emergency" was broadly defined

FIGURE **1**

Timeline of UK Events



and can include responses to extreme weather events. The act requires that organizations share information and cooperate in emergency planning and response. It also established Local Resilience Forums, which conduct risk assessments and publish the results as a Community Risk Register (CRR), as a preliminary step for emergency planning. In addition, the act established two categories of responders. Category 1 responders (police, fire, ambulance, local authority, coast guard, port authority, National Health Service, Health Protection Agency [HPA], the Environment Agency/Scottish Environment Protection Agency) are required to have an emergency planning officer to serve as coordinator. Category 2 responders (such as utility and transportation companies) may be requested to support the actions of the category 1 responders (Elizabeth II, 2004).

Devolution of power also impacted climate change responses. In 1998 and 2006, legislation was passed to devolve limited powers to Northern Ireland, Scotland, and Wales and to create the Northern Ireland Assembly, the Scottish Parliament, and the Welsh Assembly as legislative bodies (Elizabeth II, 2008a; Wikipedia, 2013). According to David Kidney, Chartered Institute for Environmental Health (CIEH) policy director, "when they were set up, the LA21 agenda of their local governments in effect influenced the attitudes of their politicians in the devolved parliaments and assemblies. So they were quite keen on taking action. And they [were] at least up to speed with the UK politicians, maybe in some cases ahead of the game" about going green and renewable energy programs (D. Kidney, personal communication, July 4, 2012).

The UK has taken positive steps to examine the potential impacts of climate change through adaptation and mitigation planning, which incorporate health risk and health risk communication strategies as well as energy sustainability efforts (Figure 1). Beginning in 2005, the Environment Agency in the UK has worked to develop and implement climate change adaptation strategies across its core functions and into a variety of policy settings. According to the Climate Change Adaptation Strategy (2008–2011) section 3.1, severe weather events during the past decade (heat wave, drought, and flooding) have highlighted the impact of climactic events on society. The document also highlights some of the predicted risks associated with climate change such as flooding, drought and water scarcity, changes in species habitat and distribution, water quality, and pollution incidents (section 3.3). Waste management sites were specifically identified as potentially causing increased risks to the environment and human health due to future climate change, with the focus to improve waste management practices as a means to alleviate the increased risks (section 4.3). The document further indicates that the UK Climate Impacts Programme has been involved in generating new climate change impact scenarios to examine "probabilistic" ranges of climate variables (Environment Agency, 2008).

Several key events occurred in 2008, the chief of which was passage of the Climate Change Act (Elizabeth II, 2008b). The act was a direct result of the Kyoto Protocol and had broad political support. It established a general framework for reducing greenhouse gas emissions by 80% of the 1990 baseline levels by 2050. Also in 2008, the Department of Health and the HPA jointly issued a report about the predicted health effects of climate change. The report highlighted the key challenges as heat waves, flooding, UV radiation exposure, infectious and vectorborne disease (often associated with flooding), and increased ozone concentrations (air quality) (Department of Health & Health Protection Agency, 2008). The HPA has developed collaborative relationships with other agencies to implement wide-ranging responses to climate change and advocates for additional research in this area.

Sabbatical Overview

Because the initial waves of planning and implementation were completed, I examined the progress that is being made and the challenges that have emerged. During my sabbatical month (July 2012) in the UK, I met with key decision makers and policy planners including leadership at CIEH, a Member of Parliament (MP), members of the Welsh government, government-employed environmental health practitioners (EHPs), and academics preparing EHPs. My overall impression from these series of meetings is that the UK has put

considerable time and resources into identifying and planning for potential climate change impacts and is preparing its environmental health workforce to meet these challenges. CIEH has provided a general framework for government bodies through its policy and planning documents, and practitioners have adapted the framework to meet local needs.

At CIEH, I discussed policy issues with David Kidney, head of policy. Mr. Kidney was recruited by CIEH following service as an MP representing Stafford (1997–2010), during which time he was actively involved in environmental issues, eventually becoming parliamentary under secretary of state in the Department for Energy and Climate Change. While at CIEH, I also met with CEO Graham Jukes and Chris Day. Mr. Day discussed educational standards, qualifications to become an EHP, professional continuing education, and how the public health system is transitioning.

After touring Parliament and observing a discussion in the House of Commons, I met with Jake Berry, MP representing Rossendale and Darwen (2010–present). As minister for housing and local government at the Department of Communities and Local Government, Mr. Berry discussed how national policies impact local governments and provided examples of efforts to budget for weather-related expenses.

Steve Miller was head of the Joint Local Authority Regulatory Service for 2012 and environmental health officer (EHO) for the London Borough of Newham based in Stratford. In East London, Newham historically has had a diverse, somewhat transient immigrant population. This borough has been impacted by the development of several Olympic venues. Mr. Miller was able to address issues related to the 2012 Summer Olympics, local public health issues, the difficulties of addressing climate change at the borough level within a larger metropolitan area, the importance of culturally tailoring messages, and climate change risks such as projected rising levels of the River Thames.

North of London is the borough of Welwyn Hatfield. Peter Hill is an EHO who oversees local authority sustainability efforts. Mr. Hill oversaw development of the council's climate change strategy and the corresponding yearly action plans to cut emissions. His work also entailed educational outreach about climate change initiatives for council employees and borough constituents.

Lancashire County outreach campaign.

The city of London Port Health Authority is based at the Port of Tilbury, located about 35 miles east of London on the River Thames. Food safety inspection at a port of entry is a traditional role for EHOs. Robin Catchlove and John Ambrose gave me a tour and discussed the role of the European Union in setting policy for food safety. Inspections at the time of my visit were ramped up in preparation for the Olympics and the expected influx of tourists. We also discussed potential impacts of climate change on food imports, including the potential for higher temperatures leading to increased rates of food spoilage, as well as concerns about vectors.

Mark Taylor and Eryl Prytherch at Lancashire County Council discussed risk assessment and risk communication strategies. They explained how the CRR plays an important role in identifying risks for emergency management planning. At the time of my visit, continuous heavy rains were causing flooding, so discussing response plans was timely.

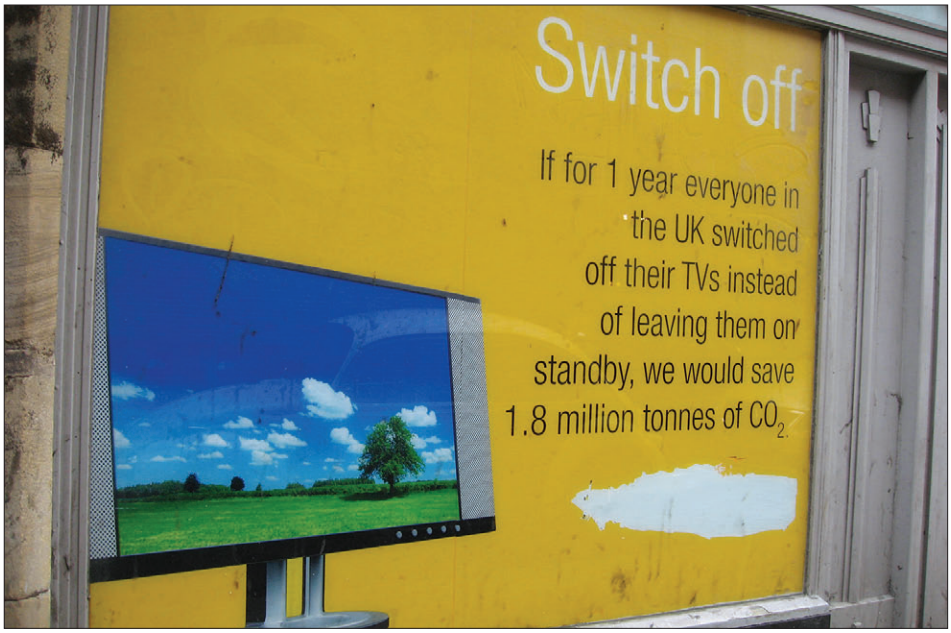
On the Isle of Man I met with Martin Hall, director of the Department of Environment, Food, and Agriculture, as well as his staff Kristian Cowin and Ivan Bratty. We discussed risks and sustainability efforts. Investment in green energy (solar and wind) and green design were evident.

Dr. Tom Knowland from the Leeds City Council addressed issues of sustainable development and economic factors. Leeds is a large, densely populated area with a commercial and financial center. Our discussion included housing needs and building codes, as well as risk communication/public outreach efforts with a multilingual approach.

My visit to Wales was hosted by Julie Barratt, director of CIEH Wales. She arranged for a Skype conference with Gary McFarlane, director of CIEH Northern Ireland. Mr. McFarlane is a key player with climate change policy and advocates for each devolved parliament to prioritize climate change and sustainability efforts. Ms. Barratt and her staff shared Welsh documents about climate change risk assessment, planning, and communication. I also had the opportunity to meet local and national representatives in Wales, including Steve Knowles and Gavin Macho of the Cardiff City and County Council, as well as Andy Fraser and Lucy Corfield from the Wales government and Andy Poole from the Environment Agency—Wales.

Tim Deveaux provided prospective as a private consultant in Newcastle upon Tyne. I also met with academics from several institutions: Graeme Mitchell from Liverpool John Moores University, Gai Murphy and Steven Todd at Salford University, Ann Clayson at Manchester Metropolitan University, and Alan Whitfield from the University of Derby. Discussions included environmental health research (mosquitoes) as well as the foundations for preparing EHPs. All of them understood the need to incorporate climate change impacts into the core environmental health competencies.

Water conservation billboard.



Electrical conservation billboard.

Challenges to Addressing Climate Change

Many EHPs are local government employees whose work is directly impacted by politics and funding priorities. Mr. Hill stated that a public opinion poll conducted several years ago indicated approximately a 30% interest in climate change; this lack of public interest directly impacts political will to address such issues (P. Hill, personal communication, July 6, 2012). Similarly, Mr. Miller observed, "I think local politicians are not on the climate change agenda at all [because they are focused on more pressing local issues] (S. Miller, personal communication, July 5, 2012)." Another factor is the view that local government has little impact on such a large problem so the national government should carry the burden of responsibility.

Government budgets are annual, so long-term planning for issues not currently viewed as pressing can be difficult. As Mr. Hill succinctly stated, "If you want to plan for something that's going to happen in five years' time, it's very difficult to include that in the local government budgetary process." MP Jake Berry highlighted the difficulty in budgeting for climate-related weather events at the national level. The winter of 2009–2010 had unusually large amounts of snowfall, so the following fiscal year approximately £500,000 were allocated for snow removal. That winter was mild and the snow removal budget went largely unused. In the midst of economic difficulties, the public viewed such a budget set-aside as wasteful (J. Berry, personal communication, July 5, 2012). Among politicians a range of opinions exists, but extreme weather events tend to draw attention to the issue of climate change. In early 2012 concerns were prevalent about water shortages, followed by "the wettest June that we've ever had since records began in Great Britain. So…from having a water shortage to having floods in areas that we've never had floods before (S. Miller, personal communication, July 5, 2012)."

A notable exception to the typical yearly budget was long-term planning for infrastructure. EHPs highlighted the need to incorporate aspects of sustainability and minimizing potential threats from climate change. On the Isle of Man, for example, predicted sea level rise makes the Douglas Promenade area particularly vulnerable to coastal flooding. Proposed adaptation measures to minimize flooding risks need to be able "to adapt critical infrastructure…at minimal cost (Isle of Man, 2013.)"

The Role of EHPs in Addressing Climate Change

In the UK, the term "environmental health practitioner" refers to an individual who has matriculated from an accredited academic program and been issued a certificate of registration as an EHP. These professionals often fill local government positions as EHOs. CIEH is a professional organization for EHPs in the UK overseeing professional accreditation, providing training materials, developing policy positions, and advocating for environmental health interests. As such, it has taken a leading role in developing climate change policy.

In November 2008, CIEH hosted a conference entitled, "An Unhealthy Climate—a Call for Action and Changing Behaviour (CIEH, 2008a)" to focus attention on the impact of climate change on public health and to encourage EHPs to be active participants in mitigating and adapting to the effects of climate change. Presenters included representatives from HPA, the Local Government Association, and the Sustainable Development Unit of the National Health Service. In addition, CIEH released a comprehensive report in 2008 specifically addressing the implications of climate change for EHPs. The report, "Climate Change and Its Health Implications (CIEH, 2008b)," highlights the need for both mitigation efforts and the need to plan for longer-term adaptation strategies. Included in the recommendations is the need for public information (risk communication) on a variety of the covered topics.

In addition to policy, CIEH created online resources for EHPs dealing with specific aspects of climate change, including general environmental health, air pollution, food safety, housing, pest control, and water (CIEH, 2013). CIEH has also created a climate change envi-

ronmental health work group, which currently has approximately 60 members. The group uses the Internet to exchange ideas and discuss the links between environmental health and climate change. These EHOs have been connecting the dots of sustainability and public health work with issues such as fuel policy and extreme weather plans. They have also been trying to use a public health approach to reconnect the dots between issues such as environmental health, housing, and sustainability.

Several EHPs noted a shift in how the profession is viewed and consequently in the role of EHPs in addressing environmental public health concerns. According to Mr. Miller, EHPs have been asserting the need for environmental regulation as national government has moved to a deregulation mode. "We're losing our public health role. We're seen to be a regulatory role. We can do both, we have been doing both, but it's who owns the issue." In addition, Mr. Miller noted a shift of responsibility for enforcement. "A lot of boroughs are [using policemen rather than EHPs]. There's more of an enforcement role, not so much of an education [role]…because there's this 'anyone can do that job' sort of culture, particularly from the current government. Regulation is being looked at as too much of a burden [under current economic circumstances]." Mr. Hill also highlighted the shift that has occurred in the public health approach. He noted that in some local authorities, housing has been separated from environmental health, resulting in a focus on structural inspections rather than a public health approach.

Communication Strategies

EHPs use a wide variety of education and outreach strategies. Examples included professional training for EHOs about climate change and how to incorporate a mindset of sustainability into a variety of settings (food, transportation, housing, etc). Outreach among other government employees in the Welwyn Garden Council was accomplished through establishing a voluntary climate change group to host events such as staff awareness fairs and a staff magazine. Lobbying efforts with politicians included educational components led by CIEH. Public awareness campaigns included public service announcements, print materials (e.g., brochures, calendars, and newsletters), electronic educational materials on government Web sites, social media, and billboards (Photo on page 30). Some billboards encouraged behavior change, such as limiting shower time to conserve water or turning off unused electronics to reduce carbon emissions (Photos on page 31). Many locations used "What if" campaigns to encourage citizens to think about how they would respond to potential threats such as flooding or severe weather. Giveaways of items such as low-energy light bulbs and government subsidies of energy efficiencies such as insulation were also employed to bring about greater awareness of climate change through a focus on sustainability and reducing emissions.

Conclusion

Despite public perception and funding challenges, all the local government representatives with whom I met incorporated climate change risk assessment, adaptation, and mitigation planning into their work. The CRR is a key planning document developed by each local government authority and is a meaningful way to look at potential climate change health risks. Adaptation and sustainability were common threads in my meetings. These often took the form of "going green" with transportation, energy efficiency, conserving resources, and building design because the efforts made sense monetarily as future cost savings.

Acknowledgements: I would like to thank NEHA/UL and CIEH for making this sabbatical exchange possible. Peter Wright was an invaluable resource coordinating the sabbatical. I would also like to thank all those with whom I met for making this exchange so productive. Your time, insights, and resources were a great help.

Corresponding Author: Dhitinut Ratnapradipa, Associate Professor, Department of Health Education and Recreation, Southern Illinois University, Carbondale, IL 62901. E-mail: dhitinut@siu.edu.

References

Chartered Institute of Environmental Health. (2008a). *An unhealthy climate—a call for action and changing behavior.* Retrieved from http://www.cieh.org/media/media3.aspx?id=16006

Chartered Institute of Environmental Health. (2008b). *Climate change and its health implications*. London: Author.

Chartered Institute of Environmental Health. (2013). *Policy/climate change*. Retrieved from http://www.cieh.org/policy/climate_change.html

Department of Health/Health Protection Agency. (2008). *Health effects of climate change in the UK 2008: An update of the Department of Health report 2001/2002*. Retrieved from http://www.ftsnet.it/documenti/162/Health%20Effects%20of%20climate%20change%20in%20the%20UK%202008.pdf

Elizabeth II. (2004). *Civil contingencies act 2004*. Retrieved from http://www.legislation.gov.uk/ukpga/2004/36/pdfs/ukpga_20040036_en.pdf

Elizabeth II. (2008a). *Devolution of powers to Scotland, Wales and Northern Ireland.* Retrieved from https://www.gov.uk/devolution-of-powers-to-scotland-wales-and-northern-ireland

Elizabeth II. (2008b). *Climate change act 2008*. Retrieved from http://www.legislation.gov.uk/ukpga/2008/27/pdfs/ukpga_20080027_en.pdf

Environment Agency. (2008). *Climate change adaptation strategy (2008–2011)*. Retrieved from http://www.environment-agency.gov.uk/static/documents/Leisure/adaptation_strategy_2083410.pdf

Intergovernmental Panel on Climate Change. (2013.) *Organization*. Retrieved from http://www.ipcc.ch/organization/organization.shtml#.UVNf_jdvCOo

References

Isle of Man. (2013). *Coastal flooding due to sea level rise*. Retrieved from http://www.gov.im/categories/home-and-neighbourhood/floodwatch/

Nottingham City. (2011). *The Nottingham declaration on climate change*. Retrieved from http://www.nottinghamcity.gov.uk/CHttpHandler.ashx?id=27628&p=0

United Nations Environment Programme. (2013). *Agenda 21—preamble*. Retrieved from http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=52&ArticleID=49&l=en

United Nations Framework Convention on Climate Change. (2013a). *Essential background—the convention*. Retrieved from http://unfccc.int/key_steps/the_convention/items/6036.php

United Nations Framework Convention on Climate Change. (2013b). *Kyoto Protocol*. Retrieved from http://unfccc.int/key_documents/kyoto_protocol/items/6445.php

United Nations Framework Convention on Climate Change. (2013c). *Status of ratification of the Kyoto Protocol*. Retrieved from http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

Wikipedia. (2013). *Devolution in the United Kingdom*. Retrieved from http://en.wikipedia.org/wiki/Devolution_in_the_United_Kingdom

Thank You for Supporting the NEHA/AAS Scholarship Fund

American Academy of Sanitarians
Lawrenceville, GA

American Public University
Manassas, VA

LeGrande G. Beatson, Jr., MS, REHS
Lynchburg, VA

Franklin B. Carver
Winston Salem, NC

Bruce Clabaugh, RS
Greenwood Village, CO

Elwin B. Coll, RS
Ray, MI

Dion L. Lerman
Philadelphia, PA

COL Wendell A. Moore
Davidsonville, MD

Richard L. Roberts, MPH
Grover Beach, CA

Welford C. Roberts, PhD, RS, REHS, DAAS
South Riding, VA

B. Robert Rothenhoefer, RS, REHS, CP-FS
Falls Church, VA

Walter P. Saraniecki, MS, LDN, LEHP, REHS/RS
La Grange, IL

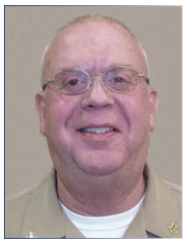
James M. Speckhart, MS
Norfolk, VA

Ned Therien
Olympia, WA

Clayton Tolson
Baltimore, MD

Dale H. Truesdell
Yakima, WA

DIRECT FROM ATSDR



H. Edward Murray, PhD

Kristina A. Thayer, PhD

Implementing Systematic Review in Toxicological Profiles: ATSDR and NIEHS/NTP Collaboration

Editor's Note: As part of our continuing effort to highlight innovative approaches to improving the health and environment of communities, the *Journal* is pleased to publish a bimonthly column from the U.S. Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is a federal public health agency of the U.S. Department of Health and Human Services and shares a common office of the Director with the National Center for Environmental Health at the Centers for Disease Control and Prevention (CDC). ATSDR serves the public by using the best science, taking responsive public health actions, and providing trusted health information to prevent harmful exposures and diseases related to toxic substances.

The purpose of this column is to inform readers of ATSDR's activities and initiatives to better understand the relationship between exposure to hazardous substances in the environment and their impact on human health and how to protect public health. We believe that the column will provide a valuable resource to our readership by helping to make known the considerable resources and expertise that ATSDR has available to assist communities, states, and others to assure good environmental health practice for all is served.

Dr. Ed Murray is the acting director of the Division of Toxicology and Human Health Science at ATSDR. He has published extensively on chemical pollutants in the environment. Dr. Kristina Thayer is director of the National Toxicology Program's (NTP's) Office of Health Assessment and Translation located on the campus of the National Institute for Environmental Health Sciences (NIEHS). Prior to joining NTP/NIEHS, she was a senior scientist at the World Wildlife Fund and at the Environmental Working Group.

The Agency for Toxic Substances and Disease Registry's (ATSDR's) Toxicological Profiles provide comprehensive qualitative and quantitative summations of potential adverse health effects from exposure to hazardous substances. This information is subsequently used to derive ATSDR's minimal risk levels (MRLs). These profiles and their attendant MRLs serve as the scientific basis for ATSDR's applied public health activities such as site-specific health assessments, health studies, health education, and emergency response. ATSDR's profile-development and MRL-derivation processes consist of a multitiered critical evaluation and interpretation of the available scientific literature for a specific hazardous substance (Agency for Toxic Substances and Disease Registry, 1996, 2003). Recently, ATSDR has been updating the approach used to develop profiles by incorporating methods of systematic review (SR). Adoption of SR methods should provide for even more comprehensive, transparent, and organized examination and assessment of the information and conclusions presented in ATSDR's Toxicological Profiles and Addenda.

SR methods first gained traction in the area of health care interventions, prompting Congress to direct the Institute of Medicine in 2008 to develop a set of standards for conducting SRs in order "to assure objective, transparent, and scientifically valid systematic reviews" of the effectiveness of medical and surgical interventions (Institute of Medicine, 2011). Although originally intended to evaluate the strength of evidence used to develop guidelines for clinical practice and health care interventions (Agency for Healthcare Research and Quality, 2012), SR has become an increasingly important tool to search, analyze, and summarize information used to make environmental health decisions (Silbergeld & Scherer, 2013; Woodruff & Sutton, 2011).

More recently, the National Toxicology Program's (NTP's) Office of Health Assessment and Translation (OHAT) implemented a program to utilize SR methodology to standardize and document their steps, process, and decision making when evaluating environmental health literature (Birnbaum, Thayer, Bucher, & Wolfe, 2013). Such information is used by OHAT to assess the state of the science on a topic or develop hazard identification conclusions. Another illus-

tration of the applicability of SR methods to address environmental health issues was a recent recommendation by the National Academy of Science that the U.S. Environmental Protection Agency consider utilizing SR for evaluating its integrated risk information system documents (National Research Council, 2011).

Because of the demonstrated usefulness of SR and its expanding applications in the field of environmental health, ATSDR's Division of Toxicology and Human Health Sciences recently entered into a collaborative project with NTP OHAT to implement SR for updating and evaluating the scientific literature used to develop ATSDR Toxicological Profiles and Addenda. One new Toxicological Profile and three Addenda have been identified for initial development using SR methodology. This process will utilize a steps approach previously outlined by NTP OHAT for evaluating environmental studies used in developing its literature-based health assessments (ntp.niehs.nih.gov/NTP/OHAT/EvaluationProcess/DraftOHATApproach_February2013.pdf).

This approach provides a means to (1) establish specific inclusion and exclusion criteria for individual studies; (2) distinguish between and utilize data from human, animal, and in vitro studies; (3) evaluate the internal validity of studies ("risk of bias"); (4) rate confidence in the body of evidence for individual studies; and (5) translate and integrate evidence from animal, human, and in vitro studies to make conclusions regarding the potential hazard to humans. In addition, if the total body of evidence is sufficient, it may be possible to pool the extracted data to perform meta-analyses. Such pooled analyses generally result in increased accuracy and precision. Moreover, meta-analysis could be further restricted to utilize only those studies with a low or moderately low probability of risk. This would decrease the likelihood that effects detected in small studies were due to chance, and also decrease the likelihood that increased effects detected in large studies were due to chance (Egger, Davey Smith, Schneider, & Minder, 1997; Egger, Smith, & Phillips, 1997). Such information would provide better insight into how direction and magnitude of response might change in response to changes in study design. In addition, such analyses would allow ATSDR to use summary information from multiple validated studies in order to calculate a point of departure for MRL derivation, rather than relying on a single point estimate from just one study. Alternatively, meta-analyses, using SR-derived data, would enable identification of those studies with the lowest probability of risk bias, and thus the best studies and data for deriving MRLs.

In conclusion, collaboration between NTP OHAT and ATSDR will provide both programs with the experience needed to continue to translate SR methods into the field of environmental health, a process that will inevitably include steps of methods development and refinement. Using SR methods will result in a more transparent and consistent science-based format for analyzing environmental health studies and for developing conclusions to guide ATSDR's public health decisions and activities. Moreover, ATSDR's 25+ years of experience with site-specific health assessments, health studies, health education, and emergency response can provide NTP OHAT with the practical knowledge and perspectives gained from actual, hands-on public health experience. Last, but not least, this collaborative effort will bring cross-agency consistency to how environmental health information and knowledge is evaluated, interpreted, and applied.

Disclaimer: The findings and conclusion in this report are those of the authors and do not necessarily represent the views of CDC/ATSDR and NIEHS/NTP.

Corresponding Author: Ed Murray, Acting Director, Division of Toxicology and Human Health Science, ATSDR, Chamblee Building 106, 3rd Floor, Room 3031, 4770 Buford Highway NE, Mail Stop F-61, Atlanta, GA 30341. E-mail: HEM0@cdc.gov.

References

Agency for Healthcare Research and Quality. (2012). *Grading the strength of a body of evidence when assessing health care interventions: An update* (draft report). Retrieved from http://effectivehealthcare.ahrq.gov/search-for-guides-reviews-and-reports/?pageaction=displayProduct&productID=1752

Agency for Toxic Substances and Disease Registry. (1996). Minimal risk levels for priority substances and guidance for derivation. *Federal Register, 61,* 33511–33520.

Agency for Toxic Substances and Disease Registry. (2003). *Guidance for the preparation of toxicological profiles.* Retrieved from http://www.atsdr.cdc.gov/toxprofiles/guidance/profile_development_guidance.pdf

Birnbaum, L.S., Thayer, K.A., Bucher, J.R., & Wolfe, M.S. (2013). Implementing systematic review at the National Toxicology Program: Status and next steps. *Environmental Health Perspectives, 121*(4), a108–a109.

Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *BMJ, 315*(7109), 629–634.

Egger, M., Smith, G.D., & Phillips, A.N. (1997). Meta-analysis: Principles and procedures. *BMJ, 315*(7121), 1533–1537.

Institute of Medicine. (2011). *Finding what works in health care: Standards for systematic reviews*. Washington, DC: National Academies Press. Retrieved from http://www.iom.edu/reports/2011/finding- what-works-in-health-care-standards-for-systematic-reviews.aspx

National Research Council. (2011). *Review of the Environmental Protection Agency's draft IRIS assessment of formaldehyde*. Washington, DC: National Academies Press.

Silbergeld, E., & Scherer, R.W. (2013). Evidence-based toxicology: Strait is the gate, but the road is worth taking. *ALTEX, 30*(1), 67–73.

Woodruff, T.J., & Sutton, P. (2011). An evidence-based medicine methodology to bridge the gap between clinical and environmental health sciences. *Health Affairs*, *30*(5), 931–937.

DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES BRANCH

Brenda Vanschaik Faw, Sr. REHS, CP-FS

Joyce L. Tuttle, Sr. REHS, PHM

Mobile Food Trucks: California EHS-Net Study on Risk Factors and Inspection Challenges

Editor's Note: NEHA strives to provide up-to-date and relevant information on environmental health and to build partnerships in the profession. In pursuit of these goals, we feature a column from the Environmental Health Services Branch (EHSB) of the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.

In this column, EHSB and guest authors from across CDC will highlight a variety of concerns, opportunities, challenges, and successes that we all share in environmental public health. EHSB's objective is to strengthen the role of state, local, tribal, and national environmental health programs and professionals to anticipate, identify, and respond to adverse environmental exposures and the consequences of these exposures for human health.

The conclusions in this article are those of the author(s) and do not necessarily represent the views of CDC.

Brenda Vanschaik Faw and Joyce L. Tuttle are project coordinators for the California EHS-Network that supports environmental health through research and training.

Across the nation mobile food facilities or mobile food trucks are showing up everywhere: on street corners, at school campuses, in front of businesses, and at special events. Traditionally, food trucks serve basic menus of hamburgers, sandwiches, and tacos typically at construction or agricultural sites. Since 2008, spurred by the economic downturn, mobile "food eateries" have embarked upon more complex and gourmet menus, and people are turning out in droves to eat food prepared in these trucks. It is estimated that approximately three million mobile food vendors and more than five million food carts are operating in the U.S. (Opsahl, 2012).

As part of the Centers for Disease Control and Prevention's (CDC's) Environmental Health Specialists Network (EHS-Net) cooperative agreement, the California EHS-Net program conducted a study to identify risk factors associated with mobile food trucks and the challenges associated with inspecting these types of food operations. The study consisted of a brief survey, which examined food and water safety, sanitation knowledge, and food handling practices of mobile food truck operators and food workers while food vehicles were in actual operation. The study also included a self-reported survey of California environmental health jurisdictions on basic program management for inspections and resources related to mobile food trucks.

Similar to fixed retail food facilities, mobile food trucks in California are regulated under the provisions of the California Retail Food Code and are inspected and permitted by the local environmental health agencies, which inspect and permit the trucks annually. Unlike fixed food facilities, however, these mobile facilities are difficult to locate during actual operation due to the transient nature of the business. As a result, the annual public health inspection is usually scheduled and does not occur when the food truck is in operation. Therefore, the food trucks are empty of food and water, and since no food preparation is occurring the evaluation of food and water safety risk factors is not possible.

In this study 95 mobile food trucks were assessed while in operation in Contra Costa, Kern, Napa, Sacramento, San Mateo, and Tulare counties. The observational component of the survey evaluated the food worker handling practices most closely associated with critical risk factors that contribute to foodborne illness: improper temperatures, poor personal hygiene, and unsanitary food handling practices (Gould, Rosenblum, Nicholas, Phan, & Jones, 2013). Table 1 describes the critical risk factors identified during the mobile food truck assessment. Of the 95 mobile food trucks assessed, 90 (94.73%) exhibited at least one critical risk factor, demonstrating that mobile food trucks exhibit attributes that are comparable to fixed food facilities and would benefit from similar inspection practices.

Many jurisdictions require the mobile food truck to provide their daily route, with the

TABLE **1**

Critical Food Safety Risk Factors Observed

Risk Factors Observed	*n* (%) of Mobile Food Trucks (*N* = 95)
Improper hand washing or no hand washing	84 (88.42)
Refrigeration units not operating	23 (24.21)
Refrigeration ambient temperatures >45°F	42 (44.21)
Internal food temperature >41°F	34 (35.78)
Cross contamination with ready-to-eat foods	57 (60.00)
Inadequate or no sanitation solution (for sanitizing surfaces)	65 (68.42)

expectation that an inspection could be conducted while the trucks are in full operation. Even with a designated route on file, however, these "restaurants on wheels" are difficult and time consuming to locate, creating a considerable resource drain to an already taxed workforce (Dyjack, Case, Marlow, Soret, & Montgomery, 2007; National Environmental Health Association, 2013). To meet inspection goals, many local environmental health agencies resort to "scheduled" inspections at the health department office or at the mobile food truck commissary when the truck is not operating. Most of the 57 California environmental health agencies surveyed indicated they conduct only one "scheduled" inspection per year, citing inadequate resources to locate mobile food trucks while in operation as one of the greatest challenges in managing their inspection program.

During a food facility inspection, observing food handling and personal hygiene practices by food workers to identify potential food safety risk factors is a strong focus. Restaurants are routinely inspected during hours of operation when food preparation is actually occurring. These routine inspections are usually unannounced, providing the inspector the opportunity to observe "real time" food worker practices. Mobile food trucks use the same types of complex food preparation processes that are used in traditional food facilities (i.e., restaurants). Due to the elusive nature of the mobile food truck, however, these popular eateries often are given a basic, low-risk structural inspection instead of a higher, more complex food preparation risk-based inspection.

Mobile food trucks will continue to be a major player in the food industry. These results provide support that in order to improve food safety and better protect public health, mobile food truck inspection programs could be improved by conducting risk-based field inspections similar to those used for traditional restaurants: impromptu, unannounced inspections with the ability to observe actual food handling. Without the ability to inspect mobile food trucks during actual operation, food safety risk factors that may occur could potentially lead to foodborne illness or death. The results of this study provide evidence that using innovative approaches to effectively conduct risk-based inspections can provide the same level of food safety protection as for other retail establishments and restaurants while protecting public health at these popular eateries.

Corresponding Author: Brenda Vanschaik Faw, Project Coordinator, California EHS-Network, 1500 Capitol Ave., MS 7602, Sacramento, CA 95814. E-mail: Brenda.Faw@cdph.ca.gov.

References

Dyjack, D.T, Case, P., Marlow, H.J., Soret, S., & Montgomery, S. (2007). California's county and city environmental health services delivery system. *Journal of Environmental Health, 69*(8), 35–43.

Gould, L.H., Rosenblum, I., Nicholas, D., Phan, Q., & Jones, T.F. (2013). Contributing factors in restaurant-associated foodborne disease outbreaks, FoodNet sites, 2006 and 2007. *Journal of Food Protection, 76*(11), 1824–1828.

National Environmental Health Association. (2013). *Assessment of foodborne illness outbreak response and investigation capacity in U.S. environmental health food safety regulatory programs*. Retrieved from www.neha.org/pdf/NEHA_FBIOutbreakCapacityAssessment_ResultsReport.pdf_

Opsahl, K. (2012, May 20). Local vendors say popularity of food trucks on the rise. *The Herald Journal*. Retrieved from http://news.hjnews.com/features/article_1c55eac4-a0fb-11e1-9890-001a4bcf887a.html

DEMYSTIFYING THE FUTURE

Thomas Frey

Fifty-Five Jobs of the Future: Part One

Editor's Note: Significant and fast-paced change is occurring across society in general and our profession in particular. With so much confusion in the air, NEHA is looking for a way to help our profession better understand what the future is likely to look like. The clearer our sense for the future is, the more able we are to both understand and take advantage of trends working their way through virtually every aspect of our lives today. To help us see what these trends are and where they appear to be taking us, NEHA has made arrangements to publish the critical thinking of the highly regarded futurist, Thomas Frey.

The opinions expressed in this column are solely that of the author and do not in any way reflect the policies and positions of NEHA and the *Journal of Environmental Health*.

Thomas Frey is Google's top-rated futurist speaker and the executive director of the DaVinci Institute®. At the Institute, he has developed original research studies enabling him to speak on unusual topics, translating trends into unique opportunities. Frey continually pushes the envelope of understanding, creating fascinating images of the world to come. His talks on futurist topics have captivated people ranging from high-level government officials to executives in Fortune 500 companies. He has also authored the book *Communicating with the Future*. Frey is a powerful visionary who is revolutionizing our thinking about the future.

There is no future in any job. The future lies in the person who holds the job.—George W. Crane

One of my primary complaints with higher education is that it tends to prepare students for jobs of the past. A midwesterner would phrase it, "they are constantly shooting behind the duck."

Similarly, whenever a column is written about the best paying jobs of the future, jobs like civil engineers, registered nurses, and computer system analysts, they are all jobs that currently exist today.

Yes, many of these jobs will still exist in the future, but every one of them will morph and change as technology and communication systems make their impact.

As an example, technology research firm IDC predicts the amount of data businesses will have access to will grow 50-fold over the next decade. As data becomes cheaper, faster, and more pervasive, the nature of our work begins to change as well.

The first wave of baby boomers has now turned 65. As this generation grays, their needs will change. Their growing numbers and increasing medical needs will require a different kind of health care professional to take care of them.

As a rule of thumb, 60% of the jobs 10 years from now haven't been invented yet. With that in mind, I've decided to pull together a list of 55 jobs that will be in high demand in the future.

Jobs Before 2020

Many of the changes we see today will cause new jobs to materialize quickly. Part one of this column deals with new positions that will likely be spawned within the next 10 years.

1. Augmented Reality Architects: Much like the paint we put on houses and the flavorings we add to food, the future will seem boring if our reality hasn't been augmented in some way.
2. Alternative Currency Bankers: According to Javelin Strategies, 20% of all online trades are already being done with alternative currencies. The stage is being set for next-gen alt-currency banks.
3. Seed Capitalists: In the startup business world a huge gulf exists between initial concept and fundable prototypes. This dearth of funding options will require an entirely new profession. Seed capitalists will specialize in high-risk start-

ups. Counter to today's investment-world thinking, if they get more than 100% return on their investments, they will be docked for not taking enough risk.

4. Global System Architects: Our systems are transitioning from national systems into global systems. Architects of these new global systems will play a crucial role in future global politics. More details at www.futuristspeaker.com/2011/06/global-system-architects-%e2%80%93-tomorrows-new-power-brokers/.
5. Locationists: People who specialize in adding the relevance of "place" to our global online communities.
6. Waste Data Managers: To insure data integrity in today's fast-evolving information storage industry, multiple redundancies have been built into the system. Achieving more streamline data storage in the future will require de-duplication specialists who can rid our data centers of needless copies and frivolous clutter.
7. Urban Agriculturalists: Why ship food all the way around the world when it can be grown next door? Next generation produce-growing operations will be located underground, often below the grocery stores where the produce will be sold directly to customers. More details at www.futuristspeaker.com/2009/11/the-coolest-profession-on-earth-next-generation-agriculture/.
8. Business Colony Managers: The average person who turns 30 years old in the U.S. today has worked 11 different jobs. In just 10 years, the average person who turns 30 will have worked 200–300 different projects. Business colonies are an evolving new kind of organizational structure designed around matching talent with pending work projects. The operation will revolve around some combination of resident people based in a physical facility and a nonresident virtual workforce, with some opting to forgo the cost of the physical facility entirely. People who can effectively manage this type of operation will be in high demand. More details at www.futuristspeaker.com/2010/11/business-colonies-a-study-of-structure-organization-and-the-evolution-of-work/.
9. Competition Producers: One of the hottest new trends will be to design incentive-based competitions to solve some of the world's biggest problems. Paving the way has been X-Prize Foundation's Pete Diamandis and the success of the Ansari X-Prize. In the future, every major corporation will have their name on a major prize competition. Similar to buying the naming rights to a stadium, a well-orchestrated competition has far-reaching branding potential.
10. Avatar Designers: Next generation avatars will become indistinguishable from humans on a two-dimensional screen. Avatars will only live in the computer world for a short time longer, however. It is only a matter of time before they emerge from the computer and appear as visual beings, walking around among us. Once an avatar goes through the radical metamorphosis from an image that we see on a screen to a three-dimensional being that joins us for dinner, carries on conversations with our friends, and serves as a stand-in for us at meetings, we will see work start on an even more realistic avatar, one that we can touch. More details at www.futuristspeaker.com/2009/12/6-trends-to-watch-in-20101-the-turing-test-for-avatars/.
11. Avatar Relationship Managers: As the foibles of humanity enter the realm of autonomous, freethinking avatars, people will find it necessary to both manage and limit the often dangerous relationships that avatars get themselves into.
12. 3D Printing Engineers: Classes in 3D printing are already being introduced into high schools and the demand for printer-produced products will skyrocket. The trend will be for these workerless workshops to enter virtually every field of manufacturing, stemming the tide of outsourcing, at the same time, driving the need for competent technicians and engineers to design and maintain the next wave of this technology.
13. 3D Food-Printer Engineers: Pushing the envelope for 3D printer technology even further will be the coming age of food printers. Converting 3D printers to work with cartridges containing food stocks will prove difficult and demanding on a number of levels. Those who can solve this kind of problem will be in high demand. More details at www.futuristspeaker.com/2011/10/the-coming-food-printer-revolution/.
14. Book-to-App Converters: Over the coming months we will begin to see a form of competition brewing between books and apps. With both being information products that we interface with differently, we will begin to see a large-scale effort to convert existing books and literature into an interactive app, similar to the current effort to convert popular literature from print to audiobooks. More details at www.futuristspeaker.com/2011/09/introducing-the-perpetual-self-updating-book/.
15. Social Education Specialists: We learn from each other. But what is it that we learn from others that is valuable? And how do we structure a circle of friends, as a highly influential group that we rely heavily on, to give us a constant stream of truly valuable information and advice?
16. Privacy Managers: If you think you have lost most of your privacy already, we've only scratched the surface. We are all terminally human, and as such, we do not always make good decisions. Striking the perfect privacy-transparency balance will require far more than amateur insights. It will require a privacy professional. More details at www.futuristspeaker.com/2011/02/the-coming-transparency-war/.
17. Wind Turbine Repair Techs: The proliferation of windmills around the world will dramatically drive the demand for repair techs who are not afraid of heights and can solve whatever new problems this fledgling new industry blows their way.
18. Data Hostage Specialists: Holding people as hostages is very messy. But holding data hostage is a less risky crime that can be done remotely and has the potential for far greater rewards. This is especially true if the country you're living in condones your actions. This type of activity will give rise to the likes of data-hostage negotiators, data-retrieval specialists, and damage-control analysts.
19. Smart Dust Programmers: In its simplest form, smart dust consists of a sensor combined with a wireless transmitter and some kind of power source. Many

are envisioning the power to come from wireless radio frequency signals. The reason it is referred to as "smart dust" is because the technology is shrinking in size until it reaches the particle size of dust. Future designs for smart dust involve detecting everything from moisture content, to soil temperature, to chemical composition. More details at www.futuristspeaker.com/2011/10/tapping-into-the-secret-language-of-plants/.

20. Personality Services: Talking back and forth to a computer that has a machine-like voice is boring. But being able to download specific "personality packages" will add an entirely new level of engagement for basement-dwellers everywhere. The hottest personalities to download will be offshoots of existing characters or celebrities such as being able to download a David Letterman personality, a Homer Simpson personality, or perhaps even a Darth Vader personality.
21. Smart Contact Developers: The idea of "smart" contact lenses, the kind that can superimpose information on the wearer's field of view, has been around for a while. But the first iteration of smart contact lenses is already on the market and industry execs are beginning to generate a wide array of possible applications. More details at www.futuristspeaker.com/2011/10/tapping-into-the-secret-language-of-plants/.
22. Nano-Medics: The medical problems most people have can be traced to a single cell or a small group of them. Health professionals capable of working on the nano level, both in designing diagnostics systems, remedies, and monitoring solutions will be in high demand.
23. New Science Philosopher-Ethicists: Every new technology creates its own set of unintended consequences, and people who can ask the tough questions and demand deeper introspection will be in high demand. Industry sages will serve as both a conscience and a guide for decision makers everywhere.
24. Organ Agents: The demand for transplantable organs is exploding and people who can track down and deliver healthy organs will be in hot demand.
25. Octogenarian Service Providers: As the population continues the age we will have record numbers of people living into their 80s, 90s, and 100s. This mushrooming group of active oldsters will provide a demand for goods and services currently not being addressed in today's marketplace.
26. Elevated Tube Transport Engineers: The next big infrastructure project on planet earth will be a human and cargo transport system designed around a network of vacuum tubes with maglev tracks. Operating at less than 2% of the cost of today's car, truck, jet, ship, and train systems, this emerging tube transport system will be a massive undertaking that demands talented new-age thinkers for decades to come. More details at http://et3.com.

Next month's column will cover part two of this list. The final 29 jobs will be broken down into two categories: the dismantlers and jobs in 2030 and beyond. Don't miss May's column for the entire picture of these future jobs and my final thoughts.

Interested in sharing your thoughts? Go to www.FuturistSpeaker.com.

Corresponding Author: Thomas Frey, Senior Futurist and Executive Director, DaVinci Institute®, 511 East South Boulder Road, Louisville, CO 80027.
E-mail: dr2tom@davinciinstitute.com.

fYi

Address changes take approximately thirty days to become effective. To ensure that you don't miss a single issue of the *Journal*, please notify us as soon as possible of your new address.

Thanks!

GREAT Benefit for Sustaining Members

NEHA Sustaining Members can post their URLs on NEHA's Web site for FREE.

To take advantage of this benefit, please e-mail your organization's Web site address (URL) to staff@neha.org.

We'll do the rest! Reciprocal links are appreciated. To access the links on NEHA's Web site, simply visit us at neha.org and click on "Links."

Did You Know?

NEHA has a new *Certified Professional-Food Safety* manual available that compiles the latest research from trusted food safety professionals. See page 47 for more details.
You can also order now from NEHA's Bookstore at www.neha.org/store.

CAREER **OPPORTUNITIES**

Food Safety Inspector

UL Everclean Services is the leader in the restaurant inspections market. We offer opportunities throughout the country. We currently have openings for professionals to conduct Q.A. audits of restaurants.

Albuquerque, NM	Little Rock, AR
Baltimore, MD	McAllen, TX
Billings, MT	Owatonna, MN
Bismarck, ND	Pittsburgh, PA
Boise, ID	Pocatello, ID
Buffalo, NY	Puerto Rico
Butte, MT	Rochester, NY
Cleveland, OH	Rogers, AR
Columbus, OH	Spearfish, SD

Past or current food safety inspecting is required.
Interested applicants can send their resume to: Bill Flynn at Fax: 818-865-0465. E-mail: Bill.Flynn@ul.com.

DAVIS CALVIN WAGNER SANITARIAN AWARD

The American Academy of Sanitarians announces the annual Davis Calvin Wagner Award. The award will be presented by the academy during the Annual Educational Conference of the National Environmental Health Association. The award consists of a plaque and a $500 honorarium.

Nominations for this award are open to all diplomates of the academy who:

1. Exhibit resourcefulness and dedication in promoting the improvement of the public's health through the application of environmental and public health practices.
2. Demonstrates professionalism, administrative and technical skill, and competence in applying such skills to raise the level of environmental health.
3. Continues to improve oneself through involvement in continuing education type programs to keep abreast of new developments in environmental and public health.
4. Is of such excellence to merit academy recognition.

The nomination for the award may be made by a colleague or a supervisor and must include the following:

1. Name, title, grade, and current place of employment of the nominee.
2. A description of the nominee's educational background and professional experience.
3. A description of the nominee's employment history, including the scope of responsibilities.
4. A narrative statement of specific accomplishments and contributions on which the nomination is based, including professional association activities, publications, and community/civic activities.
5. Three endorsements (an immediate supervisor and two other members of the professional staff or other person as appropriate).

NOMINATIONS MUST BE RECEIVED BY APRIL 15, 2014. THREE COPIES OF THE NOMINATION DOCUMENT MUST BE SUBMITTED TO:

American Academy of Sanitarians
c/o Thomas E. Crow
25278 Kennebec Drive
South Riding, VA 20152
tcrow23701@aol.com
www.sanitarians.org/aas-awards/

2014 Walter F. Snyder Award

Call for Nominations

Nomination deadline is April 30, 2014.

Given in honor of NSF International's co-founder and first executive director, the *Walter F. Snyder Award* recognizes outstanding leadership in public health and environmental health protection. The annual award is presented jointly by NSF International and the National Environmental Health Association.

❖ ❖ ❖

Nominations for the 2014 *Walter F. Snyder Award* are being accepted for professionals achieving peer recognition for:

- outstanding accomplishments in environmental and public health protection,
- notable contributions to protection of environment and quality of life,
- demonstrated capacity to work with all interests in solving environmental health challenges,
- participation in development and use of voluntary consensus standards for public health and safety, and
- leadership in securing action on behalf of environmental and public health goals.

❖ ❖ ❖

Past recipients of the *Walter F. Snyder Award* include:

2013 - Vincent J. Radke
2012 - Harry E. Grenawitzke
2011 - Gary P. Noonan
2010 - James Balsamo, Jr.
2009 - Terrance B. Gratton
2008 - CAPT. Craig A. Shepherd
2007 - Wilfried Kreisel
2006 - Arthur L. Banks
2005 - John B. Conway
2004 - Peter D. Thornton
2002 - Gayle J. Smith
2001 - Robert W. Powitz
2000 - Friedrich K. Kaeferstein
1999 - Khalil H. Mancy
1998 - Chris J. Wiant
1997 - J. Roy Hickman
1996 - Robert M. Brown
1995 - Leonard F. Rice
1994 - Nelson E. Fabian
1993 - Amer El-Ahraf
1992 - Robert Galvan
1991 - Trenton G. Davis
1990 - Harvey F. Collins
1989 - Boyd T. Marsh
1988 - Mark D. Hollis
1987 - George A. Kupfer
1986 - Albert H. Brunwasser
1985 - William G. Walter
1984 - William Nix Anderson
1983 - John R. Bagby, Jr.
1982 - Emil T. Chanlett
1981 - Charles H. Gillham
1980 - Ray B. Watts
1979 - John G. Todd
1978 - Larry J. Gordon
1977 - Charles C. Johnson, Jr.
1975 - Charles L. Senn
1974 - James J. Jump
1973 - William A. Broadway
1972 - Ralph C. Pickard
1971 - Callis A. Atkins

NSF

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

The 2014 Walter F. Snyder Award will be presented during NEHA's 78th Annual Educational Conference (AEC) & Exhibition to be held in Las Vegas, Nevada, July 7 - 10, 2014.

For more information or to download nomination forms, please visit www.nsf.org or www.neha.org or contact Stan Hazan at NSF at 734-769-5105 or hazan@nsf.org.

EH CALENDAR

UPCOMING NEHA CONFERENCE

July 7–10, 2014: NEHA's 78th Annual Educational Conference & Exhibition in Partnership with the International Federation of Environmental Health, The Cosmopolitan of Las Vegas, NV. For more information, visit www.neha2014aec.org.

NEHA AFFILIATE AND REGIONAL LISTINGS

Alabama

April 9–11, 2014: 2014 Annual Education Conference, sponsored by the Alabama Environmental Health Association, The University of Alabama at Birmingham, AL. For more information, visit www.aeha-online.com.

California

March 31–April 3, 2014: 63rd Annual Educational Symposium, "**Harvest the Knowledge**," hosted by the Redwood Chapter of the California Environmental Health Association, Napa Valley Marriott Hotel, Napa, CA. For more information, visit www.ceha.org/events.

Georgia

July 16–18, 2014: 68th Annual Interstate Environmental Health Seminar, hosted by the Georgia Environmental Health Association, Hyatt Regency, Savannah, GA. For more information, visit www.geha-online.org.

Iowa

April 1–2, 2014: Iowa Governor's Conference on Public Health, partnered by the Iowa Environmental Health Association, Scheman Conference Center, Ames, IA. For more information, visit www.ieha.net.

Minnesota

May 1–2, 2014: Spring Conference, sponsored by the Minnesota Environmental Health Association, Arrowwood Resort & Conference Center, Alexandria, MN. For more information, visit www.mehaonline.org.

Ohio

April 15–16, 2014: 2014 Spring Annual Education Conference, sponsored by the Ohio Environmental Health Association, Worthington Double Tree Hotel, Columbus, OH. For more information, visit www.ohioeha.org/annual-education-conference.aspx.

Utah

April 2–4, 2014: Spring Conference 2014, sponsored by the Utah Environmental Health Association, Red Cliffs Lodge, Moab, UT. For more information, visit www.ueha.org/events.html.

Virginia

April 18, 2014: 2014 Spring Educational Session, sponsored by the Virginia Environmental Health Association, Culpepper, VA. For more information, visit www.virginiaeha.org/educational-sessions/.

Washington

May 12–13, 2014: 2014 Annual Educational Conference, "**Environmental Public Health—Improving Quality of Life in Our Communities**," sponsored by the Washington State Environmental Health Association, Great Wolf Lodge, Grand Mound, WA. For more information, visit www.wseha.org/2014-aec/.

Wisconsin

April 15–16, 2014: Spring Education Conference, sponsored by the Wisconsin Environmental Health Association, Kalahari Resort, Wisconsin Dells, WI. For more information, visit www.weha.net.

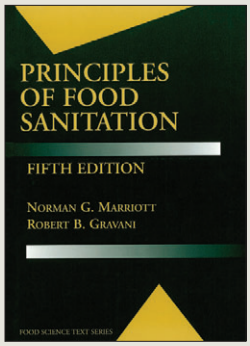
TOPICAL LISTINGS

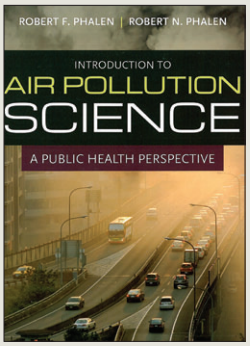
Healthy Homes

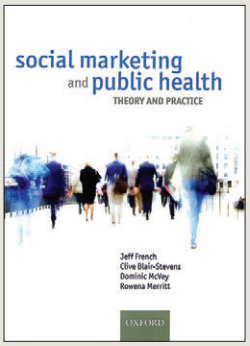
May 28–30, 2014: National Healthy Homes Conference, sponsored by the U.S. Department of Housing and Urban Development, Rebuilding Together, HGTV, and DIY Network, Nashville, TN. For more information, visit www.healthyhomesconference.org.

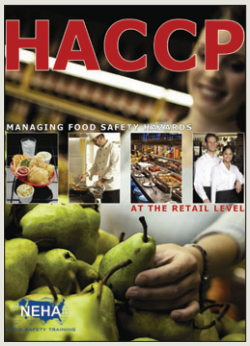
Did You Know?

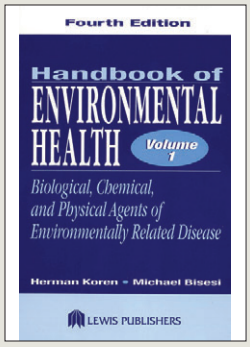
The theme of the 2014 AEC is innovation, and it will feature a variety of educational sessions focused on new ideas, methods, and practices in the environmental health profession. By attending the 2014 AEC in Las Vegas you can stay up-to-date on the latest innovative ideas shaping the environmental health field and receive the training and tools to put them into action. More information at www.neha2014aec.org.

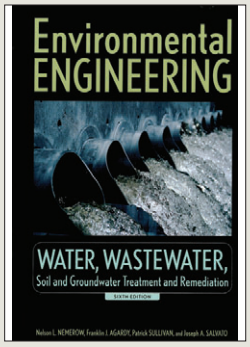


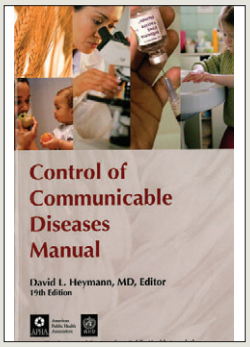


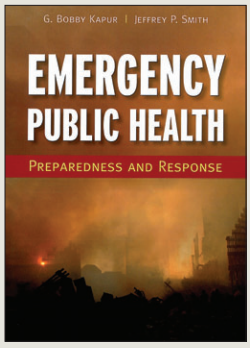


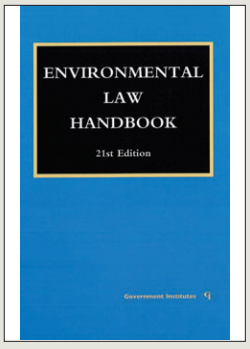


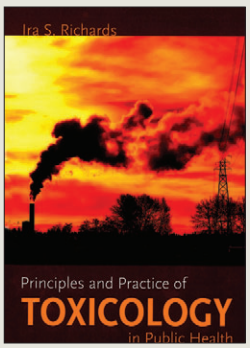


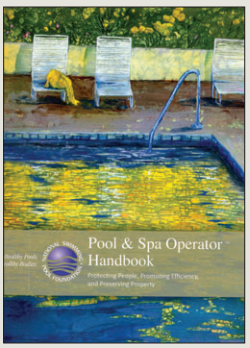


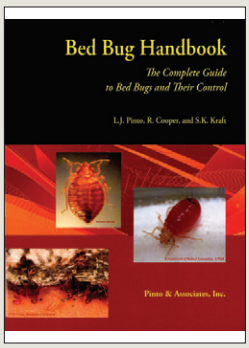


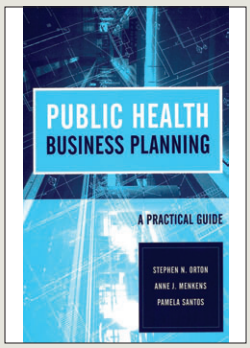


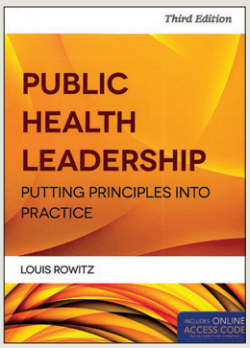












NEHA BOOKSTORE
www.neha.org/store

Choose from the most complete library of environmental health resources available—more than 150 texts, as well as recent *Journal of Environmental Health (JEH)* articles and E-*Journal* issues. NEHA's Bookstore allows you to search for resources by topic and gives you the opportunity to peruse resource descriptions and table of contents.

- AEC & Exhibition
- Air Quality
- All-Hazards Preparedness
- Clearance Books
- Credential Study References
- Epidemiology
- Food Safety and Protection
- Food Safety Training Resources
- General Environmental Health
- Hazardous Materials
- *JEH* Articles and E-*Journal* Issues
- NEHA Merchandise
- Occupational Health
- Sustainability
- Swimming Pools/Spas
- Toxicology
- Vector Control
- Water Quality
- Workforce Development

Purchase online or call

www.neha.org/store 303.756.9090

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

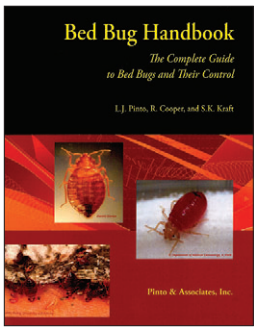
RESOURCE CORNER

Resource Corner highlights different resources that NEHA has available to meet your education and training needs. These timely resources provide you with information and knowledge to advance your professional development. Visit NEHA's online Bookstore for additional information about these, and many other, pertinent resources!

NEHA BOOKSTORE
www.neha.org/store

Bed Bug Handbook: The Complete Guide to Bed Bugs and Their Control

L.J. Pinto, R. Cooper, and S.K. Kraft (2007)

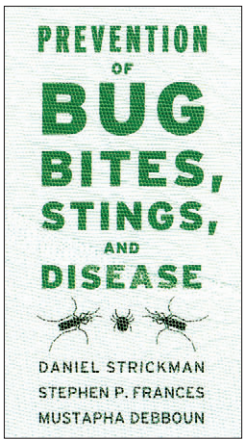


The *Bed Bug Handbook* is a complete and up-to-date guide to bed bugs and their control. It includes sections on the history and impacts of bed bugs, their biology and habits, how bed bugs spread, and medical and social considerations of bed bug infestations. The largest portion of the book consists of practical step-by-step guidance for preventing bed bug infestations and for dealing with bed bug outbreaks. There is an extensive section on bed bug inspections. The book includes checklists for preventing and controlling bed bugs in specific kinds of facilities, such as apartments, hotels, medical facilities, and furniture rental warehouses.

266 pages / Paperback / Catalog #1037
Member: $66 / Nonmember: $69

Prevention of Bug Bites, Stings, and Disease

Daniel Strickman, Stephan P. Frances, and Mustapha Debboun (2009)

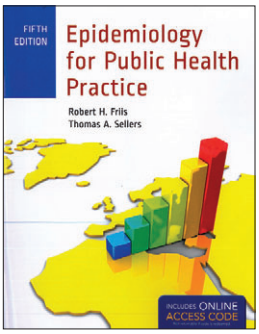


Here is all the information you will ever need—no matter where you are—to identify, avoid, and protect yourself against all manner of blood-sucking or venomous arthropods. Topics covered range from scorpions, spiders, ants, and bees to mites, ticks, lice, bed bugs, sand flies, biting midgies, mosquitoes, and horseflies. Attractive line drawings and color photographs held identify bugs accurately, and information on each bug's particular habits and habitats allows readers to minimize potentially annoying, painful, and even lethal encounters. This book is packed with helpful tips on using barriers and on choosing the right repellent for the right bug in the right place. Based upon the best available science, this well-illustrated, crystal-clear guide is a useful reference for public health professionals and the public.

323 pages / Paperback / Catalog #756
Member: $20 / Nonmember: $24

Epidemiology for Public Health Practice (Fifth Edition)

Robert H. Friis and Thomas A. Sellers (2014)

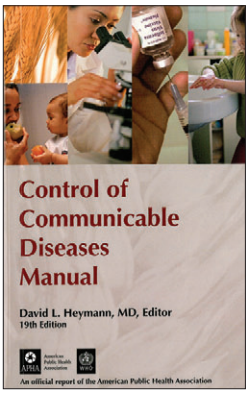


New edition! This book offers comprehensive coverage of all the major epidemiological concepts. With extensive treatment of the heart of epidemiology—from study designs to descriptive epidemiology to quantitative measures—this reader-friendly text is accessible and interesting to a wide range of health-related disciplines. A unique focus is given to real-world applications of epidemiology and the development of skills that can be applied in the field. The fifth edition is a thorough revision with updated material throughout, including coverage of the 2009 H1N1 pandemic; 2010 Census data; a look at the Healthy People 2020 overarching goals; and coverage of new topics related to the epidemiologic aspects of the environment, such as climate change, the BP oil spill, and the Japanese tsunami.

804 pages / Paperback / Catalog #572
Member: $93 / Nonmember: $99

Control of Communicable Diseases Manual (Nineteenth Edition)

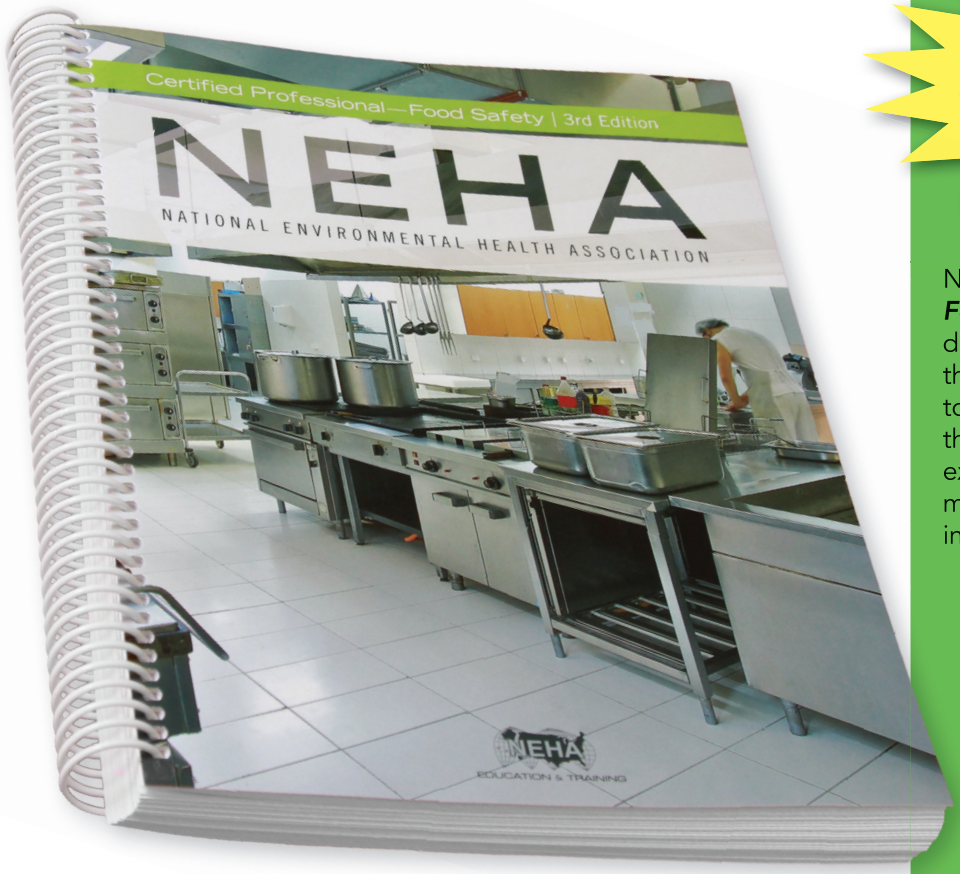
Edited by David L. Heymann, MD (2008)



Designed to be an authoritative reference for public health workers in official and voluntary health agencies, the Nineteenth Edition sticks to the tried and tested structure of previous editions. Chapters have been updated by international experts from the Centers for Disease Control and Prevention and the World Health Organization. New disease variants have been included and some chapters have been fundamentally reworked. This book is a timely update to a milestone reference work that ensures its relevance and usefulness to every public health professional around the world. This book is a study reference for NEHA's REHS/RS, CP-FS, and CEHT exams.

746 pages / Paperback / Catalog #573
Member: $35 / Nonmember: $45

The go-to resource for students of food safety and industry professionals.



Hundreds of pages of new content to help candidates prepare for the current CP-FS exam

Updated to the *2013 Food Code*

An integral part of Integrated Food Safety System (IFSS) body of knowledge

Includes new Food Safety Modernization Act (FSMA) requirements

Full-color photographs and illustrations throughout

Now available at NEHA's online bookstore.
neha.org/store

Introducing...
NEHA's ALL-NEW Certified Professional–Food Safety (CP-FS) manual!

NEHA's ***Certified Professional–Food Safety*** manual was developed by experts from across the various food safety disciplines to help candidates prepare for the updated CP-FS credential examination. This 360-page manual contains science-based, in-depth information about:

- Causes and prevention of foodborne illness
- HACCP plans and active managerial control
- Cleaning and sanitizing
- Pest control
- Risk-based inspections
- Sampling food for laboratory analysis
- Food defense
- Responding to food emergencies and foodborne illness outbreaks
- Conducting facility plan reviews
- Legal aspects of food safety

NEHA
EDUCATION & TRAINING

SUPPORT THE NEHA ENDOWMENT FOUNDATION

The NEHA Endowment Foundation was established to enable NEHA to do more for the environmental health profession than its annual budget might allow. Special projects and programs supported by the foundation will be carried out for the sole purpose of advancing the profession and its practitioners.

Individuals who have contributed to the foundation are listed below by club category. These listings are based on what people have actually donated to the foundation—not what they have pledged. Names will be published under the appropriate category for one year; additional contributions will move individuals to a different category in the following year(s). For each of the categories, there are a number of ways NEHA recognizes and thanks contributors to the foundation. If you are interested in contributing to the Endowment Foundation, please fill out the pledge card or call NEHA at 303.756.9090.

Thank you.

DELEGATE CLUB ($25–$99)

Name in the Journal *for one year and endowment pin.*

Freda W. Bredy
Alexandria, VA

George F. Pinto
Elgin, IL

HONORARY MEMBERS CLUB

($100–$499)

Letter from the NEHA president, name in the Journal *for one year, and endowment pin.*

Michele R. DiMaggio
Martinez, CA

H. Harold Lehman
Potomac Falls, VA

B. Robert Rothenhoefer, RS, REHS, CP-FS
Falls Church, VA

James M. Speckhart, MS
Norfolk, VA

21st CENTURY CLUB ($500–$999)

Name in AEC program book, name submitted in drawing for a free one-year NEHA membership, name in the Journal *for one year, and endowment pin.*

Scott M. Golden, RS, MSEH
Grove City, OH

Bette J. Packer
Ham Lake, MN

Peter M. Schmitt
Shakopee, MN

Dr. Bailus Walker, Jr.
Arlington, VA

SUSTAINING MEMBERS CLUB

($1,000–$2,499)

Name in AEC program book, name submitted in drawing for a free two-year NEHA membership, name in the Journal *for one year, and endowment pin.*

James J. Balsamo, Jr., MS, MPH, MHA, RS, CP-FS
Metairie, LA

Welford C. Roberts, PhD, RS, REHS, DAAS
South Riding, VA

Walter P. Saraniecki, MS, LDN, LEHP, REHS/RS
La Grange, IL

AFFILIATES CLUB

($2,500–$4,999)

Name in AEC program book, name submitted in drawing for a free AEC registration, name in the Journal *for one year, and endowment pin.*

EXECUTIVE CLUB AND ABOVE

($5,000–$100,000)

Name in AEC program book, special invitation to the AEC President's Reception, name in the Journal *for one year, and endowment pin.*

NEHA ENDOWMENT FOUNDATION PLEDGE CARD

I pledge to be a NEHA Endowment Foundation Contributor in the following category:

❍ Delegate Club ($25)
❍ Honorary Members Club ($100)
❍ 21st Century Club ($500)
❍ Sustaining Members Club ($1,000)
❍ Affiliates Club ($2,500)
❍ Executive Club ($5,000)
❍ President's Club ($10,000)
❍ Endowment Trustee Society ($25,000)
❍ Visionary Society ($50,000)
❍ Futurists Society ($100,000)
❍ **You have my permission to disclose the fact and amount (by category) of my contribution and pledge.**

I plan to make annual contributions to attain the club level of _____ over the next _____ years.

Signature _____ Print Name _____

Organization _____ Phone _____

Street Address _____ City _____ State _____ Zip _____

❍ Enclosed is my check in the amount of $_____ payable to **NEHA Endowment Foundation**.

❍ Please bill my: MasterCard/Visa Card #_____ Exp. Date _____

Signature _____

MAIL TO: NEHA, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246, or FAX to: 303.691.9490. 1404JEHEND

SPECIAL NEHA MEMBERS

Sustaining Members

Allegheny County Health Department
Steve Steingart
www.county.allegheny.pa.us

American Academy of Sanitarians (AAS)
Gary P. Noonan
www.sanitarians.org

American Chemistry Council
www.americanchemistry.com

Arlington County Public Health Division
www.arlingtonva.us

Ashland-Boyd County Health
hollyj.west@ky.gov

Association of Environmental Health Academic Programs
www.aehap.org

CDP, Inc.
www.cdpehs.com

Chemstar Corporation
www.chemstarcorp.com

City of Bloomington
www.ci.bloomington.mn.us

City of Fall River Health & Human Services
(508) 324-2410

City of Houston Environmental Health
www.houstontx.gov/health/Environmental

Coconino County Public Health
www.coconino.az.gov

Columbia County Health Department
www.columbiacountyny.com/depts/health2

Decade Software Company LLC
Darryl Booth
www.decadesoftware.com

DEH Child Care
www.denvergov.org/DEH

DeltaTrak, Inc.
Vallierie Cureton
www.deltatrak.com

Department on Disability Services, District of Columbia
http://dds.dc.gov

Digital Health Department, Inc.
www.dhdinspections.com

Diversey, Inc.
Steve Hails
www.diversey.com

DuPage County Health Department
www.dupagehealth.org

Ecolab
robert.casey@ecolab.com
www.ecolab.com

EcoSure
charlesa.arnold@ecolab.com

English Sewage Disposal, Inc.
(756) 358-4771

Erie County Department of Health
www.erie.gov/health

Food Marketing Institute
www.fmi.org

Gass Weber Mullins LLC
www.gasswebermullins.com

Gila River Indian Community, Environmental Health Services
www.gilariver.org

GLO GERM/Food Safety First
Joe D. Kingsley
www.glogerm.com

HealthSpace USA Inc.
Joseph Willmott
www.healthspace.com

Industrial Test Systems, Inc.
www.sensafe.com

Inspect2Go
www.inspect2go.com

Inspek Pro LLC
mail@inspekpro.com
www.inspekpro.com

Jefferson County Health Department (Missouri)
Joe Hainline
www.jeffcohealth.org

Jefferson County Public Health (Colorado)
csanders@jeffco.us
http://jeffco.us/health

Kansas Department of Health & Environmental
jrhoads@kdheks.gov

LaMotte Company
www.lamotte.com

Linn County Public Health
health@linncounty.org

Maricopa County Environmental Services
jkolman@mail.maricopa.gov

Mars Air Doors
Steve Rosol
www.marsair.com

McDonough County Health Department
www.mchdept.com

Mesothelioma Lawyer Center
www.mesotheliomalawyercenter.org

Mid-Ohio Valley Health Department
tim.l.miller@wv.gov
www.movhd.com

Mitchell Humphrey
www.mitchellhumphrey.com

Mycometer
www.mycometer.com

National Environmental Health Science and Protection Accreditation Council
www.ehacoffice.org

National Registry of Food Safety Professionals
Lawrence Lynch
www.nrfsp.com

National Restaurant Association
www.restaurant.org

National Swimming Pool Foundation
Michelle Kavanaugh
www.nspf.org

New Jersey State Health Department, Consumer and Environmental Health Services
Joe Eldridge
www.njeha.org

New York City Department of Health & Mental Hygiene
www.nyc.gov/health

North Bay Parry Sound District Health Unit
www.healthunit.biz

Nova Scotia Department of Agriculture
www.gov.ns.ca

NSF International
Stan Hazan
www.nsf.org

Omaha Healthy Kids Alliance
www.omahahealthykids.org

Oneida Indian Tribe of Wisconsin
www.oneidanation.org

Orkin
Zia Siddiqi
www.orkincommercial.com

Ozark River Hygienic Hand-Wash Station
www.ozarkriver.com

PerkinElmer, Inc.
www.perkinelmer.com

Pinnacle Health Childhood Lead Poisoning Prevention Program
www.pinnaclehealth.org/Conditions---Treatments/Services/Children-s-Health/Services/Childhood-Lead-Poisoning-Prevention-Program.aspx

Prometric
www.prometric.com

Racine City Department of Health
www.cityofracine.org/Health.aspx

San Jamar
www.sanjamar.com

Seattle & King County Public Health
Michelle Pederson
michelle.pederson@kingcounty.gov

Shat-R-Shield Inc.
Anita Yost
www.shat-r-shield.com

Skillsoft
Melynda Hilliard
mhilliard@skillsoft.com

Sneezeguard Solutions Inc.
Bill Pfeifer
www.sneezeguard-solutions.com

St. Johns Housing Partnership
www.sjhp.org

Stater Brothers Market
www.staterbros.com

Sweeps Software, Inc.
Kevin Thrasher
www.sweepssoftware.com

Target Corporation
www.target.com

Texas Roadhouse
www.texasroadhouse.com

The Steritech Group, Inc.
www.steritech.com

Tri-County Health Department
www.tchd.org

Underwriters Laboratories, Inc.
Gus Schaeffer
www.ul.com

Waco-McLennan County Public Health District
davidl@ci.waco.tx.us

West Virginia Office of Economic Opportunity
www.oeo.wv.gov

Winn-Dixie Stores, Inc.
www.winn-dixie.com

WVDHHR Office of Environmental Health Services
www.wvdhhr.org

YUM! Brands, Inc.
daniel.tew@yum.com
www.yum.com

Educational Institution Members

American Public University
Tatiana Sehring
www.StudyatAPU.com/NEHA

Colorado State University, Department of Environmental/Radiological Health
www.colostate.edu

East Tennessee State University, DEH
Phillip Scheuerman
www.etsu.edu

Eastern Kentucky University
worley.johnson@eku.edu
http://eh.eku.edu

Institute of Public Health, Georgia State University
cstauber@gsu.edu

Internachi-International Association of Certified Home Inspectors
Nick Gromicko
lisa@internachi.org

University of Illinois at Springfield
Sharron LaFollette
www.uis.edu/publichealth

University of Wisconsin–Oshkosh
www.uwosh.edu/llce

University of Wisconsin–Stout, College of Science, Technology, Engineering, and Mathematics
www.uwstout.edu

SPECIAL **LISTING**

The board of directors includes NEHA's nationally elected officers and regional vice presidents. Affiliate presidents (or appointed representatives) comprise the Affiliate Presidents Council. Technical advisors, the executive director, and all past presidents of the association are ex-officio council members. This list is current as of press time.

Sandra Long, REHS, RS
Region 5 Vice President

Adam London, RS, MPA
Region 6 Vice President

National Officers

President—Alicia Enriquez Collins, REHS
enriqueza@comcast.net

President Elect—Carolyn Hester Harvey, PhD, CIH, RS, DAAS, CHMM, Professor, Director of MPH Program, Department of Environmental Health, Eastern Kentucky University, Dizney 220, 521 Lancaster Avenue, Richmond, KY 40475.
Phone: (859) 622-6342
carolyn.harvey@eku.edu

First Vice President—Bob Custard, REHS, CP-FS, Environmental Health Manager, Alexandria Health Department, 4480 King Street, Alexandria, VA 22302.
Phone: (703) 746-4970
Bob.Custard@vdh.virginia.gov

Second Vice President—David E. Riggs, REHS/RS, MS, 2535 Hickory Avenue, Longview, WA 98632. Phone: (360) 430-0241
davideriggs@comcast.net

Immediate Past President—Brian Collins, MS, REHS, DAAS, Director of Environmental Health (ret)

NEHA Executive Director—Nelson E. Fabian (non-voting ex-officio member of the board of directors), 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246.
Phone: (303) 756-9090, ext 301
nfabian@neha.org

Regional Vice Presidents

Region 1—Vacant

Region 2—Marcy A. Barnett, MA, MS, REHS, Emergency Preparedness Liaison, California Department of Public Health, Center for Environmental Health, Sacramento, CA. Phone: (916) 449-5686
marcy.barnett@cdph.ca.gov
Arizona, California, Hawaii, and Nevada. Term expires 2015.

Region 3—Roy Kroeger, REHS, Environmental Health Supervisor, Cheyenne/Laramie County Health Department, 100 Central Avenue, Cheyenne, WY 82008.
Phone: (307) 633-4090
roykehs@laramiecounty.com
Colorado, Montana, Utah, Wyoming, and members residing outside of the U.S. (except members of the U.S. armed forces). Term expires 2015.

Region 4—Keith Johnson, RS, Administrator, Custer Health, 210 2nd Avenue NW, Mandan, ND 58554.
Phone: (701) 667-3370
keith.johnson@custerhealth.com
Iowa, Minnesota, Nebraska, North Dakota, South Dakota, and Wisconsin. Term expires 2016.

Region 5—Sandra Long, REHS, RS, Inspection Services Supervisor, City of Plano Health Department, 1520 K Avenue, Suite 210, Plano, TX 75074. Phone: (972) 941-7143 ext. 5282; Cell: (214) 500-8884
sandral@plano.gov
Arkansas, Kansas, Louisiana, Missouri, New Mexico, Oklahoma, and Texas. Term expires 2014.

Region 6—Adam London, RS, MPA, Environmental Health Director, Kent County Health Department, 700 Fuller NE, Grand Rapids, MI 49503.
Phone: (616) 632-7266
adam.london@kentcountymi.gov
Illinois, Indiana, Kentucky, Michigan, and Ohio. Term expires 2016.

Region 7—John A. Steward, REHS, MPH, CAPT, USPHS (ret), Institute of Public Health, Georgia State University, P.O. Box 3995, Atlanta, GA 30302-3995.
Phone: (404) 413-1137
jsteward@gsu.edu
Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, and Tennessee. Term expires 2014.

Region 8—LCDR James Speckhart, MS, USPHS, Occupational Safety and Health Specialist, USDA/FSIS/EHSB, Mellon Independence Center, 701 Market Street, Suite 4100C, Philadelphia, PA 19106.
Phone: (215) 430-6221
jamesmspeckhart@gmail.com
Delaware, Maryland, Pennsylvania, Virginia, Washington, DC, West Virginia, and members of the U.S. armed forces residing outside of the U.S. Term expires 2015.

Region 9—Edward L. Briggs, MPH, MS, REHS, Director of Health, Town of Ridgefield Department of Health, 66 Prospect Street, Ridgefield, CT 06877.
Phone: (203) 431-2745
eb.health@ridgefieldct.org
Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Term expires 2016.

Affiliate Presidents

Alabama—Cindy Goocher, Montgomery, AL.
cindy.goocher@adph.state.al.us

Alaska—Ryan Autenrieth, Bethel, AK.
ryan_autenrieth@ykhc.org

Arizona—Shikha Gupta, Environmental Operations Program Supervisor, Maricopa County, Phoenix, AZ.
sgupta@mail.maricopa.gov

Arkansas—Jeff Jackson, Camden, AR.
jeff.jackson@arkansas.gov

California—Dorothy Janse, REHS, San Diego, CA.
djanse@cox.net

Colorado—Mindi Ramig, Environmental Health Supervisor, Jefferson County Public Health, Golden, CO.
mramig@jeffco.us

Connecticut—Marco Palmeri, RS, Chief Sanitarian, Plainville-Southington Regional Health District, Plainville, CT.
health@plainville-ct.gov

Florida—Robert Maglievaz, Environmental Specialist III, Florida Dept. of Health, DeLand, FL.
robert_maglievaz@flhealth.gov

Georgia—Kathleen Worthington, Compliance Specialist, Georgia Dept. of Agriculture–Food Safety Division, Claxton, GA.
kathleen.worthington@agr.georgia.gov

Hawaii—John Nakashima, Sanitarian IV, Food Safety Education Program, Hawaii Dept. of Health, Hilo, HI.
john.nakashima@doh.hawaii.gov

Idaho—Jami Delmore, Idaho Southwest District Health, Caldwell, ID.
jami.delmore@phd3.idaho.gov

Illinois—Adam Dotson, MPA, LEHP, Community Development Director, City of Oak Forest, Oak Forest, IL.
adotson@oak-forest.org

Indiana—Michael Mettler, Indiana State Dept. of Health, Indianapolis, IN.
mmettler@isdh.in.gov

Iowa—Michael Wichman, Associate Director, State Hygienic Laboratory, The University of Iowa, Coralville, IA.
michael-wichman@uiowa.edu

Jamaica—Paul Ximines
paulx2007@yahoo.com

Kansas—Bronson Farmer, RS, HHS, Salina-Saline County Health Dept., Salina, KS.
farmerduo@hotmail.com

Kentucky—Stacy Roof, Kentucky Restaurant Association, Louisville, KY.
stacy@kyra.org

Louisiana—John Koury, MS, COO, KourCo Enivironmental Services, Inc., Lafayette, LA.
jkoury@kourco.com

Maryland—James Lewis, Westminster, MD.
jlewis@mde.state.md.us

Massachusetts—Heidi Porter, Bedford Board of Health, Bedford, MA.
president@maeha.org

Michigan—Chris Klawuhn, RS, Deputy Director, Bureau of Environmental Health, Ingham County Health Dept., Lansing, MI.
cklawuhn@ingham.org

Minnesota—Kimberley Carlton, Planner Principal, Minnesota Dept. of Health, St. Paul, MN.
kim.carlton@state.mn.us

Mississippi—Queen Swayze, Food Program Specialist, Mississippi State Dept. of Health, Jackson, MS.
elizabeth.swayze@msdh.state.ms.us

Missouri—Ericka Murphy, St. Louis County Dept. of Health, St. Louis, MO.
emurphy@stlouisco.com

Montana—Laurel Riek, RS, Program Manager, Lewis & Clark City/County Health Dept., Helena, MT.
lriek@lccountymt.gov

National Capitol Area—Shannon McKeon, Environmental Health Specialist, Fairfax, VA.
smckeon@ncaeha.com

Nebraska—Kathy King, Environmental Health Specialist II, Lincoln-Lancaster Health Dept., Lincoln, NE.
kking@lincoln.ne.gov

Nevada—Tamara Giannini, Environmental Health Supervisor, Southern Nevada Health District, Las Vegas, NV.
giannini@snhdmail.org

New Jersey—Marconi Gapas, Health Officer, Township of Union and Borough of Kenilworth Dept. of Health, Union, NJ.
mgapas@uniontownship.com

New Mexico—Jeff Dickson, Environmental Health Officer, Indian Health Service, Rio Rancho, NM.
jeff.dickson@ihs.gov

New York—Contact Region 9 Vice President Edward L. Briggs.
eb.health@ridgefieldct.org

North Carolina—Jesse Dail, Environmental Health Specialist, Morehead City, NC.
jessed@carteretcountygov.org

North Dakota—Jane Kangas, Environmental Scientist II, North Dakota Dept. of Health, Fargo, ND.
jkangas@nd.gov

Northern New England Environmental Health Association—Co-president Brian Lockard, Health Officer, Town of Salem Health Dept., Salem, NH.
blockard@ci.salem.nh.us
Co-president Thomas Sloan, RS, Agricultural Specialist, New Hampshire Dept. of Agriculture, Concord, NH.
tsloan@agr.state.nh.us

Ohio—Joseph Harrod, RS, Columbus Public Health, Columbus, OH.
jaharrod@columbus.gov

Oklahoma—Matthew Brosh, RPES, Public Health Specialist, Oklahoma City-County Health Dept., Oklahoma City, OK.
matt_brosh@occhd.org

Oregon—Delbert Bell, Klamath Falls, OR.
Dbell541@charter.net

Past Presidents—Mel Knight, REHS, Folsom, CA. melknight@sbcglobal.net

Pennsylvania—Joseph "Jay" S. Tarara, Greensburg, PA. littletfamily@aol.com

Rhode Island—Dottie LeBeau, CP-FS, Food Safety Consultant and Educator, Dottie LeBeau Group, Hope, RI. deejaylebeau@verizon.net

Saudi Arabia—Zubair M. Azizkhan, Environmental Scientist, Saudi Arabian Oil Company, Saudi Arabia. Zubair.azizkhan@aramco.com.sa

South Carolina—Trey Reed, Regional Environmental Health Director, South Carolina Dept. of Health and Environmental Control, Aiken, SC. reedhm@dhec.sc.gov

South Dakota—John Osburn, Pierre, SD. john.osburn@state.sd.us

Tennessee—David Garner, Nashville, TN. david.garner@tnenvironmentalhealth.org

Texas—Cindy Corley, REHS, CP-FS, Environmental Health Manager, City of Garland Health Dept., Garland, TX. ccorley@garlandtx.gov

Uniformed Services—Joseph Hout, Environmental Science Officer, The Uniformed Services University of the Health Sciences, Bethesda, MD. joseph.hout@usuhs.edu

Utah—Ronald Lund, Salt Lake County Health Dept., Murray, UT. rlund@slco.org

Virginia—Christopher Gordon, Executive Advisor-Public Health, Virginia Dept. of Health, Richmond, VA. christopher.gordon@vdh.virginia.gov

Washington—Kay Massong, Tenino, WA. massonk@co.thurston.wa.us

West Virginia—Elizabeth Green, Parkersburg, WV. elizabeth.s.green@wv.gov

Wisconsin—Timothy Anderson, Chief, Regulatory and Technical Services, Dept. of Agriculture, Madison, WI. timothy.anderson@wisconsin.gov

Wyoming—Terri Leichtweis, Environmental Health Specialist, Jefferson County Public Health, Lakewood, CO. tleicht@jeffco.us

NEHA Historian

Dick Pantages, NEHA Past President, Fremont, CA. dickpantages@comcast.net

Technical Advisors

Air Quality—Scott E. Holmes, REHS, MS, Environmental Public Health Manager, Lincoln-Lancaster County Health Dept., Lincoln, NE. sholmes@lincoln.ne.gov

Aquatic Venues/Recreational Health—Tracynda Davis, MPH, Environmental Health Consultant, Colorado Springs, CO. tracynda@gmail.com

Aquatic Venues/Recreational Health—Colleen Maitoza, REHS, Supervising Environmental Specialist, Environmental Management Dept., County of Sacramento, Mather, CA. maitozac@saccounty.net

Children's Environmental Health—M.L. Tanner, HHS, Environmental Health Manager III, Bureau of Environmental Health Services, Division of Food Protection and Rabies Prevention, South Carolina Dept. of Health and Environmental Control, Columbia, SC. tannerml@dhec.sc.gov

Drinking Water/Environmental Water Quality—Sharon Smith, RS, West Central Region Supervisor, Minnesota Dept. of Health, Fergus Falls, MN. sharon.l.smith@state.mn.us

Emergency Preparedness and Response—Martin A. Kalis, Public Health Advisor, CDC/NCEH/DEEHS/EHSB, Atlanta, GA. mkalis@cdc.gov

Emergency Preparedness and Response—Vince Radke, MPH, REHS, CP-FS, DAAS, Sanitarian, CDC/NCEH/DEEHS/EHSB, Atlanta, GA. vradke@cdc.gov

Emerging Pathogens—Lois Maisel, RN, CP-FS, Environmental Health Specialist II, Fairfax County Health Dept., Fairfax, VA. lois.maisel@fairfaxcounty.gov

Environmental Justice—Welford C. Roberts, PhD, DAAS, RS/REHS, Subject Matter Expert, Office of the Air Force Surgeon General, ERP International, LLC., South Riding, VA. welford@erols.com

Food (including Safety and Defense)—Eric Bradley, MPH, REHS/RS, CP-FS, Environmental Health Specialist, Scott County Health Dept., Davenport, IA. Eric.Bradley@scottcountyiowa.com

Food (including Safety and Defense)—John A. Marcello, REHS, CP-FS, Pacific Regional Food Specialist, FDA, Tempe, AZ. john.marcello@fda.hhs.gov

General Environmental Health—Ron de Burger, Retired Director, Toronto Public Health, Toronto, ON, Canada. rdeburger@gmail.com

General Environmental Health—Eric Pessell, REHS, Environmental Health Division Director, Kent County Health Dept., Grand Rapids, MI. eric.pessell@kentcountymi.gov

Global Climate Change and Health—Steve Konkel, PhD, MCP, AICP, FRIPH, Associate Professor, Environmental Health Sciences, University of Alaska Anchorage, Anchorage, AK. steven.konkel@uaa.alaska.edu

Hazardous Materials/Toxic Substances—Priscilla Oliver, PhD, Life Scientist/Program Manager, U.S. EPA, Atlanta, GA. POliverMSM@aol.com

Healthy Homes and Healthy Communities—Sandra Whitehead, MPA, Environmental Public Health Planner, Division of Environmental Health, Florida Dept. of Health, Tallahassee, FL. Sandra_Whitehead@doh.state.fl.us

Injury Prevention—CAPT Alan J. Dellapenna, Jr., RS, MPH, DAAS, Historian, Indian Health Service, Rockville, MD. alan.dellapenna@gmail.com

Institutions/Schools—TBD

International—Sylvanus Thompson, PhD, CPHI(C), Associate Director, Toronto Public Health, Toronto, ON, Canada. sthomps@toronto.ca

Land Use Planning/Design—Felix I. Zemel, MCP, MPH, RS, DAAS, Health Agent/Administrator, Cohasset Board of Health, Cohasset, MA. felix.zemel@gmail.com

Legal—Doug Farquhar, JD, Program Director, National Conference of State Legislatures, Denver, CO. doug.farquhar@ncsl.org

Mentorship—Sheila D. Pressley, DrPH, REHS/RS, Associate Professor, Eastern Kentucky University, Richmond, KY. sheila.pressley@eku.edu.

Mentorship—Marie Woodin, REHS, Deputy Division Chief, Sacramento County Environmental Management Dept., Sacramento, CA. WoodinM@saccounty.net

Occupational Health/Safety—D. Gary Brown, DrPH, CIH, RS, DAAS, Professor, Eastern Kentucky University, Richmond, KY. gary.brown@eku.edu

Radiation/Radon—TBD

Risk Assessment—TBD

Sustainability—Tom R. Gonzales, MPH, REHS, Environmental Health Director, El Paso County Public Health, Colorado Springs, CO. tomgonzales@elpasoco.com

Technology (including Computers, Software, GIS, and Management Applications)—Darryl Booth, MBA, President, Decade Software Company, Fresno, CA. darrylbooth@decadesoftware.com

Vector Control—Zia Siddiqi, PhD, BCE, Director of Quality Systems, Orkin, Inc., Atlanta, GA. zsiddiqi@rollins.com

Wastewater—Craig Gilbertson, RS, Environmental Planner, TrackAssist-Online, Walker, MN. cgilbertson@yaharasoftware.com

Workforce Development, Management, and Leadership—CAPT Michael E. Herring, REHS, MPH, Senior Environmental Health Scientist/Training and Technical Assistance Team Leader, CDC, Atlanta, GA. mherring@cdc.gov.

Workforce Development, Management, and Leadership—George Nakamura, MPA, REHS/RS, DAAS, President/CEO, Nakamura Leasing, Sunnyvale, CA. gmlnaka@comcast.net

NEHA Staff: (303) 756-9090

Rance Baker, Program Administrator, NEHA Entrepreneurial Zone (EZ), ext. 306, rbaker@neha.org

Trisha Bramwell, Customer & Member Services Specialist, ext. 336, tbramwell@neha.org

Laura Brister, Customer & Member Services Specialist, AEC Registration Coordinator, ext. 309, lbrister@neha.org

Patricia Churpakovich, Credentialing Coordinator, ext. 317, pchurpakovich@neha.org

Ginny Coyle, Grants/Projects Specialist, Research and Development (R&D), ext. 346, gcoyle@neha.org

Jill Cruickshank, Chief Operating Officer (COO), ext. 342, jcruickshank@neha.org

Vanessa DeArman, Project Coordinator, R&D, ext. 311, vdearman@neha.org

Cindy Dimmitt, Receptionist, Customer & Member Services Specialist, ext. 300, cdimmitt@neha.org

Elizabeth Donoghue-Armstrong, Copy Editor, *Journal of Environmental Health,* nehasmtp@gmail.com

Nelson Fabian, Executive Director, ext. 301, nfabian@neha.org

Eric Fife, Learning Content Producer, NEHA EZ, ext. 344, efife@neha.org

Soni Fink, Strategic Sales Coordinator, ext. 314, sfink@neha.org

Michael Gallagher, IFSS Logistics and Training Coordinator, NEHA EZ, ext. 343, mgallagher@neha.org

TJay Gerber, Credentialing Specialist, ext. 328, tgerber@neha.org

Genny Homyack, Executive Associate, ghomyack@neha.org

Dawn Jordan, Customer Service Manager, Office Coordinator, HR and IT Liaison, ext. 312, djordan@neha.org

Erik Kosnar, Learning Content Production Assistant, NEHA EZ, ext. 318, ekosnar@neha.org

Elizabeth Landeen, Assistant Manager, R&D, (860) 351-5099, elandeen@neha.org

Matt Lieber, Marketing and Communications Assistant, ext. 338, mliebert@neha.org

Larry Marcum, Managing Director, R&D and Government Affairs, ext. 307, lmarcum@neha.org

Marissa Mills, Project Assistant, R&D, ext. 304, mmills@neha.org

Carol Newlin, Credentialing Specialist, ext. 337, cnewlin@neha.org

Terry Osner, Administrative Coordinator, ext. 302, tosner@neha.org

Barry Porter, Financial Coordinator, ext. 308, bporter@neha.org

Kristen Ruby, Content Editor, *Journal of Environmental Health*, ext. 341, kruby@neha.org

Michael Salgado, Assistant Manager, NEHA EZ, ext. 315, msalgado@neha.org

Jill Schnipke, Education Coordinator, ext. 313, jschnipke@neha.org

Joshua Schrader, Sales & Training Support, NEHA EZ, ext. 340, jschrader@neha.org

Clare Sinacori, Marketing and Communications Manager, ext. 319, csinacori@neha.org

Christl Tate, Project Coordinator, R&D, ext. 305, ctate@neha.org

To update information, contact Terry Osner at tosner@neha.org.

NEHA TECHNICAL ADVISORS' CORNER

Darryl Booth, MBA

Yelp Partners With Health Departments to Improve Food Safety

Editor's Note: NEHA Technical Advisors are subject-matter experts who represent 26 different areas of environmental health expertise. These individuals are appointed by the NEHA president and are responsible for providing subject-matter expertise and counsel to NEHA's board of directors, staff, affiliates, and members. Within their areas of expertise, their specific duties include the following: staying abreast of the latest developments and educational needs of the profession; identifying and sharing trends and needs of importance; actively assisting in the development and implementation of the education offered at the NEHA AEC; assisting NEHA in responding to press inquiries, developing position papers, serving as an expert witness, and speaking on behalf of the association; and other activities requested and agreed upon by the NEHA board of directors. A complete listing of Technical Advisors can be found in the Special Listing section of the *Journal*.

The NEHA Technical Advisors' Corner was created to provide readers with relevant, timely, and useful information generated from the NEHA Technical Advisors. This feature will be printed occasionally throughout the year as content is made available to NEHA from the Technical Advisors.

Darryl Booth is president of Decade Software Company and has been monitoring regulatory and data tracking needs of agencies across the U.S. for 18 years. He serves as technical advisor to NEHA's technology section, which includes computers, software, GIS, and management applications.

It's not often that a successful Silicon Valley startup invites local health departments to enhance its core product … a product so visible that it garners national attention and yet is entirely compatible with the environmental health industry's mission to promote safe food. This is exactly what Yelp, an online review forum that connects people with local businesses and services, has done.

Yelp, founded in 2004, maintains a worldwide inventory of businesses, including restaurants. Consumers use Yelp to find nearby businesses, confirm hours and location, read reviews and rankings, and post their own opinions. Ultimately, Yelp reviews can drive new business to a well-reviewed restaurant. Those reviews might also prompt customers to rethink their favorite Saturday night dining destination.

Though opinions about social media can differ, many forward-thinking health departments already use Facebook, Twitter, YouTube, and others to get their messages out. Simply search Google for "health department YouTube" to get a sense of it. Utilizing Yelp to convey restaurant inspection results is a logical next step in this growing practice of using social media to inform the public.

Many already consider Yelp an ally in food safety. At its foundation, the popular Web site and mobile app already promote well-run restaurants. While the reviews are not, strictly speaking, oriented to food safety, customer observations in the dining area can correlate to practices behind kitchen doors.

According to a 2012 study by two Berkeley economists, Yelp scores can directly impact a restaurant's reservation rate (Ferenstein, 2012). This economic reality can prompt positive operational changes, including matters concerning some foodborne risk factors.

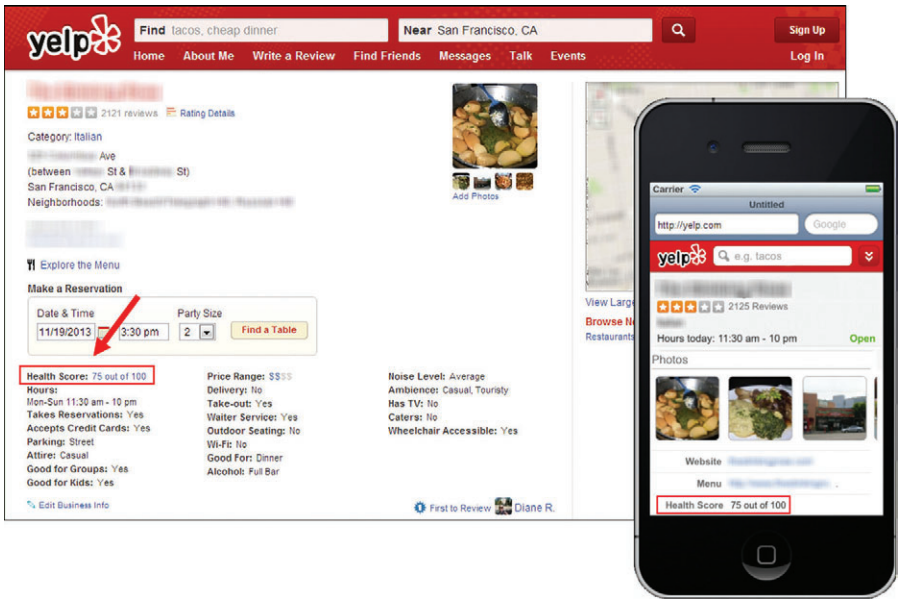
The LIVES Standard

In a 2013 media release, Yelp announced the LIVES standard (http://officialblog.yelp.com/2013/01/introducing-lives.html). LIVES stands for Local Inspector Value-Entry Specification and is a private/public initiative to integrate official inspection scores with the user-generated reviews at Yelp (Figure 1). The program's purpose and intent is to make health department inspection scores visible by augmenting the user-generated reviews and ratings with official inspection results and even violation details (Figure 2). "Yelp can generate Web traffic that is more than 150-fold over the numbers generated by local health department Web sites," explains Yelp Director of Public Policy Luther Lowe.

In addition, since the LIVES standard and the data are open (i.e., they are not "owned" by Yelp), the initiative is expected to generate

FIGURE **1**

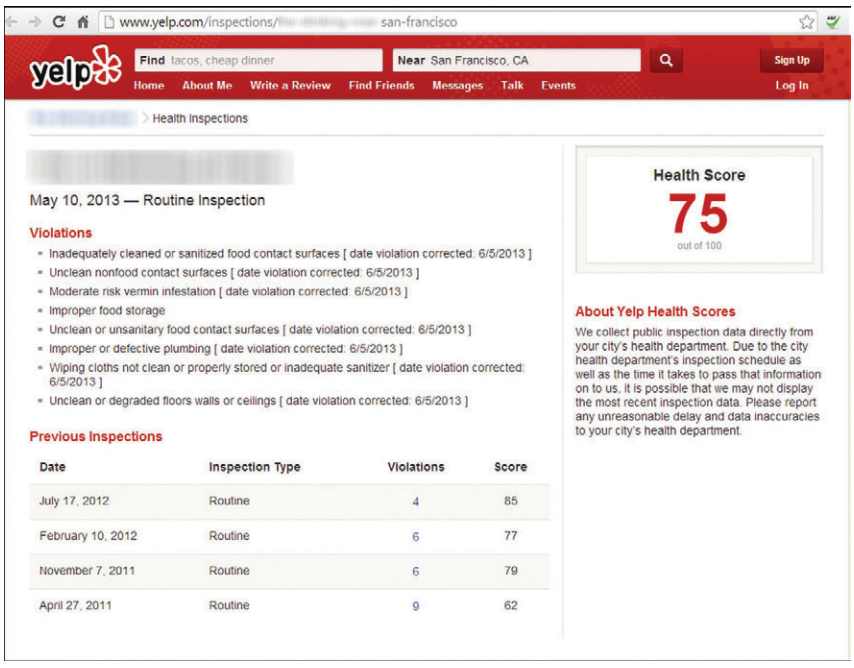
The Yelp Web Page and Mobile Site



Example of a standard restaurant review page on Yelp, as seen in a standard Web page, as well as a mobile device. The restaurant's health score is listed with applicable business information.

FIGURE **2**

Inspection Details Are a Click Away



Click the score link to open the details of recent inspections.

interest by other app developers as they rush to find new and interesting ways to package and combine the inspection data.

Implementing the LIVES Standard

To manage the expected technical issues that often accompany an initial rollout, Yelp engineers handpicked health department partners from among those with the capacity and interest to engage. Health departments can request to be added to the queue by sending an e-mail to healthscores@yelp.com.

At any time, a health department may publish their data according to the LIVES standard (www.yelp.com/healthscores), even without Yelp's engagement. In practical terms, this means working with the health department's software vendor or internal IT to design queries and establish data flows according to the published standard.

The LIVES standard calls for several files. Each file has a required format and purpose. The **business** file catalogs all the businesses the health department intends to share. The **inspections** file holds the inspection history and score and the **violation** file contains the details behind the inspection result. The remaining files, **feed_info** and **legend**, wrap things up by declaring the name of the health department, the extraction date, and how to interpret the scoring. The health department e-mail is also included to facilitate customer feedback. These files constitute a snapshot of the inspections broadcast by the health department (Figure 3).

By creating these files and placing them in a publically accessible part of the health department's Web site, the data become available to Yelp (and visible to other interested parties). Yelp, in particular, intends to match health department facilities to their own record of businesses in order to augment the business record.

Anticipate the Challenges

Interviews with early LIVES standard adopters Los Angeles County, city and county of San Francisco, and New York City health departments yielded the following challenges and advice.

Getting the Filter Right

A filter is just a rule to exclude blocks of facilities, inspections, and violations from LIVES reporting. Complaint investigations, normally,

should be excluded (or filtered). For example, some inspection history may be interesting, but too much history can be distracting or misleading. Two years of history seems to be a good fit. Some health departments may choose to expunge inspection history following a change of ownership, for example.

Start by roughly correlating the food permits to Yelp records. Search for a few facilities at www.yelp.com. If Yelp doesn't have a good match for classes of facilities (e.g., mobile food facilities), then exclude that block of businesses.

Business/Facility Matching

Matching the health department's record of each permitted facility to the corresponding Yelp businesses is central to the whole exercise. This is not easy to automate since the health department's name and address for each facility may differ from those maintained by Yelp. If the health department provides the restaurant's latitude and longitude, Yelp engineers can help pinpoint and match the facility using certain heuristics. Otherwise, matching on address and name has a 10% failure rate. This can require some special handling or even omitted results.

In Los Angeles County, for example, the health department permits and inspects every food vendor at Dodger Stadium. The Yelp system doesn't get that granular. The Yelp record might show one overall review of Dodger Stadium and a few of the marquee food spots, but no one-for-one correlation to the specific permitted/inspected snack bars within the stadium. In these cases, the nonmatches may be ignored, added to Yelp, or consolidated.

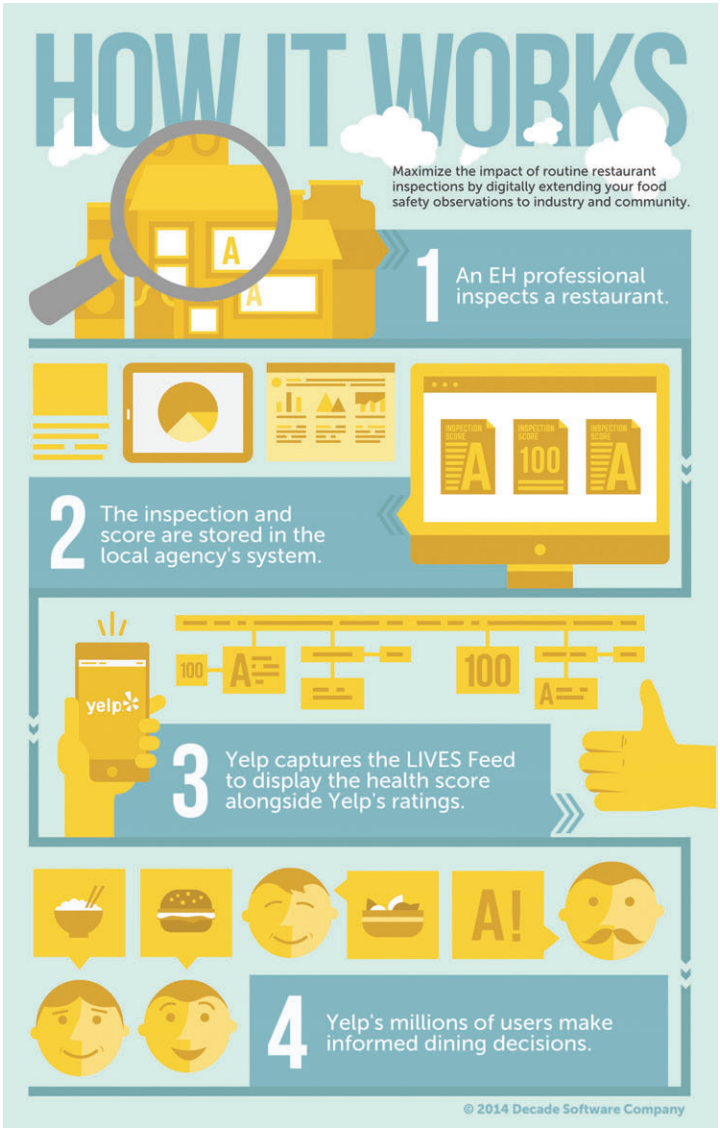
Scoring/Grading

The LIVES standard format assumes a discrete result for every inspection. While grading and placarding may be controversial, an equivalent "conclusion" must accompany every inspection. So, be prepared to deliver a score (i.e., a numeric value) and a scale (e.g., 100–90 = A, 89–80 = B, etc.). The score can have any meaning and the scale is yours to define (e.g., 0–1 = green, 2–3 = yellow, 4–99 = red).

The LIVES standard correctly reflects the fact that some inspections (e.g., follow-up inspections) do not result in a score. The score may be left blank in these cases (although it might be best to exclude those inspections from the onset).

FIGURE **3**

The Process of Publishing Inspection Details to Yelp



The LIVES standard calls for several files. These files constitute a snapshot of the inspections broadcast by the health department. By placing these files in a publicly accessible part of the health department's Web site, the data become available to Yelp.

Pull vs. Push

One of the interesting things about Yelp's approach is its focus on "pulling" the data instead of asking health departments to "push." The difference is akin to mail being picked up by the postal carrier at your mailbox versus driving to the post office to drop off letters. Picking up is better.

In order for Yelp and others to pick up health department data, the data will have to be visible to the world via a Web site. Ideally, this is a portion of the health department's existing Web site (e.g., www.myhealthdepartment.gov/LIVES). If the existing Web site can't handle it, other arrangements for hosting the file need to be made.

The data are picked up daily by Yelp.

Automating the Process

The preferred method is automated. That is, health departments can't expect staff to remember to generate these files and transfer them to the Web server. Set the expectation from the onset that this is an automated data flow without any routine human interaction.

Customer Feedback

There's something to the idea of presenting one's work product for general review. It changes the conversation, at least. One should expect a few phone calls with comments like, "Yelp shows a 'yellow' when my inspector told me I'd received a 'green.' You're killing my business!"

These can be managed by offering a reinspection service and by quickly correcting any legitimate errors. In fact, the LIVES standard prompts for an agency-provided customer service e-mail address and Web site that can be used to channel questions and concerns to the proper staff. After all, all parties involved want to get the information right!

These few challenges are easily overshadowed by the new awareness of the health department's daily work to protect consumers and the very real motivator for better practices in retail food facilities.

Bringing It Back to Safe Food

Amplifying the health inspector's work through Yelp drastically increases awareness, making consumers and operators more mindful in their choices. Well-run facilities should be rewarded for their investment and healthy practices.

Also, for those health departments enrolled in the Food and Drug Administration Voluntary Program Standard 7, this project augments the efforts under industry and community relations.

It is the responsibility of the operators to provide safe food. The health department serves its role through education, assessment, and enforcement. Making the consuming public a partner through education and awareness completes the cycle.

Corresponding Author: Darryl Booth, President, Decade Software Company, 1195 W. Shaw, Fresno, CA 93711.
E-mail: darrylbooth@decadesoftware.com.

References

Ferenstein, G. (2012, September 2). Berkeley study: Half-star change in Yelp rating can make or break a restaurant. *TechCrunch*. Retrieved from http://goo.gl/Ll6Bpb

NEHA NEWS

Staff Profiles

Michael Gallagher

I have been with NEHA for a little over a year. I moved to the Denver area from Montana last January and have loved it ever since. I started out as an administrative assistant and I am currently the logistics and training coordinator for NEHA's Entrepreneurial Zone. I am responsible for the logistics of instructor-led training classes including scheduling, lodging, and transportation contracts; on-site logistics; and student, instructor, or staff travel. Along with all the great people I work with on a day-to-day basis, I really enjoy being able to travel and experience new things both on and off the clock.

I graduated from the University of Montana Western with a Bachelor of Science in business administration. After graduation I returned to my hometown for the summer and finally made it to Denver a few months later. I had heard great things about Denver and was hooked after being able to play golf in January! After combining the golf, mountains, and sunshine, I think I will be sticking around this town for quite some time.

I am excited for this year—2014 should be very exciting and busy for the rest of the NEHA staff and me.

Joshua Schrader

I took over the sales and training support position in NEHA's Entrepreneurial Zone in April 2013. I come from a career in various aspects of the marketing field including market research, demographic analysis, sales, and advertising. I've also run my own promotions company since 2001, working with a variety of artists. Being an entrepreneur myself, I feel I bring a special insight into the business needs of our food safety trainers, and I am well prepared for the industry changes that occur on a regular basis.

Born and raised in Colorado, I continue to enjoy the Denver area and all it has to offer in terms of art, music, and culture. I've been heavily involved in volunteering and fundraising for various nonprofit groups since my early teens and continue to devote the majority of my time to help make a difference in the community.

NEHA's Sustainability and Climate Change Activities

NEHA has been very busy with sustainability and climate change activities. Vanessa DeArman oversees most of these activities with the input and collaboration of other NEHA staff. The following is a list of recent projects.

- **Project Citizen panel judge** (May 2013)—Vanessa served as one of three experts on sustainability/environmental issues for Colorado's Project Citizen Showcase last spring at the Colorado State Capitol. As a panel member she listened to three short student presentations in the format of a simulated legislative hearing in which elementary and middle school students describe a school, local community, or state environmental problem and their policy proposal for addressing it. NEHA staff member Terry Osner is a regular volunteer for Project Citizen and invited Vanessa to participate.
- **Project Citizen meeting with George Washington High School students** (November 2013)—NEHA staff members Larry Marcum, Terry Osner, and Vanessa, along with Jenn Titus from Waste Management, met with two George Washington High School students to assist them with their Project Citizen assignment. The policy issue the students chose was keeping plastic bags out of landfills and the possibility of a plastic bag ban/fee. NEHA staff shared information about NEHA and Jenn shared Waste Management information and recycling/landfill issues. Their timing could not have been more perfect as this issue was addressed by the Denver City Council. NEHA was able to share environmental health information addressing recycling/solid waste policies and let them know that NEHA is an important resource. The students were extremely grateful for NEHA's help.
- **NEHA recycling demo on "America Recycles Day"** (November 15, 2013)—On America Recycles Day, Vanessa conducted a recycling demo (and Dumpster dive) presentation. The presentation included examples of what is and is not recyclable by identifying items from the trash as well as the recycling bins. It was a very interactive session with a lot of discussion and participation from the staff who attended.
- **Green news e-mail on how to make your Thanksgiving more green** (November 2013, http://ecowatch.com/2013/11/21/14-ways-to-green-thanksgiving/)—An e-mail was sent to staff on tips to make their Thanksgiving more green. The information was also posted on NEHA's social media sites.
- **University of Colorado, Boulder sustainability practices program: online professional certificate in community sustainability management** (January–September 2014)—Vanessa is enrolled in the University of Colorado, Boulder's online sustainability practices certificate program (noncredit) that is geared toward working professionals. Sustainability is still a very new and growing field and to benefit NEHA's sustainability and climate change activities even more, education is a great next step. Vanessa received a loan for this educational opportunity but is also researching scholarships and other funding opportunities.
- **2014 New Partners for Smart Growth Conference** (February 2014)—NEHA staff member Jill Schnipke joined Vanessa to attend this multidisciplinary conference offering plenary sessions, breakouts, and workshops. It featured cutting-edge policies and programs, projects, best practices, and strategies and implementation tools that address the challenges of implementing smart growth development principles.

As you can see, the activities include both staff education and community outreach with many more activities being developed. NEHA hopes to turn these activities into an official program and is continuously researching grant funding opportunities on sustainability issues and the health effects of climate change to fund this future program. The Community Volunteer Event at NEHA's Annual Educational Conference (AEC) & Exhibition is also part of these sustainability activities and details are provided in the 2014 AEC information (www.neha2014aec.org). If you have any ideas or suggestions to share with Vanessa, please feel free to contact her at vdearman@neha.org.

NEHA Supports National Healthy Schools Day

National Healthy Schools Day (NHSD) is April 8, 2014. NEHA is pleased to partner again with the Healthy Schools Network (www.healthyschools.org) in supporting and promoting this event. NEHA has been a supporter since 2011. NHSD is a national partnership campaign for indoor air quality in schools coordinated by the Healthy Schools Network with involvement from the U.S. Environmental Protection Agency (U.S. EPA), other federal agencies, and numerous organizations.

The Healthy Schools Network is the leading national voice for children's environmental health in schools and is an award-winning 501c3 nonprofit environmental health organization. Founded in 1995, the network launched the national healthy schools movement with comprehensive state policy recommendations and a model coalition. It has since fostered reform coalitions in many states and localities.

NHSD promotes the use of U.S. EPA's IAQ Tools for Schools guidance (www.epa.gov/iaq/schools/index.html) as well as other U.S. EPA environmental health guidelines and programs for schools and children's health.

NEHA Government Affairs and Research and Development Managing Director Larry Marcum stated, "NEHA and the thousands of practitioners we represent in the environmental health profession recognize children's environmental health issues as being one of our core priority areas. Our work in the area of school food safety, indoor air quality in schools, asthma trigger risk reduction, and smoking cessation are all reflective of that concern. NEHA is proud to join our colleagues in many other organizations in offering its strong support of this year's National Healthy Schools Day."

For more information about NHSD, please visit www.nationalhealthyschoolsday.org.

NEHA MEMBERSHIP

WHAT DOES MEMBERSHIP IN THE NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION OFFER YOU?

As a member of the National Environmental Health Association (NEHA), you join over 4,500 environmental health and protection professionals from across the nation and around the world in the public and private sectors as well as academia and the uniformed services in the only association serving ALL of environmental health and protection and ONLY environmental health and protection!

Benefits of NEHA membership include:

A Free Subscription to the Esteemed Journal of Environmental Health

- Find out why subscribers from around the world go to the *Journal of Environmental Health (JEH)* to stay current on the latest technological, legal, and research-based advancements in environmental health and protection. The *JEH* is an esteemed, peer-reviewed journal published ten times a year to keep you informed!
- **NEW!** Get an electronic copy of the *JEH*. Beginning with the November 2013 issue, NEHA members will receive the *JEH* in an electronic format for free in addition to receiving it in print.

Continuing Education

- Maintain your NEHA credential(s) with access to free educational courses and continuing education credits through NEHA's e-Learning site.
- Study environmental health abroad through the NEHA/UL Sabbatical Exchange Program!
- Take advantage of unique training opportunities through NEHA workshops on topics such as indoor air quality, radon resistant new construction, and Epi-Ready at little or no cost!

Savings and Discounts

- Receive big discounts on attendance to the NEHA Annual Educational Conference & Exhibition where you can acquire practical and real-world information, expertise, and training on a variety of environmental health topics and network with other professionals and experts in the field.
- Get significant discounts on credentialing fees as you look to advance yourself professionally by earning a credential offered by NEHA.
- Receive discounts on more than 150 environmental health and protection publications available in NEHA's online Bookstore!

Join/Renew Today at neha.org/member

NEHA is also working hard to bring you a membership that fits your particular wants and needs. We are working to evolve the NEHA membership options available to you including a multiyear dues option and the opportunity to receive an electronic version of the Journal of Environmental Health. *Updates and information are available at neha.org.*

Managing Editor's Desk
continued from page 78

apprentice programs, continuous learning, and developmental assignments, where the task is not so much to do something as it is to develop the skill that would enable the employee to do something in particular in the future and do it exceedingly well.

Capability development! In my mind, this is a powerful phrase and idea.

Once we can root this idea into both our thinking and our systems for developing our employees, other components of our personnel systems can be expected to change as well. Take performance reviews for example. The literature suggests that these will evolve more into coaching, development, continuous goal alignment, and even recognition experiences. The emphasis is changing from evaluating people to helping them to achieve extraordinary performance.

Managers in turn will be evaluated based on whether they consume talent or produce it.

Over the years, I have spent hours in this column talking about the future. I've done this because it is NEHA's job to be a step ahead and to prepare people for the world that is emerging as opposed to the world we are leaving behind. If we can't prepare you for a successful future, then we've lost any right to call ourselves dynamic and visionary to say nothing of how meaningless our value proposition becomes.

I've learned over my years at NEHA that many environmental health professionals are drawn into our professional field of practice because of its appealing cause and mission. I've also seen, however, how this noble intention often gets upstaged when the best among us are offered higher salaries to move on.

It doesn't have to be this way.

While there will always be a segment of any workforce that will be drawn to the higher compensation, other factors can create an equal or even stronger pull in the direction of staying. We hear a lot about people in general and millennials in particular valuing meaningful and rewarding work experiences. What is a meaningful and rewarding work experience? I would suggest that it is one that allows for (and even encourages) innovation and creativity. It is also a work environment that invests in the individual development of its employees.

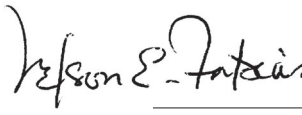
While the intention behind this column is mostly to spark some thinking among employers about developing their staff, rather than just using them, I can't resist adding a comment about NEHA. For some time, we have observed a slow but clear progression of thought/action among employers when it comes to employee development. Largely because of tight budgets, funding for education has pretty much become a lost cause. If an employee wants to become educated, good luck. That's something to be had on one's own dime.

For a while, we found some traction with the idea of "training" and so oriented a lot of what NEHA has to offer in that direction. But budgets rule and in recent years, even selling training has been a hard sell.

With this latest idea, however, an irony of sorts begins to seep into the bigger picture. The very financial pressures that have had employers cut funding support for developmental experiences is now pressuring the system to fund capability development. For one thing, we need certain capabilities within our staff. Repeat: we need certain capabilities within our staff. For another, the highly skilled are the ones driving productivity gains, the very gains that we have to achieve if we are to survive on the leaner budgets that we operate on today.

We are therefore driven to learn more about the capabilities that employers of environmental health professionals need from among their staff and to be your partner in providing opportunities for the development of those capabilities. This idea is central to a lot of our current thinking about conference programming as well as how we organize our vast volume of learning resources to best help you.

In the end, we're in this together. Our mission remains being a valuable resource for the advancement of this profession.



nfabian@neha.org

MY NEHA:

YOUR KEY TO EASY PROFILE MANAGEMENT AND SELF-SERVICE ONLINE

Because of our growth, the National Environmental Health Association (NEHA) is implementing a new and more powerful system to manage data and operate the association. You, the NEHA members and customers, will benefit greatly from this new system as it provides you with the ability to more easily manage your personal profile and transactions with NEHA.

With just one login and password you will create your My NEHA profile. Through this profile you can easily manage your profile and update your contact information, join NEHA as a member or renew a current membership, review your credentials and continuing education credit requirements, buy products, register for events, and review your purchase history!

Visit neha.org to create your My NEHA profile.

My Contact Information
Easy Profile Management and Self-Service

- Change your profile password or request a new password in the event of a forgotten password
- Update your contact information
- Manage your e-mail preferences to receive e-mails only on the topics most important to you

My Membership and My Professional Development
Manage Your Membership and Credentials

- View your member record to see when your membership expires and automatically renew online
- View your credential record to see your credential number, expiration date, and other pertinent information related to each credential you hold
- Review your continuing education credit submissions to see which were approved/rejected, how many credits were applied, and to which credential the credits were applied

Shop Online

- It's time to get registered for the NEHA 2014 AEC, so shop online and purchase your conference registration using My NEHA
- Purchase membership, books, and more
- Handle open orders, invoices, and other transactions
- Receive a receipt automatically via e-mail for your purchases

My Transactions
Access Your Transaction History

- View all of your transaction history within your profile whether it is products you've purchased, events you've attended, and/or memberships and credentials you hold
- Review invoices and pay any outstanding balances through the online store
- Access receipts for previous purchases

WATCH VIDEO ENHANCED FEATURE ACCESSIBLE THROUGH THE E-*JOURNAL*

78th National Environmental Health Association (NEHA)
Annual Educational Conference (AEC) & Exhibition in Partnership
with the International Federation of Environmental Health (IFEH)

REGISTER TODAY | JULY 7–10, 2014 LAS VEGAS, NEVADA

Building a World of Innovative Ideas for Environmental Health

78th NEHA AEC

IN PARTNERSHIP WITH THE
IFEH 13TH WORLD CONGRESS

ENHANCED FEATURE ACCESSIBLE THROUGH THE E-*JOURNAL*

Check out this video from the 2013 AEC to see why you should attend the 2014 AEC!

neha2014aec.org

Follow NEHA on: Twitter Facebook LinkedIn

78th NEHA AEC

Don't miss this unique experience: The NEHA 2014 AEC is being held in collaboration with the International Federation of Environmental Health! This is an unprecedented and exciting opportunity to explore innovative ideas, approaches, and methods with environmental health professionals from all over the world.

Reasons Why

Attending the NEHA AEC Is a Wise Investment for You and Your Organization

1. The NEHA AEC is a premiere training and educational event for you to gain the skills, knowledge, and expertise needed to build capacity for environmental health activities, help solve your environmental health organization's daily and strategic challenges, and make recommendations to help improve your bottom-line results.
2. The NEHA AEC has fantastic session speakers that are environmental health subject matter experts, industry leaders, peers that share common challenges, and this year—speakers will come from all over the world!
3. Your attendance at the NEHA AEC is a solid investment in your organization that will result in immediate and longer-term benefits.
4. You can earn continuing education (CE) credit to maintain your professional credential(s).
5. NEHA is committed to providing you with a training and educational experience that also provides a return on investment (ROI) made for you to attend the AEC.

Need additional reasons why you should attend?

Check out the videos on neha2014aec.org to hear what other environmental health professionals are saying about the NEHA AEC.

AEC SPONSORS & PARTNERS

The National Environmental Health Association would like to recognize the following sponsors for their generous support of the Annual Educational Conference & Exhibition:

In addition, we thank the following partners for their continued efforts to enrich the environmental health profession:

Association of Pool & Spa Professionals

Centers for Disease Control and Prevention

State Onsite Regulators Alliance and Captains of Industry

Uniformed Services Environmental Health Association

U.S. Department of Agriculture Food and Nutrition Service

U.S. Environmental Protection Agency

U.S. Food and Drug Administration

COMPLETE AND UP-TO-DATE INFORMATION CAN BE FOUND ONLINE AT NEHA2014AEC.ORG.

PRE-CONFERENCE WORKSHOPS

Schedule is subject to change.

Industry-Foodborne Illness Investigation Training and Recall Response (I-FITT-RR) Workshop

Monday, July 7, 8:00am – 5:00pm

Do you and your staff know what to do if a foodborne illness or food recall occurs? If not, you need to attend this workshop to get the critical training needed to respond to these issues.

This NEHA/FDA supported workshop is designed to bridge the gap between the retail food industry and local and state regulatory officials in an effort to create stronger working relationships prior to a potential foodborne incident or recall occurring. It will help you

- understand the steps for responding to a potential illness outbreak,
- know what to do when you get customer or product complaints,
- learn what's involved in food recalls and what you need to do, and
- be more familiar with the different agencies that work together to help you get through a food-related crisis.

This workshop is designed for retail food stores and food service establishments (restaurants, grocery stores, casinos, etc.); single unit to large chains; mid-level managers and above; and quality assurance/quality control professionals.

Cost to attend is $39 per person and space is limited to 30 people.

Springboard to Prevention: The Model Aquatic Health Code, 1st Edition

Monday, July 7, 1:00 – 5:00pm

Over the past six years a group of public health, academic, and industry experts have been working with CDC to develop the first comprehensive public health guidance for swimming pools and aquatic venues in the U.S. This workshop will present the first completed version of the Model Aquatic Health Code (MAHC). The MAHC will be a guidance document that can help local and state authorities update or implement swimming pool and spa codes or standards without having to "recreate the wheel." The workshop will cover

- common health concerns at aquatic venues,
- key concepts influencing lifeguarding staffing plans,
- secondary disinfection, and
- a science-based operational and communication support toolkit for aquatic and pool programs.

Cost is free with a full or one-day conference registration to the NEHA 2014 AEC.

ENVIRONMENTAL HEALTH ADVANCEMENT

CREDENTIAL AND CERTIFICATION COURSES AND EXAMS

Schedule is subject to change.

Advance your expertise and career potential by obtaining a NEHA credential or certification at the AEC. You may choose to take just a credential/certification course, just an exam, or both a course and an exam while at the NEHA AEC.
(Note: Only qualified applicants will be able to sit for an exam.)

Certified Professional of Food Safety (CP-FS)

Friday & Saturday, July 11 and 12, 8:00am – 5:00pm

This two-day refresher course is designed to enhance your preparation for the NEHA CP-FS credential exam. Participants are expected to have prior food safety knowledge and training equal to the eligibility requirements to sit for the CP-FS exam. The course will cover exam content areas as described in the job task analysis. The instructor will be available during and after the course for questions.

Cost: $325 for members and $425 for non-members, which includes the CP-FS Study Package (newly revised and updated CP-FS manual, *NEHA's* Professional Food Manager *book, and the* 2009 and 2013 FDA Food Codes *on CD), a $145 value.*

Exam: Sunday, July 13, 8:00 – 10:30am
Separate application and exam fee required. $245 member/$390 non-member. Deadline to apply to take the exam is May 30, 2014.

Certified in Comprehensive Food Safety (CCFS)

Wednesday & Thursday, July 9 and 10, 8:00am – 5:00pm

NEHA is pleased to offer the introductory course for the Certified in Comprehensive Food Safety (CCFS) credential at the 2014 AEC. The CCFS is a strong core credential for food safety professionals with a primary concern of overseeing the producing, processing, and manufacturing environments of the U.S. food supply. It has been designed to meet the increasing need for highly qualified food safety professionals from both industry and the regulatory community that provide oversight in preventing food safety breaches at U.S. production and manufacturing facilities and abroad. The credential course will cover exam content areas as described in the job task analysis. The course will utilize different learning modalities from critical thinking exercises to small group breakouts and videos.

Cost: $325 for members and $425 for non-members, which includes NEHA's brand new CCFS Preparation Guide.

Exam: Friday, July 11, 8:00 – 10:30am
Separate application and exam fee required. $245 member/$390 non-member. Deadline to apply to take the exam is May 30, 2014.

Registered Environmental Health Specialist/ Registered Sanitarian (REHS/RS)

Friday & Saturday, July 11 and 12, 8:00am – 5:00pm
Sunday, July 13, 8:00am – 12:00pm

This two and a half day refresher course is designed to enhance your preparation for the **NEW 2014 NEHA REHS/RS credential exam.** Participants are expected to have a solid foundation of environmental health knowledge and training equal to the eligibility requirements to sit for the REHS/RS credential exam. This course alone is not enough to pass the REHS/RS credential exam. The class will cover exam content areas as described in the job task analysis. The instructor will be available during and after the course for questions.

Cost: $499 for members and $599 for non-members, which includes the newly revised and updated REHS/RS Study Guide*, a $179 value.*

Exam: Sunday, July 13 1:00 – 6:00pm
Separate application and exam fee required. $265 member/$450 non-member. Deadline to apply to take the exam is May 30, 2014.

The July 13 REHS/RS exam is newly revised. Visit neha.org/credential/rehs2014 for new course outline, updated study guide, and other details.

Certified Pool/Spa Operator® Certification Course (CPO®)

Friday & Saturday, July 11 and 12, 8:00 am – 5:00 pm (includes exam)

This two-day course is designed to provide individuals with the basic knowledge, techniques, and skills of pool and spa operations. The CPO® certification program includes pool and spa chemistry, testing, treatment, filtration, maintenance, automatic feeding equipment, and government requirements. The CPO® certification program requires an open book written examination and certification is valid for five years.

Cost: $300 for members and non-members, which includes the NSPF Pool & Spa Operator Handbook *and CPO® certification fee, a $115 combined value.*

CONTINUING EDUCATION (CE) CREDITS

Earn up to 24 hours of CE contact hours (enough to meet your full two-year NEHA professional credential requirement) by attending and participating in the NEHA AEC. CEs can be fulfilled by attending:

- First Time Attendee Workshop
- Training and Educational Sessions
- The Keynote Session
- Pre-Conference Workshops
- Credential Review Courses
- Educational sessions via the Virtual AEC while they are being shown live during the AEC or as an archive after the AEC is over

INNOVATION & INTERNATIONAL SESSIONS

Building a World of Innovative Ideas for Environmental Health

This year's combined NEHA and IFEH event will offer sessions that help environmental health professionals adapt to and excel in the ever-changing economic, professional, and global landscape by learning the best tips, tricks, and tweaks needed to thrive in their positions.

CHILDREN'S EH

Keeping Children Safe and Healthy Through Comprehensive Child Care Center Regulations
Are your children protected against secondhand smoke, scalding hot water, and shigellosis outbreaks in the child care center where they spend a great deal of time? Are they assured of receiving healthy meals and regular outdoor exercise in a safe playground? Learn in this session how one county developed environmental health regulations to ensure protections against these and other environmental hazards and how you can do the same in your jurisdiction.

EMERGENCY PREPAREDNESS & RESPONSE

Environmental Health and Disaster Management: An International Effort for Training and Awareness
Globally, environmental health professionals have a critical role in mitigating public health risks before and after disasters. To build this capacity, IFEH, CDC, and NEHA have collaborated to develop the course "Environmental Health and Disaster Management," which was heavily guided by CDC's successful Environmental Health Training in Emergency Response course. Attend this session to see how this type of course promotes the profession and ensures that professionals are adequately equipped to prepare, respond, recover, and mitigate the adverse impacts of disasters internationally.

Incorporating Emergency Preparedness into Retail Food Facility Inspections
What can you do to make food facilities strong and capable of moving forward after a disaster? This session will describe how to efficiently address emergency preparedness with operators during routine food facility inspections and will provide resources for your reference. This approach provides an opportunity for the regulator and operator to partner not only to increase chances of the facility's success after a disaster, but to reduce time spent on post-disaster assessment, and protect the public's health at the same time.

Protecting the Living Environment of Survivors in Congregate Shelters During Disasters: Is Public Health Ready?
Shelters play an important role in providing safety and basic human needs for survival during disaster situations and are an important priority for public health agencies responding to any disaster. This session will describe the current knowledge and use of assessments as well as the importance and benefits of using them as a data collection tool for decision making and occupant protection. Attend this session to see how to implement assessment procedures and tools in your jurisdiction's disaster response.

Disaster Management Challenges From Non-Communicable Diseases: Lessons Learned and Questions Going Forward
Due to population aging and an increase in longevity, there has been a disease transition to non-communicable diseases (NCDs), which are the challenge for the 21st century. This is a new concept for environmental health and disaster management to explore, as the focus has traditionally been on communicable diseases in the disaster setting. Today, damages to public health infrastructure such as food, water, and sanitation place the vulnerable population with NCDs at great

risk. Attend this group exercise to discuss and debate possible approaches to and roles environmental health professionals play in mitigating the risks of disaster.

ENVIRONMENTAL JUSTICE

101 Ways to Improve Health Equity
IFEH works to disseminate knowledge concerning environmental health and promote cooperation between countries where environmental health issues are transboundary. IFEH recently adopted Policy 10, based on the WHO report "Closing the Gap in a Generation," which aims to improve health equity through action on the social determinants of health. The session will showcase how colleagues around the world are making a difference! What problem are they addressing? What actions have been taken? What outcomes are being delivered? And, how can YOU make a difference where YOU are?

FOOD PROTECTION AND DEFENSE

Foods Without Frontiers
"Farm to Fork" is a great slogan, but how do we really ensure food safety when the farm is in one country, processing in another, and consumers in a third, fourth, or more countries? Using the recent international food safety recall of Karicare Whey Protein Concentrate for a contaminated ingredient, you'll see that simply knowing about an adverse event in your country is no longer enough. This session will identify gaps in international incident notification systems such that attendees will be equipped to act to fill those gaps and respond promptly and efficiently to the next incident that arrives at the shipping dock.

Focusing Disney Magic on Food Safety
This Learning Lab will demonstrate how the latest Disney technologies and smart temperature probes are being used in food service food safety and impacting inspections. When you put your hands on these technologies in this session, you'll have a FASTPASS for food safety. Bypass the complexity. Go straight to the critical control points. Take your process for a ride. And when it's all over, you get a digital "picture" for your records. This session will give you the skills and confidence you need to conduct inspections or audits in facilities using these types of technologies.

How to Deliver Effective Food Safety Programs on a Tight Budget
Due to the worldwide economic downturn and its effect on government spending, existing UK delivery models for food hygiene inspections are now in need of review. This session will quantifiably describe the economic and programmatic challenges agencies are facing using Wales as the example. The session will examine the traditional food hygiene inspection program model and then evaluate contemporary adaptive approaches that are more innovative, imaginative, and targeted. These techniques may help your agency provide a quality service while protecting public health.

Catch Me If You Can–Misbranding, Adulterating, and Counterfeiting Foods: A National/International Food Incident Workshop
Recent food fraud incidents involving melamine, horse meat, and rat meat necessitate that local, national, and international government and industry stakeholders have knowledge of response when an incident occurs in their jurisdictions. The newest FDA Food Related Emergency Exercise Bundle (FREE-B) exercise explores such a food fraud scenario. When faced with this situation, what are the risks? Who gets involved? What are the handoffs to different national or international government agencies? This workshop includes live participation of international stakeholders via a web platform. In addition, related multi-lingual educational materials will provide attendees with immediately applicable resources for the stakeholders in their own jurisdictions.

HEALTHY HOMES AND COMMUNITIES

Clever Software Tools That Advance Health in Homes
Get an introduction to the Housing Health and Safety Rating System (HHSRS) and English housing enforcement work. Then try two useful software tools to help with using HHSRS. Hunt for hazards in a virtual home, a tool which can be taken away for free. Then try an online tool to justify budgets by calculating the cost savings from using the HHSRS. Bring your laptops and tablets!

Implementing a Community-Based Child Care Program Utilizing the Healthy Homes Rating System
This session will review a case study of the expansion of the local healthy homes program to home-based and small child care providers. A community organization created a new healthy child care assessment program based on the Healthy Homes Rating System. The program rates 29 environmental, health, and safety hazards for their potential to harm residents and enables those risks to be mitigated. The local fire department even accepts the assessment as equivalent to a fire inspection. Attend this session to learn how a program like this can benefit your community.

LAND USE PLANNING & DESIGN

Outside-the-Box Advocacy: Organizing Public Health's Engagement in Built Environment Advocacy
The buzz phrase "Health in All Policies" has almost become ubiquitous, especially in public health's efforts to come to the land use planning and infrastructure design discussion. Tulsa Health Department will share their project's success using community engagement and collaborative relationships. They'll provide you with some innovative techniques to use when resources are limited to educate and advocate for health with decision makers, the public, and your own agency.

Annoyance and Perception of Noise in Rural and Urban Areas of France
Traffic, urban, and occupational noises are now described as major environmental problems, which can greatly interfere with health. This session will discuss the results of a survey conducted to identify the perception of noise pollution in occupational and domestic environments. Attend this presentation to identify possible interventions and recommendations that may alleviate health risks from noise pollution.

NEHA and SORA are again partnering to bring together onsite regulators and industry leaders for decentralized and onsite wastewater treatment. The sessions offered by the NEHA and SORA partnership will focus on topics such as sustainability, reuse, reciprocity, and other emerging issues.

ONSITE WASTEWATER

Sustainability Is the Name of the Game: EPA's Decentralized Wastewater Program Efforts
There are small and underserved rural communities across the U.S. in need of first-time and adequate access to water and

wastewater infrastructure. Through joint efforts with many government agencies, EPA has developed programs and tools such as workshops in a box to assist these communities in creating sustainable solutions that will meet their current and future needs. Attend this session to gain knowledge and resources to implement programs in your community even on a shrinking budget.

Currumbin–A Community Designed Around Environmental Sustainability and Wastewater Reuse in Queensland, Australia (NEHA/SORA session)
On the Gold Coast of Queensland, Australia, EcoVillage at Currumbin is a community focused on implementing and teaching sustainable development principles. Wastewater systems were chosen that created the lowest total impact to the environment in its manufacturing, construction, and operation. After treatment followed by UV and chlorine disinfection, the wastewater from 144 homes and numerous community facilities is recirculated to homes for reuse via toilet flushing, car washing, garden watering, and landscape irrigation. Attend this session to see how these award-winning techniques could make a difference in your community.

PATHOGENS AND OUTBREAKS

Who's Missing From the Table? Building Partnerships With the Medical Community in Foodborne Illness Surveillance
Detecting increases in self-reported foodborne illnesses and low report rates by medical providers, Kern County Environmental Health implemented an innovative approach to enhance collaboration between environmental health, public health, and the medical community. The execution of the Foodborne Illness Surveillance Guidance Training for Medical Professionals became a successful method in communicating with the medical community and improving foodborne illness surveillance. This presentation will provide an overview of the workshop design, challenges, results, and next steps that you may want to apply within your community.

Restroom Infection Control: Chlorhexidine, the Final Frontier
Pioneering, award-winning work at the Queen Elizabeth Hospital, UK, has demonstrated the remarkable residual antimicrobial activity of chlorhexidine on surfaces, thereby maintaining their continuous cleanliness over time. In this school-setting trial, the presenters will demonstrate significant improvements in continuous cleanliness of restroom door handles. Attend this session and join in the discussion of the possible benefits of applying this simple, inexpensive technique beyond clinical and office environments.

RECREATIONAL WATER

Rethinking Recreational Water Monitoring: Can Predictive Modeling Increase Public Health Outcomes?
Canadian recreational water safety practices are put into an international context by comparing them with the EPA and WHO guidelines. A review of the use of a geometric mean will identify the limitations of using bacteriology in general, and the geometric mean of *E. coli* in particular, as the basis of recreational water safety decision-making, and determine the most appropriate, evidence-based values of the geometric mean for recreational water to be considered safe. Use these results in your organization to create a comprehensive risk assessment strategy, forecasting models, and risk management approaches to posting recreational water safety.

Developing a Drowning Prevention Awareness Program That Works for You (NEHA/APSP session)
The Florida Department of Health, Brevard County, won the 2013 Dr. Neil Lowry Award for their very successful drowning prevention program. This presentation will illustrate the importance of public outreach and demonstrate how to fund your program with grant writing and develop novel partnerships. Could implementing these key elements save lives in your community?

VECTOR CONTROL & ZOONOTIC DISEASES

Get Results! Tools for Managing a Public Health Nuisance Program (Sponsored by Orkin)
The housing crisis and diminished mental health services have resulted in more complaints and public health nuisance inspections at Franklin County Public Health. See how simple triage and scoring tools were used to categorize and prioritize complaints to get results and gain recognition in the community. In this session, you'll be able to evaluate this approach and test these tools as a way for your department to manage public health nuisances with limited funds and staff.

Integrated Approach to Malaria Prevention in Uganda: Experiences From a Pilot Project
This pilot project promoted an integrated approach to the prevention of malaria at the household level in two rural communities where malaria is the leading cause of morbidity and mortality. This project conducted a baseline survey on malaria prevention knowledge and practices, trained community health workers, increased awareness of the population of an integrated approach to malaria prevention, and established study demonstration sites. The integrated approach to malaria prevention was well received by the study communities and work continues to assess health benefits and community perceptions of this approach. Available data will be shared with attendees during the session.

WATER QUALITY

Tools and Data for Identifying Areas With a High Potential for Private Well Contamination
In many areas there are concerns about private well water quality, but little data on levels of contaminants such as nitrate, arsenic, and uranium. We have compiled extensive groundwater quality data from national, state, and local sources and generated maps spanning the U.S. showing where there is the greatest chance of elevated levels of these contaminants. In this session, you will be shown how to access and interpret these maps and data for application in your jurisdiction.

Attend the Awards Ceremony on July 8 to find out who wins the NEHA Environmental Health Innovation Award.

In its second year, this award is presented to an individual, team, or organization for an innovative contribution in the form of a new idea, practice, or product that has had a positive impact on improving environmental public health and the quality of life. Change that promotes or improves environmental health protection is the foundation of this award.

MORE SESSIONS BY TRACK

Acquire comprehensive information from subject matter experts and industry leaders, and learn from your peers as you share.

CHILDREN'S EH

- Lessons Learned About Environmental Health in the World of Child Care
- Beating the Odds: Eliminating Lead Exposure for Kids in the Nation's Capital
- Association Between Risk of Birth Defects and Arsenic Concentrations in Soils of China

EMERGENCY PREPAREDNESS & RESPONSE

- Hurricane Sandy: A Complex Environmental Health Communications Challenge
- Enhancing Planning and Preparedness: Development of an E-Learning Tool for Chemical Incidents
- Public Health Preparedness: Examination of Legal Language Authorizing Responses to Radiological Incidents
- Destructive Wildfires and Devastating Floods: EH's Response and Role in Recovery
- To Tweet or Not To Tweet: Leveraging Social Media for Environmental Health

FOOD PROTECTION AND DEFENSE

- Food Safety Focus Series I: A National Collaborative Effort to Support the FDA National Retail Food Regulatory Program Standards *(Sponsored by Prometric and Skillsoft)*
- Food Safety Focus Series II: Local Experiences With the FDA Retail Food Program Standards *(Sponsored by Prometric and Skillsoft)*
- Food Safety Apps Can Improve Food Safety Standards
- Applying a Behavior Change Model Proven to be Effective in Child Care Settings to Licensed Food Establishments
- Investigation of a Large Foodborne Illness Outbreak in Toronto, Canada
- Southern Nevada Health District THINK RISK Initiative
- FDA's Oral Culture Learner Project: Helping Food Employees Understand the Importance of Food Safety
- The Great Food Truck Race…for Food Safety
- Flip the Fear: How the FDA, ADA, and Lesley University Changed the Face of Public Health and Food Safety in 2013
- Nanotechnology Implications for Food and Food Safety

HAZARDOUS MATERIALS AND TOXIC SUBSTANCES

- Burning to Know: Neighborhood Mercury Exposure From Crematoriums
- Lead Poisoning Outbreak Resulting From Construction and Renovation at an Indoor Firing Range
- Smoke and Ash Deconstructed—Not Just Particles

HEALTHY HOMES AND COMMUNITIES

- Hazard Assessment in Houses and Some Clever Software Tools
- Multi-Agency Approach in the Closure of a Motel
- Fungal Bioburden in Foreclosed Homes Using ERMI[sm] as an Indicator
- The Public Health Challenge of Hoarding
- Pesticide Usage and Pesticide Dust Concentrations in Residences of Asthmatic Children Living in Subsidized Housing in Philadelphia

LAND USE DESIGN & PLANNING

- Developing Policy to Address Near Roadway Pollution Health Hazards
- Annoyance and Perception of Noise in Rural and Urban Areas of France
- Outside-the-Box Advocacy: Organizing Public Health's Engagement in Built Environment Advocacy
- Levels of Heavy Metals in Traffic-Related Particulate Matter Along a Major Motorway in Nigeria
- Keys to Facilitating Healthy Cities Partnership in Indonesia: A Case Study
- Air Quality Assessments Using Satellite Derived High Resolution Aerosol Optical Depth Retrievals

LEADERSHIP/MANAGEMENT

- Building Agency Capacity
- Leadership Development: Key Considerations for Mentoring Millennials
- Characterization of Competencies Required for Successful Environmental Health Work
- American Academy of Sanitarians Presents an Environmental Health Master Class
- Building an Environmental Health Program of Excellence in a Time of Austerity
- Organizational Culture Change: A Local Experience of Going From Fair to Great
- Implications of the Affordable Care Act on Environmental Health

ONSITE WASTEWATER

- Transfer of Property Requirements: Training, Certification, and Politics
- Grey Water and Water Reuse in the Southwest
- Market Impacts of Product Testing, Product Acceptance, and Regulations (NEHA/SORA session)
- Onsite Wastewater Treatment and the Value of Independent Certification
- The Proliferation of Blue-Green Algae: Context, Challenges, and Innovative Solutions
- Realtors and Environmental Health, Partners in a Successful Mandatory Point-of-Sale Program

Be a voice.

You Spoke, We Listened...

NEHA used your participation in our 2014 Abstracts Blog and your responses to our conference surveys as guidance in choosing sessions and developing the training and education program. THANK YOU for giving us feedback so we can advance the proficiency of the environmental health profession AND help create bottom line improvements for your organization!

FROM THE BLOG

- The Great Food Truck Race...for Food Safety
- Restroom Infection Control: Chlorhexidine, the Final Frontier
- Arsenic in Iowa's Groundwater—The Unknown Threat: A Pilot Study in Cerro Gordo County
- Triggers for Change in the Safest Place on Earth
- Disaster Management Challenges From Non-Communicable Diseases: Lessons Learned and Questions Going Forward

FROM CONFERENCE SURVEYS

- Inspection technology and use of apps in EH:
  - » Help! Everyone Wants My Data: A Look at Streamlining Data Collection for Environmental Health Programs
  - » Enhancing Planning and Preparedness: Development of an E-Learning Tool for Chemical Incidents
  - » Focusing Disney Magic on Food Safety
  - » Food Safety Apps Can Improve Food Safety Standards
  - » Using the Lean Program to Improve Efficiency in Environmental Health Services
- The Leadership/Management track will address your concerns related to:
  - » The future of the EH practice
  - » Demonstrating program effectiveness
  - » Value and return on investment for environmental health programs
  - » Building agency capacity under reduced budgets and staffing collaborations/programs
- Hoarding, bed bugs, and rats—we've got them covered in our Vector Control & Zoonotic Diseases and Healthy Homes and Communities tracks!
- Evaluation of the built environment and its link to public health—check out sessions in the Land Use Planning & Design track!

PATHOGENS AND OUTBREAKS

- Don't Gamble With Norovirus: Prevention, Control, and Containment of a Norovirus Outbreak in a Casino
- Issues and Challenges: Investigation of a Foodborne Outbreak in Jamaica
- Investigation of a Foodborne Illness Outbreak in Toronto, Canada

RECREATIONAL WATERS

- Chlorine Resistant Pathogen Treatment Strategies for Recreational Water (NEHA/APSP session)
- Gage-Bidwell Law of Purification: Old Errors Corrected and New Relevance Identified (NEHA/APSP session)
- Developing a Drowning Prevention Awareness Program That Works for You (NEHA/APSP session)
- Hot Tub and Spa Inspection Data: The Power to Prevent Illness and Injury
- Pool and Spa Safety Act Program: Implementation and Findings in Seattle and King County

SCHOOLS/INSTITUTIONS

- Food-Safe Schools: Food Safety Beyond the Cafeteria
- School Indoor Air Quality Improvement: Lessons from Multnomah County, Oregon
- Correcting Corrections: Surviving Jail Inspections and High Risk Inmate Activities

SUSTAINABILITY/CLIMATE CHANGE

- Climate Change and Sustainability: Navigation of Governance, Energy, and Built Environment Opportunities
- Triggers for Change in the Safest Place on Earth
- International Perspectives on Climate Change and the Role of Environmental Health
- Climate Change Impacts and Options: Case Studies in the Northwest Arctic Borough, Alaska

TECHNOLOGY AND EH

- Help! Everyone Wants My Data: A Look at Streamlining Data Collection for Environmental Health Programs
- Building Agency Capacity
- Environmental Public Health Tracking: Developing Nationally-Consistent Community Environmental Health Profiles
- Public Health Mythbusters
- Using the Lean Program to Improve Efficiency in Environmental Health Services
- Implementation of GIS for Research on Neural Tube Defects in China
- Pick a Favorite Technology To Help You Improve Inspection-Based Hand Washing

VECTOR CONTROL & ZOONOTIC DISEASES (SPONSORED BY ORKIN)

- University Integrated Pest Management Program Success With GIS Mapping Software
- Integrated Approach to Malaria Prevention in Uganda: Experiences From a Pilot Project
- Hantavirus in Northern Arizona: Investigation and Response
- Stamping Out Bed Bugs: An Organization and Systems Approach in Action
- New Urban Rat Control Program Development in the Post Recessionary Environment
- Using Heat to Treat for Bed Bugs in a Homeless Shelter
- Get Results! Tools for Managing a Public Health Nuisance Program

WATER QUALITY

- Tools and Data for Identifying Areas With a High Potential for Private Well Contamination
- Using a Rapid Bacteria Screening Method to Assess *Legionella* Risk
- Containing an Outbreak of Cryptosporidiosis in Galway: The Role of the Environmental Health Service
- An Innovative Response to Preventing Legionellosis Outbreaks
- Arsenic in Iowa's Groundwater—The Unknown Threat: A Pilot Study in Cerro Gordo County

NEHA 2014 AEC
SCHEDULE AT-A-GLANCE

Schedule is subject to change.

SAT // July 5	SUN // July 6	MON // July 7	TUE // July 8	WED // July 9	THU // July 10	FRI // July 11	SAT // July 12	SUN // July 13
EHAC Meeting	EHAC Meeting	NEHA Board of Directors Meeting	Educational Sessions	Exhibition Open	Town Hall Assembly	Credentials & Certifications • CCFS Exam • CP-FS Course • REHS/RS Course • CPO® Course	Credentials & Certifications • CP-FS Course • REHS/RS Course • CPO® Course & Exam	Credentials & Certifications • CP-FS Exam • REHS/RS Course & Exam
IFEH Council Meeting	International Environmental Health Faculty Forum Business Meeting	Pre-Conference Workshops: • Industry-Foodborne Illness Investigation Training and Recall Response Workshop • Model Aquatic Health Code Workshop • NEHA/SORA Onsite Wastewater Field Trip	"Thank You Luncheon" for guests staying at the AEC designated hotel for two or more nights	Poster Session	Educational Sessions			
				CCFS Course	CCFS Course			
	International Environmental Health Faculty Forum & EHAC Joint Meeting	IFEH Regional Meetings AEHAP Annual Meeting	Awards Ceremony & Keynote Address	Silent Auction	President's Banquet			
	IFEH AGM Meeting	Community Volunteer Event	Exhibition Grand Opening & Party	Student Research Presentations				
		First Time Attendee Workshop	Poster Session	Networking Luncheon (Sponsored by American Public University)				
		Annual UL Event		Educational Sessions				

AEHAP = Association of Environmental Health Academic Programs
EHAC = National Environmental Health Science & Protection Accreditation Council
IFEH = International Federation of Environmental Health
SORA = State Onsite Regulators Alliance

Stay at the designated AEC hotel—The Cosmopolitan of Las Vegas—for two or more nights and attend a free "Thank You Luncheon" on Tuesday, July 8. **Certain terms and conditions apply. See Web site for details.**

COMPLETE AND UP-TO-DATE INFORMATION CAN BE FOUND ONLINE AT NEHA2014AEC.ORG.

KEYNOTE SPEAKER

The National Environmental Health Association is pleased to announce that Mark Keim, MD, with the Centers for Disease Control and Prevention, will address attendees of the 78th Annual Educational Conference (AEC) & Exhibition as the keynote speaker.

With the expanded international audience at this year's AEC, you'll want to hear Dr. Keim's perspective on emerging and contemporary issues, including the far-reaching health effects of global climate change.

Register today for the 2014 AEC so you don't miss this opportunity!

The keynote speaker is sponsored by NSF International.

Check out the sessions in the Sustainability/Climate Change Track for more on this topic!

The National Environmental Health Association is pleased to announce that Mark Keim, MD, Associate Director for Science in the Office for Environmental Health Emergencies, National Center for Environmental Health/Agency for Toxic Substances and Disease Registry at the Centers for Disease Control and Prevention (CDC), will be the keynote speaker for this combined IFEH and NEHA environmental health event.

Dr. Keim will be speaking on emerging and contemporary issues, including the far-reaching health effects of global climate change.

In addition to his current role, Dr. Keim has spent many years working for the CDC in many capacities including Acting Associate Director in the Office of Terrorism Preparedness and Emergency Response, Medical Officer and Team Leader at the International Emergency and Refugee Health Branch, and Acting Associate Director for Science in the Division of Emergency and Environmental Health Services. He is also an adjunct faculty member at the Rollins School of Public Health at Emory University.

Dr. Keim has provided consultation for the management of dozens of disasters involving the health of literally millions of people throughout the world. Dr. Keim is the author of several hundred scientific presentations, 40 journal publications, and 13 book chapters.

Dr. Keim received numerous awards for his work in CDC's emergency operations during the World Trade Center, anthrax letter, and Hurricane Katrina emergencies, as well as for leading the U.S. health sector response after the Indian Ocean tsunami.

He has been a member of the White House Subcommittee for Disaster Reduction since 2006. He served as a review editor for the United Nations Intergovernmental Panel on Climate Change from 2009 to 2011.

NETWORKING

Strengthen your business and personal relationships and build a network of colleagues—in the U.S. and across the world—that you can call on at anytime!

- Before You Arrive: Send meeting requests through the networking features of the **Virtual AEC–Your Meeting Companion**
- Monday: Mingle with peers and give back to the community hosting the AEC by signing up for the **Community Volunteer Event.** Reunite with friends at the always-exciting **UL Event** in the evening!
- Tuesday: Connect with exhibitors at the **Exhibition Grand Opening & Party**
- Wednesday: See exhibitors you missed the day before and chat with colleagues during the **Networking Luncheon**
- Thursday: Collaborate with other professionals at the **Town Hall Assembly.** Reconnect with everyone you have met during the AEC at the **President's Banquet**
- After the AEC: Stay connected to your friends and contacts after leaving the conference through the **AEC and NEHA social media channels**

Annual UL Event

A trip to Las Vegas would not be complete without enjoying its world-class entertainment.

Monday, July 7, from 6:30–10:30pm

Join us for the Annual UL Event and get ready for an evening with one of the best entertainers in the industry today. As a successful headliner on the Las Vegas Strip, Terry Fator captures the hearts and funny bones of audiences from around the world with ***Terry Fator: The VOICE of Entertainment***. Backed by a live band, Fator wows audiences nightly with singing, comedy, and unparalled celebrity impressions. The "America's Got Talent" winner brings to life a hilarious range of characters including Winston, the impersonating turtle; Emma Taylor, the little girl with the big voice; and Monty Carlo, the lounge singer. Enjoy comedic banter and amazing vocal impressions of musical superstars such as Garth Brooks, Dean Martin, Aretha Franklin, Lady Gaga, and more. ***Terry Fator: The VOICE of Entertainment*** is a one-of-a-kind experience, only at The Mirage.

The UL Event is not included in the registration pricing for the AEC. Price is $65 per ticket for the first 175 tickets that are purchased and $75 for each ticket thereafter. To register for this event, visit **neha2014aec.org/register.**

4th Annual Community Volunteer Event

Clean the World®

For more details and to sign up as a volunteer, visit neha2014aec.org.

SORTING SOAPS TO CLEAN THE WORLD
Monday, July 7, from 1:00–3:00pm

The community volunteer event is designed to give back to the AEC host city community and enhance NEHA's "green" efforts to reduce the footprint of the NEHA 2014 AEC and IFEH 13th World Congress.

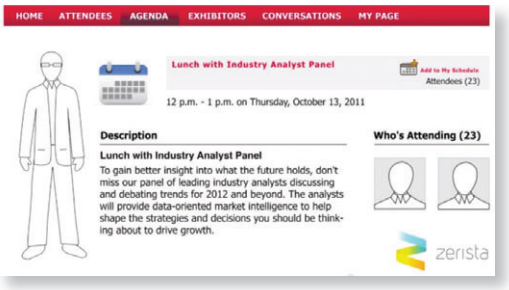
This year's community volunteer activity helps reclaim and repurpose waste from the hospitality industry and provides for people in need. Clean the World is a non-profit organization that collects and redistributes personal care items and gives them to domestic homeless shelters and impoverished countries suffering from high death rates due to hygiene-related illnesses. Since its inception in 2009, Clean the World has put over nine million soap bars and two million pounds of bottled amenities back into human use, simultaneously diverting over 600 tons of waste from landfills.

Network with colleagues and contribute to a local and global cause while participating in volunteer activities which may include sorting amenities by content and package type, cleaning and boxing amenities, assembling hygiene kits, taking inventory, or writing educational and inspirational notes to recipients.

When you sign up, please be sure to read and be prepared with required attire and waiver. Join your fellow environmental health colleagues at Clean the World's Las Vegas Recycling Operations Center and make a difference locally and internationally!

ENVIRONMENTAL HEALTH
VIRTUAL AEC

THE VIRTUAL EXPERIENCE



Enhance your learning experience whether you attend the AEC or participate online from your home or office via the Internet.

Three Ways to Use The Virtual AEC

1) Virtual AEC: Your Meeting Companion
Make the most of your time by planning your AEC schedule, events, meetings, and more! Great for both attendees and those participating remotely via the live broadcast.

2) Virtual AEC: Live Broadcast
For those who are ***not*** able to attend the AEC in person, view some of the sessions live as they occur! You, too, can schedule your sessions and chat with live and remote attendees, speakers, etc.

3) Virtual AEC: Continuing Education Resource
After the conference, view sessions for up to one year to earn continuing education credits.

Wireless connections for meeting rooms sponsored by HealthSpace USA Inc.

How Can the Virtual AEC Help You?

- **Stay connected and informed:** View interactive maps, session descriptions, speakers, exhibitors, and attendee profiles. Get the latest NEHA 2014 AEC news and announcements via live social feeds sent directly to you.
- **Create your customized conference schedule:** Add sessions and events you want to attend to your schedule. Then export the schedule to your Outlook or other electronic calendar.
- **Network and converse:** "Meet" other attendees, speakers, and exhibitors via the chat forums. Request meeting connections, swap digital business cards, or connect digitally with others in your area of specialty or geographic region.
- **Learn:** Attend some of the educational sessions as they occur via live streaming broadcast. Use the chat feature to ask questions, post comments, and communicate with speakers and other attendees. Discover the latest innovative products and services shared by AEC exhibitors. After the conference, you can still access the educational sessions, view presentation slides, and obtain supplemental material through the continuing education resource.

CONFERENCE REGISTRATION

Registration information is available at neha2014aec.org. For personal assistance, contact Customer Service toll free at 866.956.2258 (303.756.9090 local), extension 0.

	Member	Non-Member*
Full Conference Registration	$575	$735
One Day Registration	$310	$365
Student/Retired Registration	$155	$230

***Special Savings!** Join NEHA for $95 and get the AEC for $575. Combined that is a **$65 savings** over the non-member AEC registration rate. Plus, you get a whole year of NEHA member benefits!

This registration pricing is good until May 30, 2014. Registration prices will increase after this date.

neha2014aec.org Follow NEHA on: Twitter Facebook LinkedIn

ENVIRONMENTAL HEALTH DESTINATION

LAS VEGAS, NEVADA

The Perfect Destination to Mix Business and Pleasure

When you come to Las Vegas, Nevada, you'll enjoy access to one of the most exciting and entertaining cities in the world, so it's no secret why the city welcomes millions of tourists each year. Whether you're looking for an exciting night life, live entertainment, or a place to find some peace and quiet, Las Vegas has everything you could ever want.

Take a walk down the Vegas Strip and try your luck at one of the many casinos that have made the city famous. And with hundreds of different restaurants, the city can cater to every taste and craving.

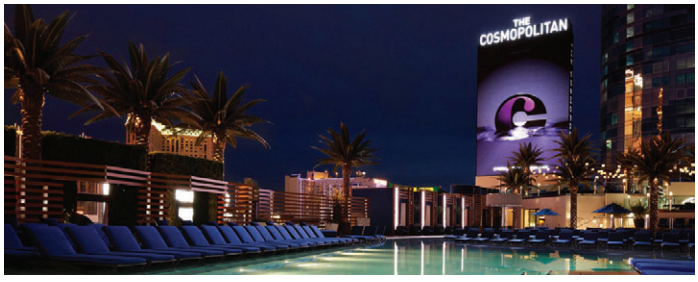
Las Vegas also plays host to almost any type of live entertainment you can imagine. You can see live comedy, stage shows, and concerts, or take in one of the many permanent fixtures of the Las Vegas entertainment industry like the Blue Man Group, Cirque du Soleil, or Penn and Teller.

For people looking to relax and unwind, Las Vegas has you covered. Treat yourself to a day at one of the city's many spas and resorts, or get out of the city and spend some time on the golf courses.

There's a reason they call Las Vegas the entertainment capital of the world. Whatever your idea of a good time is, you're almost sure to find it in Las Vegas.

neha2014aec.org

Follow NEHA on: Twitter Facebook LinkedIn



NEHA AEC Venue & Hotel

The Cosmopolitan of Las Vegas

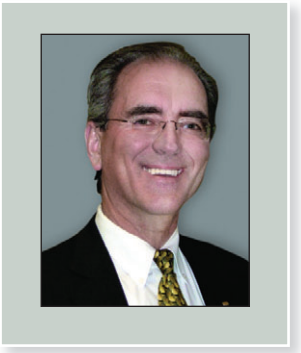
3708 Las Vegas Boulevard South, Las Vegas, NV 89109

Discounted room rates are now available–$139 USD/night plus taxes and fees.

Visit **neha2014aec.org/hotel**

COMPLETE AND UP-TO-DATE INFORMATION CAN BE FOUND ONLINE AT NEHA2014AEC.ORG.

MANAGING EDITOR'S DESK



Nelson Fabian, MS

The New Frontier in Personnel

At first it seemed like the typical reference check that I've done hundreds of times before for former employees. But then it suddenly hit me that this one was different … way different. The chart that I was filling out was not asking me in any discernable way to comment on the former employee's character or performance. Rather, it was walking me through a series of questions that were prompting me to actually grade this person across a range of some very specific skills.

Once it became clear to me that this was all about skills, the memory of some material that I recently studied from the HR field immediately came to mind. In fact, my experience of this reference check—if anything—affirmed the very point of that HR material, which was that talent and skills have become the new #1 issue and frontier of the modern day workplace. The quest for people with the right skills is now more important to employers than productivity advances, downsizing, cost cutting, or right sizing.

The material that I had studied emphasized that success in today's dynamic and global economy was increasingly becoming a function of having the right skills, creativity, and innovation present within one's staffing complement. This lesson, by the way, is as relevant for the public and nonprofit sectors as it is for the private sector. Today's workplace is just not the same as yesterday's. Today, with employers of all stripes struggling to succeed both within the limits of tight budgets and under the pressures of severe competition (often global in nature), talent is king!

The fact that skills and talent have become the dominant consideration in the formula for success leads to some fascinating repercussions.

> *The highly skilled are the ones driving productivity gains, the very gains that we have to achieve if we are to survive on the leaner budgets that we operate on today.*

For one thing, this development changes the relationship between the employer and the employee. As talent becomes the Holy Grail for employers, the talented among us increasingly gravitate to those employers who can provide working experiences (as opposed to jobs) that are empowering, innovative, meaningful, rewarding, enjoyable and … opportunities for growth. And oh yes, experiences that also tend to pay at compensation levels that are commensurate with the skills brought to these positions.

Moreover, with the new availability of widespread health insurance, such employees are no longer tethered to particular employers who provide this benefit. Rather, they are freer to change their jobs, thereby making the task of retaining these prized employees even more difficult for employers.

What makes this story even more interesting is the harsh fact that the talent employers are seeking is in short supply (and especially in STEM [science, technology, engineering, and mathematics] fields of which environmental health is a part). There is just not enough to go around. In response, companies are now more frequently sourcing or locating in other parts of the world in order to gain access to the talent that they need that they can't obtain domestically. Of even greater significance, companies are now also taking on the challenge of developing in house the talent they can't find elsewhere to deal with this shortage.

It is this latter point that serves as the driving idea behind this column. The term that I've come across that describes the new mission of HR (and a term that I particularly like) is "capability development." It is quickly replacing much less inspiring words, phrases, and notions like "training" and even "education."

Within the general idea of capability development, I am seeing some very interesting trends. One trend has employers envisioning their personnel systems the way professional baseball teams work their farm systems. This vision moves HR in the direction of building supply chains of talent. This concept begins with a greater devotion on the part of the employer to understanding what skills and talents their employees need. From there, employers can be expected to engage in

continued on page 59

Master technology. Advance your team.

Expand the potential within your organization to adapt quickly to emerging technologies and manage the evolving expectations of your profession.

- Innovate with fewer constraints to take your department to the next level.
- Maximize finite resources.
- Accelerate your progress.

With more than 28 years of experience Decade's community of experts is defining the capacity and velocity of environmental health services.

To learn how Building Capacity can work for you please call* 800.233.9847 *or visit us online.
www.decadesoftware.com

BUILDING CAPACITY
A NEHA INITIATIVE
Powered by Decade™

DECADE®
software company
Trusted to do more.®

Last year Angie Clark did **700** routine inspections, **200** complaint inspections, **100** Court dates and logged **3,000** travel miles and quite possibly prevented dozens of illnesses.

She doesn't take chances. The communities she serves depend on her to do more inspections under an increasingly difficult work load and conditions. As a true professional, she demands the most from her tools and equipment.

That's why she is never without her tablet computer and HealthSpace EnviroIntel Manager.

In the office or on the road she always has the information she needs for maximum productivity and accuracy. Facilities are never missed and high hazard establishment inspections are never late.

When Angie makes a call, her work is available to the department and the public within minutes.

EnviroIntel MANAGER

HEALTHSPACE
HARMONIZED INTELLIGENCE

HealthSpace EnviroIntel Manager provides the busy professional with Intelligence and the ability to get more done with less work.

HealthSpace provides data and communication management systems for Environmental and Public Health organizations across North America. HealthSpace EnviroIntel Manager is a proprietary system with design architecture that makes it easy to configure to meet the needs of the organization.

For more information please visit us at:

www.healthspace.com

Angie Clark is a fictitious character, however, the numbers shown above are taken from actual activity generated by inspectors recorded in HealthSpace EnviroIntel.