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THE CRAFT COCKTAIL

AND ITS INHERENT FOOD SAFETY RISKS

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ABOUT THE COVER

The recent reemergence of "craft cocktails" in bars across the country could cause some significant food safety issues that restaurant inspectors and other food safety professionals should be aware of. In this month's guest commentary, "Craft Cocktail Considerations: Fundamental Food Sanitation for Modern 'Mixology,'" the author discusses some of these issues, namely the use of fresh produce, hand-shaped ice, and raw eggs in alcoholic beverages. While the drinks on our cover might look "all sorts of good," as the author puts it, he also points out that any indulgence (or overindulgence) in such cocktails should lead only to social, and not microbiological, regrets.

See page 26.

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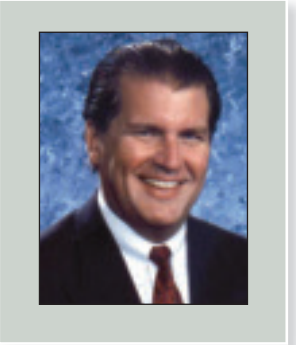


Brian Collins,
MS, REHS, DAAS

Crisis Communication: Apocalypse Now or Apocalypse Not

Last summer north central Texas was considered the epicenter of the nation's West Nile virus outbreak. Specifically, Dallas, Collin, Tarrant, and Denton counties, with a combined population of approximately 6.1 million people, comprise the area of statistical relevance. The city of Plano (population 270,000) is in Collin County (population 927,466).

As you prepare for Thanksgiving, I am relatively sure this "crisis" will have passed and flu will be the "virus du jour." As of the date on which I am writing this article (August 31, 2012), however, West Nile virus (WNV) incidence in the city of Plano stands at 8.5:100,000 over the period June 1, 2012, to August 31, 2012. Morbidity is distinguished by West Nile fever (WNF; the less debilitating form of infection) and West Nile neuroinvasive disease (WNND). Incidence for WNF is 5.2:100,000, while incidence for WNND is 3.3:100,000. One death occurred. Collin County's WNV incidence rate is 6.1:100,000 with WNF at 4.3:100,000 and WNND at 1.8:100,000.

For comparison, allow me to provide general epi data for cursory review. Dallas County (population 2,484,816) has a WNV incidence of 13:100,000; 51.6% of cases are WNF and 48.4% of cases are WNND. Thirteen deaths have been reported in Dallas. Tarrant County, with the city of Fort Worth included, has a population of 1,920,714. WNV incidence in Tarrant County is 12.1:100,000; 65.1% of cases are WNF and 34.9% of cases are WNND. Five deaths are reported in Tarrant County. Finally, Denton County (population 770,509) reports WNV incidence of 18.3:100,000; 69.5% of cases are WNF and 30.5% of cases are WNND. Two deaths are reported for Denton County.

Anything that scares—airs!

Apocalypse Now?

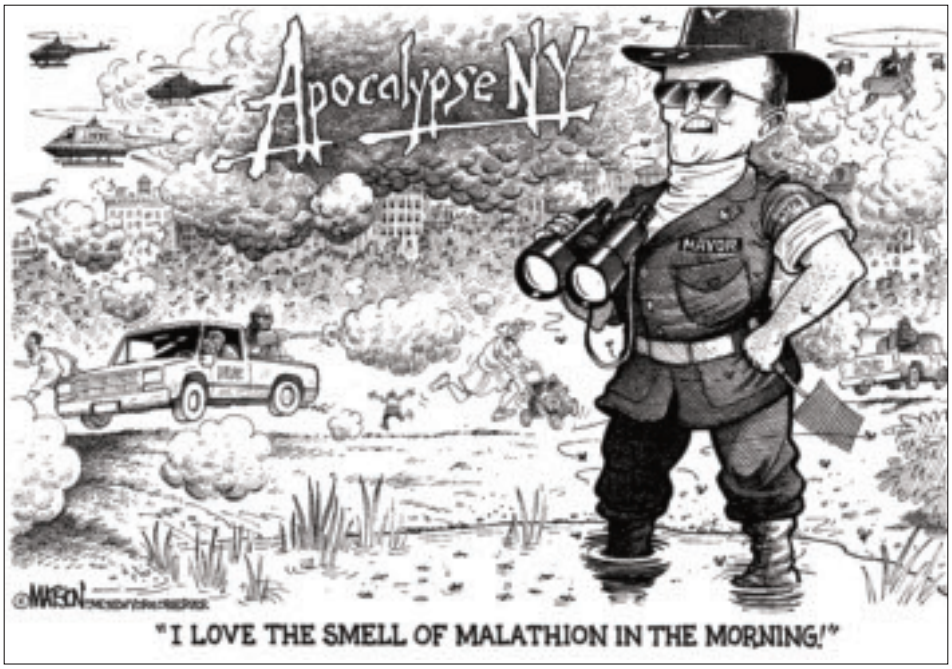
Toward the end of July, all four counties were experiencing escalating incidence. Dallas and Denton counties were exceptional not only in WNV incidence but also by the character of the illness. Dallas's ratio of WNND to WNF was 2:1 as WNV caseload increased. It now hovers at 1:1. Denton County WNF caseloads spiked in one week. Originally, messaging stressed personal protection and mitigating mosquito habitat on private property. Quickly, however, media and some "officials" transitioned the conversation to "spraying." The headline on page one of the *Dallas Morning News* on July 31 read, "West Nile Deaths Break Record." On August 4, the page one headline read, "West Nile Mist, the Fog of War." On page two the headline read, "West Nile War Takes More Than Fogging."

On August 8, Dallas County Medical Society's Community Emergency Response Committee recommended aerial spraying to reduce adult mosquitoes. Dallas's county judge then stepped in as director of emergency management and preparedness to declare a state of emergency. On August 11, Dallas County initiated arrangements for the Texas Department of State Health Services to conduct contract aerial spraying. The *Dallas Morning News* characterized aerial spraying as "air strikes" and "missions." After aerial spraying, the county judge was quoted in the newspaper saying, "I knew when I woke up this morning our citizens would be safer today." The majority of media coverage from this point forward linked mosquitoes to spraying. Fear had been anchored in the community through messaging and "aerial spraying" became a public panacea for "eradicating" mosquitoes and the threat of WNV. (BTW—the original aerial contract was reportedly $1.2 million!)

Apocalypse Not!

City of Plano Integrated Mosquito Management Program staff initiated seasonal mosquito surveillance in early May. Traps were set at empirically known high-density mosquito areas throughout the city's 72 square miles. The week of June 4 presented the first positive WNV pool of mosquitoes. The department immediately canvassed neighborhoods in proximity to the pool, notifying residents of findings; providing precautionary education; and larviciding known ponds, stagnant pools, and static creek water.

Areas with positive mosquito pools were immediately scheduled for truck-based ultra-low-volume fogging. Databases were created for positive pools of mosquitoes and reports of stagnant pools. GIS was employed to track dead birds, positive pools, and morbidity and mortality by topography and neighborhood. Multimedia pushes highlighted the "4 Ds"; personal responsibility; and information about pesticides used to mitigate adult mosquito populations, mosquito larvae, WNV



History repeating: The first case of West Nile virus (WNV) in the Western Hemisphere was identified in New York City in 1999. Thirteen years later, 2012 had the highest number of WNV cases reported to the Centers for Disease Control and Prevention since 2003. This cartoon highlights the media hype and the community fear it created—something that didn't change for public health officials involved in the 2012 outbreak. © R.J. Matson, New York Observer 1999

disease, and general FAQs. Expanded information was pushed out via Blackboard Connect, Facebook, use of flyers with QR codes, and establishment of a hotline. Web information was updated daily. (Over 3,100 of 4,900 hits on the health department Web site were on the WNV page the week of August 20–24.) In the tradition of the incident command system and the national incident management system, contact was established with our public information office, city management, city council, Collin County Health Services, and local health authorities. A threshold for aerial spraying was loosely established although it remained highly contingency based.

Crisis Communication

Competent and considered communications can assist environmental health professionals in preventing ineffective messages, fear, and escalation of crisis perception. Moreover, effective hazard and threat assessment in addition to risk communication foster trust and confidence vital to prevention and resolution.

In this case and in spite of multiple attempts to influence messages about personal protection and responsibility, environmental and public health officials lost perception management and personal responsibility messages to local media, which embraced direct links between mosquitoes and spraying as an answer to the outbreak. Language in the media included words such as "battle, epidemic, exotic virus, alarming, air strikes, war, combat, missions, and deadly." Escalated fear in the community resulted as worst-case scenarios were promulgated by "experts" who expressed opinions on what could happen with no limits. Making matters worse, politicians became default decision makers in some areas, citing action based upon a (limited) body of "scientific literature."

As Gavin De Becker discusses in his book *Fear Less,* "the point is not that bad things don't happen…it's not that there are not things to worry about…the point is that popular worst-case scenarios are just that—popular." Media jumped on the "crisis" train and manipulated fear of the novel and obscure in order to hook a person into listening or reading. This purpose of course sells space and air time. It has been said in television media, "Anything that scares—airs!"

Environmental health professionals must add crisis communication to leadership skill sets. We must be able to communicate with the public so they take action to mitigate fear and so they are not victims-in-waiting. Ultimately, they will decide they do not want to be victims if they have the right information while we do what is needed. For them and for us, action creates control. In addition, environmental health professionals must be able to communicate and influence media and community leaders by providing facts, scale, relevance, and truth.

Through this incident I was reminded of the crucial role local environmental health plays not only in mitigating disease but also in managing the psychology of fear. I observed how messages are sent and received and how perceptions are created by the use of specific words. I was acutely mindful of how the words and decisions of others affected our organization during the outbreak (for example, we were admonished by many for not electing to aerial spray and hailed by an equal number for managing WNV to the point that aerial spraying was not part of the risk equation). Fully half the time dedicated to management of the outbreak was consumed with media relations, public relations, and crisis communication.

So, for environmental health professionals who might find themselves front and center in the midst of a real or perceived public or media "crisis": I strongly encourage advance training in public relations, media relations, and crisis communication. The right message at the right time to the right people will enable citizens, the media, and community leaders to engage and act, helping themselves and helping you!

Here are a couple of items you may want to consider reading:

De Becker, G. (2002). *Fear less: Real truth about risk, safety, and security in a time of terrorism*. Boston: Little, Brown and Company.

U.S. Department of Health and Human Resources. (2002). *Communicating in a crisis: Risk communication guidelines for public officials*. Washington, DC: Author.

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Erratum

In the October 2012 quiz, question nine should have read, "**Retractions** were severely abnormal for __ of the children enrolled in the prospective study." The *JEH* apologizes for the error.

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A Summary of Health Outcomes: Multistate Foodborne Disease Outbreaks in the U.S., 1998–2007

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Abstract **Multistate foodborne disease outbreaks (FBDOs) pose a particular threat to public health. The study described in this article sought to describe the incidence and health outcomes of multistate FBDOs in the U.S. from 1998 to 2007. The Centers for Disease Control and Prevention's (CDC's) OutbreakNet Foodborne Outbreak online database was used to analyze FBDOs reported to and confirmed by CDC between 1998 and 2007. Univariate analysis and ANOVA were used to examine outcomes of illnesses, hospitalizations, and deaths. Over 100 multistate FBDOs occurred between 1998 and 2007, with a slight increase over time. Average illnesses, hospitalizations, and deaths were 74.075 (*SD* = 106.24), 14.11 (*SD* = 23.23), and 0.826 (*SD* = 2.88), respectively. Vectors most often identified as the cause of the FBDOs were *Salmonella* (*n* = 57) and *E. coli* (*n* = 30), making up 81% of all multistate outbreaks. Policy makers and health officials need to reconsider the means by which industry and government coordinate response to outbreaks—particularly across jurisdictions—to ensure an efficient and seamless system of response, particularly in the case of multistate outbreaks.**

Introduction

U.S. consumers have become used to hearing about foodborne disease outbreaks (FBDOs), and multistate outbreaks in particular garner some of the news coverage. Multistate outbreaks, or outbreaks that either spread to other states or originate from the same vector in multiple states at the same time, pose a particular threat to public health. The continued growth and expansion within the food industry and the transport of food across multiple state lines have made identifying the sources of and subsequently tracking multistate FBDOs more complicated (Allos, Moore, Griffin, & Tauxe, 2004), increasing the likelihood of more cases of foodborne illness linked to a particular outbreak. Additionally, outbreaks caused by fresh produce transported across state lines have become more prominent; the proportion of outbreaks attributed to fresh produce has increased from <1% of all reported FBDOs in the 1970s to 6% during the 1990s (Sivapalasingam, Friendman, Cohen, & Tauxe, 2004). Approximately 12% of all FBDOs occurring between 1990 and 2003 were associated with produce (Dewaal et al., 2006).

Although the incidence of FBDOs has decreased since 1990 (Silver & Bassett, 2008), major outbreaks continue to occur. In 2006, 1,270 FBDOs were reported, resulting in 27,634 reported individual cases of illness and 11 deaths (Ayers, Williams, Gray, Griffin, & Hall, 2009). In summer 2010 a multistate foodborne disease outbreak of human *Salmonella* Enteritidis was attributed to shell eggs and led to a voluntary nationwide recall. As of December 2010 the outbreak had affected 1,939 people in 11 states and was eventually linked to an unintentional contamination of animal feed (Centers for Disease Control and Prevention [CDC], 2010). Multistate FBDOs are particularly concerning because of the difficultly in tracking and following up on cases after outbreaks have crossed state lines, leading to a potential increase in negative health outcomes.

In addition to the impact on health outcomes, the economic costs of FBDOs are substantial as well. The costs associated with FBDOs total just under $152 billion each year to U.S. residents, including direct and indirect costs, with the average case totaling $1,851 (Scharff, 2010). Loss in productivity ranges between $377 and $924 per case (Scharff, 2010). FBDOs have been associated with increased spending on response including vaccinations, medical care, hospitalizations, and administrative costs (Dalton, Haddix, Hoffman, & Mast, 1996). The costs associated specifically with multistate outbreaks, however, have not been calculated. These findings indicate the need for an analysis of the human costs associated with multistate outbreaks separate from intrastate ones in order to improve upon how public health officials identify and respond to these types of food safety hazards.

In addition to cost, it is also necessary to consider factors associated with response to a multistate FBDO. Taylor and co-authors (2010) identified three factors that contribute to poor response to multistate FBDOs in particular, including "1. delayed response due to discrepancies in available resources and expertise at state and local levels, 2. inadequate communication between stakeholders and agencies, and 3. poor traceability capabilities (Taylor, Kastner, & Renter, 2010)." The absence of a coordinated response system to identify and mitigate the effects of multistate FBDOs poses a particular threat to the ability of public health officials to limit the negative health consequences associated with a multistate outbreak. The existence of a comprehensive emergency response plan, such as those recommended in the Food and Drug Administration's (FDA's) *Food Protection Plan* (2007) and the Council to Improve Foodborne Outbreak Response's (CIFOR's) *Guidelines for Foodborne Disease Outbreak Response* (2009), allows for effective communication and coordination between affected states as well as potentially affected states and may result in fewer negative health outcomes. Having a horizontally integrated system of communication in place may reduce the burden on labor, time, and resources required by states to notify one another and the Centers for Disease Control and Prevention (CDC) of foodborne illness.

The public health and economic effects of recent multistate FBDOs signal potential vulnerabilities in current practices of food safety and food defense. Previous research has reported that the incidence of multistate outbreaks has increased (Crutchfield & Roberts, 2000); further investigation of the outcomes associated with this increase is warranted and may help to identify areas for improvement of the current food safety and defense system in the U.S. Our study sought to describe the incidence and health outcomes of multistate FBDOs occurring in the U.S. between 1998 and 2007 and to highlight patterns associated with cases that may help to identify potential vulnerabilities in the current food safety and defense system. (At the time of data collection, data for 1998–2007 were all that were made available by CDC.)

Methods

CDC's OutbreakNet Foodborne Outbreak Online Database was used to access information on FBDOs attributed to unintentional food contamination that had been *reported to* and *confirmed by* CDC between the years 1998 and 2007. CDC maintains three surveillance systems that collect data on foodborne illness, including ePulseNet, FoodNet, and the National Outbreak Reporting System (Selman, 2010). Information on foodborne illness is voluntarily submitted to CDC by territorial, local, and state health departments using the Foodborne Outbreak Reporting System and is classified as "the occurrence of two or more cases of a similar illness resulting from the ingestion of a common food (CDC, 2011)." The database was released for public use in fall 2009. All states may not report all incidences; however, the system is comprehensive and likely the most complete source of public data available. The database provides information on year of outbreak; location (which varies from home family gatherings to nursing homes); type of location in which the infected food was reported to have been served; specific strain or type of virus (bacterial, parasitic, or chemical agent); and status of the vector as the cause of the outbreak (agent had been determined a confirmed, suspected, or nonapplicable culprit). Using SAS 9.1 for the UNIX environment, the index function was used to classify the vectors into 29 general agents (e.g., all *Salmonella* strains were classified as "*Salmonella*"). Additionally, only outbreaks consisting of three or more confirmed cases were included. The purpose of this was to allow for more robust analyses and a more relevant interpretation of the outbreaks.

Outbreaks with vectors confirmed by CDC affecting patients in the 50 states were included, as well as those occurring in Guam, the District of Columbia, and Puerto Rico. FBDOs resulting in ill parties in more than one state were included as a separate attribute "multistate"; these outbreaks were exclusive of those in which victims were contained to a single state. The variable "state" (which included the state where FBDO cases were confirmed) was recoded into a dichotomous variable "multistate" (multistate FBDO = 1 and intrastate outbreak = 0). All aforementioned variables were initially collected in October 2009 and included in analysis conducted between August and October 2010.

To account for population growth over time, U.S. Census projections for total population by state were added to the dataset for the years 1998–2007 (U.S. Census Bureau, 2011) and adjusted incidence rates were calculated to more accurately assess the linear trend of FBDOs. Satterthwaite *t*-tests were run on all outbreaks to compare means of total illnesses, total hospitalizations, and total deaths between multistate and intrastate outbreaks, and logistic regression was applied to predict the class of outbreaks most associated with these outcomes. Univariate analysis was conducted on outcomes of illness, hospitalization, and death by month, year, food product, and vector associated with both intrastate and multistate outbreaks. ANOVA tested for significant changes from year to year in the outcomes of illness, hospitalization, and death resulting from multistate outbreaks; least significance difference post-hoc tests were performed.

Results

Over 4,600 separate outbreaks occurred between 1998 and 2007, resulting in 143,260 ill (mean [$\bar{x}$] = 31.10, *SD* = 68.65), 6,385 hospitalizations ($\bar{x}$ = 1.67, *SD* = 5.58), and 158 deaths ($\bar{x}$ = 0.04, *SD* = 0.52). The maximum persons ill, hospitalized, or dead associated with a single outbreak were 1,644, 129, and 21, respectively, with *Campylobacter* confirmed as the vector. In 398 outbreaks only two people were reported ill; these outbreaks made up 17.28% of the overall sample and were not included in the regression. The most frequent months for deaths associated with outbreaks were May (*n* = 27) and October (*n* = 32). The *t*-tests revealed a significant difference between intrastate and multistate FBDOs for the outcomes of illness, hospitalization, and death (Table 1).

Logistic regression modeled multistate versus intrastate outbreaks as the dependent variable to predict total illnesses, total hospitalizations, and total deaths in a given outbreak. Results indicated that hospitalization and death were more likely to be associated with a multistate FBDO than an interstate one (hospitalization: $p < .001$, log odds ratio [log*OR*] = 1.206; death: $p < .05$, log*OR* = 1.284).

The following information summarizes the data on multistate outbreaks. Results provided are not state specific but are a composite of data collected from all the states impacted in particular multistate FBDOs. Of all outbreaks occurring during the 10-year period, 107 (2.54%) were multistate outbreaks and accounted for 5.53%, 17.68%, and 36% of total illnesses, hospitalizations, and deaths, respectively. In 2007

(the last year included in analysis), multistate FBDOs made up 3.59% of all outbreaks (see Figure 1 for the increase in proportion of multistate to intrastate outbreaks over time). In terms of multistate outbreak occurrences, the range was 5–18 total over the 10-year period, with a slight overall increase over time (Figure 2).

The average illnesses, hospitalizations, and deaths for multistate outbreaks were 74.075 (*SD* = 106.24), 14.11 (*SD* = 23.23), and 0.826 (*SD* = 2.88), respectively. See Table 2 for totals by year. The year with the greatest total of multistate FBDOs was 2007 (*n* = 18), with the fewest multistate FBDOs occurring in 2001 (*n* = 5). While the total number of people ill in a multistate outbreak did not experience a statistically significant change from year to year, significant changes were seen in total hospitalizations ($p < .05$); Table 2 summarizes the outcomes associated with multistate FBDOs and indicates significant changes in totals from year to year.

Months of the year during which incidence of multistate food-related emergencies were higher were July and November, with 17 and 13 total outbreaks occurring, respectively, over the 10-year period of study; the fewest outbreaks were reported in December (*n* = 2). July (*n* = 1,857), June (*n* = 1,127), and February (*n* = 1,043), however, were the months with the highest total illnesses; December again had the lowest total (*n* = 97). The frequency of outbreaks and total illnesses were correlated (*r* = .75). The highest rate of negative heath consequences associated with a single multistate outbreak was a 2002 case in which *Salmonella* made 510 consumers ill.

The vectors most often identified as the cause of the FBDOs in this sample were *Salmonella* (*n* = 57) and *E. coli* (*n* = 30), making up 81% of all multistate outbreaks. Table 3 reports the total illnesses, hospitalizations, and deaths associated with each vector confirmed in a multistate outbreak.

TABLE **1**

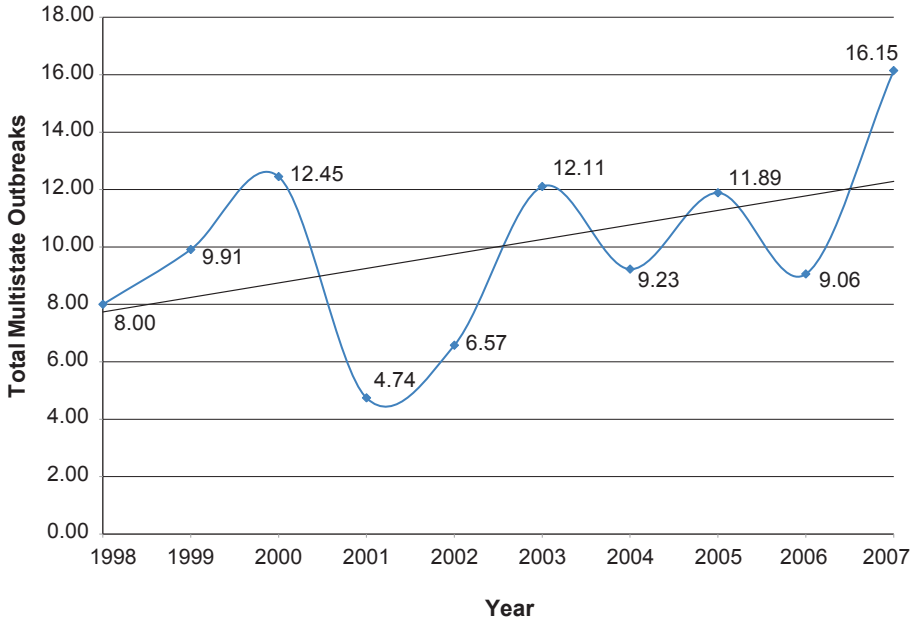
Summary of All Foodborne Disease Outbreak (FBDO) Outcomes, 1998–2007

FBDO Outcome	Intrastate Average	Multistate Average	Significance	*CI*[a] (95%)	
			(Two-Tailed)*	Lower	Upper
Total illnesses	38.808	74.075	0.00	-61.739	-20.795
Total hospitalizations	1.5043	14.113	0.00	-17.934	-7.282
Total deaths	0.0276	0.8261	0.024	-1.490	-0.107

[a] *CI* = Confidence interval.
*The Satterthwaite method was applied because Levene's statistic found unequal variances.

FIGURE **1**

Multistate Foodborne Disease Outbreaks, 1998–2007 (Adjusted for Population Growth)



Discussion

The findings in our study add to the literature highlighting the persistence of multistate FBDOs as a threat to public health (CIFOR, 2009; Sobel, Griffin, Slutsker, Swerdlow, & Tauxe, 2002) by describing morbidity and mortality over time. The proportion by which multistate outbreaks made up total outbreaks between 1998 and 2007 increased slightly as well. The Public Health Security and Bioterrorism Preparedness and Response Act (2002) includes several provisions intended to provide for the safety and protection of the U.S. food supply. Since 2003, the total multistate FBDOs occurring in a given year have totaled 10 or more, an increase over the previous decade. More needs to be done to address the threat of multistate food safety incidents as a matter of national security.

It is important to note that totals presented in this article are likely conservative estimates: these numbers capture only a portion of the FBDOs. Many people who are directly affected by a foodborne disease do not go to the hospital for treatment or are not admitted. In 2007, the Agency for Healthcare Research and Quality recorded 6,495 discharges from hospitals in the U.S. in which food poisoning (ICD9 code 005.9) was listed as one of the

FIGURE **2**

Proportion of Multistate Foodborne Disease Outbreaks, 1998–2007

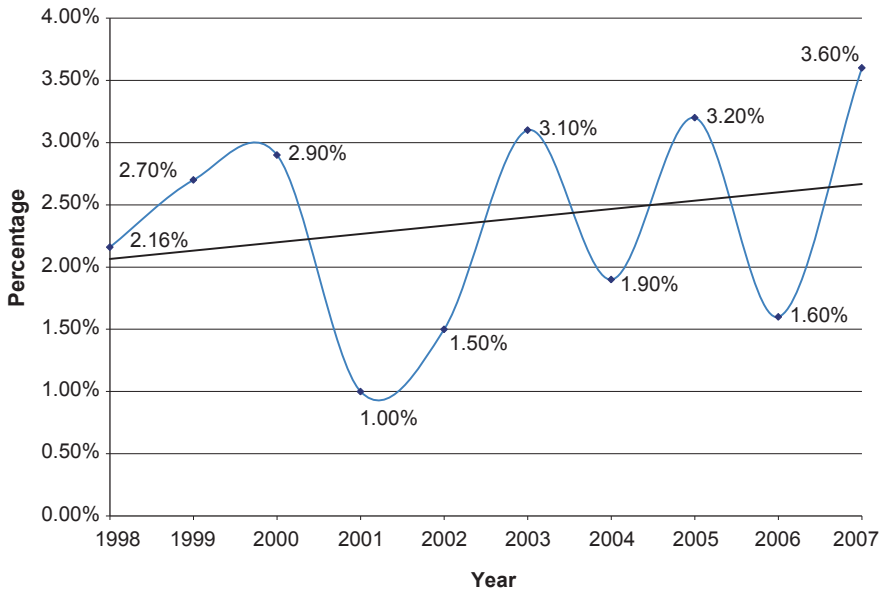


TABLE **2**

Summary of Multistate (MS) Foodborne Disease Outbreak (FBDO) Outcomes, 1998–2007

Year	Total FBDOs	Total # MS Outbreaks	Illnesses ($\bar{x}$, *SD*)	Hospitalizations ($\bar{x}$, *SD*)[a]	Deaths ($\bar{x}$, *SD*)[b]	*p*-Value
1998	369	8	949 (118, 158.08)	127 (42.33, 50.89)	24 (6, 10.1)	–
1999	370	10	670 (67, 119.91)	**19*** (4.75, 3.77)	0 (0, 0)	**.039[a], .003[b]**
2000	448	13	1279 (98.38, 145.17)	108 (10.8, 11.17)	7 (0.88, 2.47)	.663[a], .6[b]
2001	461	5	175 (35, 10.05)	28 (5.6, 4.66)	2 (0.67, 1.15)	.686[a], .9[b]
2002	482	7	774 (110.57, 177.13)	36 (12, 7)	10 (2, 3.39)	.709[a], .5[b]
2003	419	13	499 (38.38, 37.43)	**82*** (6.83, 5.68)	4 (0.44, 0.72)	**.033[a]**, .3[b]
2004	532	10	1002 (100.2, 126.51)	196 (28, 45.43)	0 (0, 0)	.061[a], .7[b]
2005	402	13	569 (43.77, 40.42)	84 (7, 4.02)	1 (0.1, 0.31)	.063[a], .9[b]
2006	621	10	979 (97.9, 80.48)	248 (24.8, 31.9)	6 (0.67,1.65)	.080[a], .6[b]
2007	502	18	1035 (57.5, 89.36)	201 (14.36, 27.23)	3 (0.23, 0.83)	.284[a], .7[b]

[a]Hospitalizations.
[b]Deaths.
*Bold and asterisk indicate a statistically significant change in hospitalizations ([a]) or deaths ([b]) from the previous year ($p < .05$).

diagnoses (Agency for Healthcare Research and Quality, 2011); however, analysis of the OutbreakNet foodborne outbreak online database data revealed a total of 753 hospitalizations, a much smaller number, signaling that all hospitalizations, and perhaps outbreaks, are not being reported to CDC. Further investigation into states' current strategies for surveillance and response to multistate FBDOs as well as communication of outcomes to the CDC are needed to ensure an accurate assessment of illness and appropriate magnitude of response.

Statistically significant changes in outcomes were seen from year to year, and several instances occurred in which this difference approached statistical significance (e.g., the surge in hospitalizations between 2005 and 2006). Furthermore, the total number of cases attributed to *Salmonella* and *E. coli* indicate that prevention mechanisms should pay particular attention to these bacteria; *Salmonella*, *Campylobacter*, *E. coli*, *Shigella,* and *Clostridium* poisoning have been linked to bacterial gastroenteritis (Meehan, Atkeson, Kepner, & Melton, 1992), which can result in chronic conditions such as irritable bowel disease (Ruigómez, García Rodríguez, & Panés, 2007). Moreover, as we see particular disease vectors more closely associated with multistate FBDOs, it provides an opportunity to focus on prevention efforts for that particular vector and perhaps the production of more sensitive testing to detect food contamination prior to human consumption.

As the likelihood of hospitalization and death has significantly increased over time in multistate FBDOs, the direct and indirect costs of health outcomes associated with this class of FBDOs must be investigated. Although multistate FBDOs are more difficult to detect due to limitations with surveillance and communications (Lynch, Tauxe, & Hedberg, 2009), an accurate interpretation of health outcomes and direct and indirect economic costs of these outbreaks is imperative to understand the true impact on food safety and defense maintenance. Furthermore, encouraging cooperation and input from industry (producers and distributors), as has been done with increased encouragement of the development of food defense plans by the Food Safety Inspection Service, might enhance coordination within the food industry and with government agencies at the local, state, and national levels. This coordination could lead to a more collaborative and productive relationship, rather than

just the government driving food safety and defense initiatives. For example, Georgia and Idaho now target industry communication and inspections, respectively (Zhang, 2009). In April 2010, the Florida State Senate passed the Tomato Food Safety law, which revises and increases safety standards for tomatoes, and includes inspections and administrative fines (Tomato Food Safety Standards, 2010).

Several limitations to our analysis should be noted. Only foodborne illness reported to the CDC that affected three or more people were included in our analysis. Among the multistate FBDOs in the database, no specific information existed on exactly how many states were affected in each outbreak or the specific states. While this information would have proven meaningful, our recommendations suggest review of current practices among states regarding outbreaks that affect more than one state overall. Finally, the nature of FBDO reporting, as well as rates of uninsurance and underinsurance and therefore decreased likelihood of presentation at a medical facility, lend themselves to underreporting and make the results of our study highly conservative.

TABLE **3**

Multistate (MS) Foodborne Disease Outbreaks (FBDOs) by Vector, 1998–2007

Vector	Total # MS FBDOs	Illnesses Total ($\bar{x}$, *SD*)	Hospitalizations Total ($\bar{x}$, *SD*)	Deaths Total ($\bar{x}$, *SD*)
Campylobacter	2	105 (52.5, 48.79)	0 (0, N/A)	0 (0, N/A)
Clostridium	2	12 (6, 2.82)	12 (6, 2.82)	1 (0.5, 0.7)
E. coli	30	1132 (37.7, 43.9)	363 (14.52, 22.03)	6 (0.3, 1.12)
Hepatitis A	2	71 (35.5, 4.94)	18 (9, 8.48)	0 (0, N/A)
Listeria	5	208 (41.6, 37.4)	143 (47.66, 46.85)	47 (9.25, 8.42)
Norovirus	3	544 (181.3, 146.7)	3 (1.5, 2.12)	0 (0, N/A)
Other chemical	1	11 (N/A, N/A)	1 (1, N/A)	0 (0, N/A)
Salmonella	57	4653 (81.6, 105.7)	574 (13.66, 24.53)	13 (0.37, 0.84)
Shigella	3	990 (330, 277.1)	13 (13, N/A)	0 (0, N/A)
Vibrio	2	200 (50, 38.18)	2 (2, N/A)	0 (0, N/A)

Conclusion

Our study analyzed changes in multistate FBDOs over time and interpreted the effects on morbidity and mortality. Our findings add to the literature citing a gradual increase in the incidence of multistate FBDOs, suggesting that this is a problem shared among states, not merely one individual state, and therefore plans for response should be coordinated across states. The variability of incidence and outcomes highlights a potential vulnerability in food defense and illustrates a need for states to restructure—or develop—systems by which industry and government can communicate information about risks to the public and each other effectively and coordinate appropriate mechanisms for response across jurisdictions. This is particularly important among contiguous jurisdictions or states that receive goods from the same source or by similar means. The CIFOR *Guidelines for Foodborne Disease Outbreak Response* (2009) provides a template for states to follow and should be adopted and modified to formally create the most relevant plans at the state level, whether food originates from a domestic or international source (CIFOR, 2009). Furthermore, results from our study suggest that public education encouraging safe food handling and preparation may need to be increased during the summer and fall, in preparation for major American holidays of which food plays an important role (Independence Day and Thanksgiving); previous research has indicated that this method is effective in increasing knowledge and awareness around this issue (Ratnapradipa, Quilliam, Wier, & Rhodes, 2011). The higher incidence of outbreak and resulting outcomes during the month of February should be investigated further as well.

More comprehensive analyses are needed to investigate the outcomes of multistate FBDOs and will be possible as more data are released. For example, investigation of reporting trends and consistency in reporting of FBDOs are needed to truly understand the effect on health outcomes. Further research investigating multistate FBDOs will allow us to better understand the implications of current practices on health outcomes and food defense initiatives and interpret appropriate measures to improve relevant economic and policy developments.

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Outbreak of Cryptosporidiosis Associated With a Man-Made Chlorinated Lake—Tarrant County, Texas, 2008

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Abstract **In July 2008, clusters of laboratory-confirmed cryptosporidiosis cases and reports of gastrointestinal illness in persons who visited a lake were reported to Tarrant County Public Health. In response, epidemiologic, laboratory, and environmental health investigations were initiated. A matched case-control study determined that swallowing the lake water was associated with illness (adjusted odds ratio = 16.3; 95% confidence interval: 2.5–infinity). The environmental health investigation narrowed down the potential sources of contamination. Laboratory testing detected *Cryptosporidium hominis* in case-patient stool specimens and *Cryptosporidium* species in lake water. It was only through the joint effort that epidemiologic, laboratory, and environmental health investigators could determine that >1 human diarrheal fecal incidents in the lake likely led to contamination of the water. This same collaborative effort will be needed to develop and maintain an effective national Model Aquatic Health Code.**

Introduction

On July 8, 2008, Tarrant County Public Health (TCPH) was notified of an outbreak of gastrointestinal illness among attendees of a picnic at a lake that was a man-made chlorinated recreational water venue (RWV). On July 9, a second group of lake visitors reported similar illness. On July 10, a local clinician called TCPH to report a cluster of three patients with laboratory-confirmed *Cryptosporidium* infection; all had visited the lake. By July 11, five laboratory-confirmed cases of cryptosporidiosis were identified among lake visitors and five separate groups reported gastrointestinal symptoms after visiting the lake.

Cryptosporidiosis is caused by the protozoan parasite *Cryptosporidium* and is characterized by watery diarrhea typically lasting one to four weeks in immunocompetent individuals (Hunter et al., 2004). *Cryptosporidium* can be transmitted by the fecal-oral route through the ingestion of contaminated water. Water at RWVs can become contaminated by the parasite when infected persons with diarrhea swim, when contaminated animal feces are introduced either directly or through water run-off, and as a result of deficiencies in human waste sanitation systems.

Cryptosporidium has been associated with three-quarters of reported outbreaks of gastroenteritis associated with treated RWVs (e.g., pools and interactive fountains) in the U.S. (1999–2008) (Hlavsa et al., 2011). The parasite's extreme tolerance of chlorine allows it to survive for 3.5–10.6 days in treated RWVs where the free chlorine level is maintained at 1–3 parts per million (ppm) (Shields, Hill, Arrowood, & Beach, 2008) as recommended by the Centers for Disease Control and Prevention (CDC). A standard protocol has been developed to remediate contaminated treated RWVs through a process called hyperchlorination, whereby the free chlorine contact time of 15,300 mg-min/L is achieved (e.g., maintaining free chlorine level at 20 ppm for 765 minutes) at water pH $\leq$7.5 and temperature $\geq$25°C (Shields et al., 2008).

Because of the clusters of laboratory-confirmed cryptosporidiosis cases and reports of gastrointestinal symptoms anecdotally associated with visiting the lake on the same day, TCPH launched an investigation in collaboration with the Texas Department of State Health Services (DSHS) and CDC. The ob-

jectives of the investigation were to confirm the lake as the outbreak source, determine the magnitude of the outbreak, identify risk factors associated with infection, identify the source contamination of the lake, and develop and implement control measures.

Methods

Epidemiologic and Laboratory Investigation

Cases were initially identified by clinicians, by self-report, or by contacting lake visitors whose names were registered in the lake's visitor logbook for June 28, 2008—the date that the first five identified laboratory-confirmed case patients visited the lake. Additional potential cases were identified during case-patient interviews conducted using a short questionnaire, which examined risk factors for *Cryptosporidium* infection in the community at large.

As the investigation continued, additional potential cases were also identified through activation of the existing local public health laboratory notifiable disease systems and the increased self-reporting that resulted from a TCPH press conference. Attempts to identify cases through other methods, such as review of credit card records, were unsuccessful. A standardized questionnaire focusing on the lake was then developed to include questions about specific water and food exposures at the lake, visits to other RWVs, and other potential exposures, such as exposure to animals, restaurants, and grocery stores.

To further delineate risk factors and assist the environmental health investigation, the standardized questionnaire was used in a matched case-control study of a subset of cases. Confirmed cases were defined as persons whose stool tested positive for *Cryptosporidium* and who developed at least one gastrointestinal symptom after June 20, 2008, following a visit to the lake. Probable cases were defined as persons with diarrhea characterized by ≥3 watery stools per day lasting ≥3 days, 2–10 days after June 20, 2008, following a visit to the lake. Controls were defined as a household contact of a confirmed or probable case who went to the lake on the same day as the case patient but did not develop gastrointestinal illness. If multiple household contacts were eligible to be controls, the one closest in age to the case was selected.

Power analysis indicated that 47 matched pairs would be needed to detect an odds ratio (*OR*) of 4.0 with a power of 80% and alpha of .05. Analysis was performed using SAS 9.2 statistical software. Differences in categorical variables were compared using the Cochran-Mantel-Haenszel test. Differences in medians were examined using the two-sample median test. Matched univariable and multivariable analyses of data on risk factors for infection were performed. Not all predictors significant in univariable analysis could be included in the multivariable analysis because of collinearity or sparseness of data. The study protocol was institutionally reviewed and determined not to be human-subjects research, as it was part of a public health response.

In addition to *Cryptosporidium* testing, the first 22 people with diarrheal illness at the time of interview were asked to submit stool for testing for *Salmonella*, *Shigella*, *E. coli*, *Campylobacter*, *Yersinia enterocolitica*, and norovirus by the Texas DSHS. When available, stool specimens from case patients were sent to CDC for *Cryptosporidium* testing. Genotyping and subtyping of *Cryptosporidium* isolates were also performed (Xiao et al., 2009).

Environmental Health and Laboratory Investigation

The objectives of the environmental health investigation were to determine if evidence existed of *Cryptosporidium* contamination of the lake, identify the source of contamination, address any identified sources of contamination, and determine the feasibility of remediating the lake using a hyperchlorination protocol. Water from the wells supplying the lake and the concession stand were tested for fecal coliforms. Additional samples for *Cryptosporidium* testing were taken from the wells, the lake itself, and the backwash of the two sand filters used to filter recirculated lake water.

Approximately 120 L were filtered for the composite lake and well samples and assayed following the U.S. Environmental Protection Agency (U.S. EPA) Method 1623 (U.S. EPA, 2001). In addition to immunofluorescence assay microscopy, CDC tested each sample using a *Cryptosporidium* genus-specific real-time polymerase chain reaction (PCR) assay (Jothikumar, da Silva, Moura, Qvarnstrom, & Hill, 2008). Drinking water sources were inspected. The property was inspected for potential sources of lake contamination, including the septic system, the restroom facilities, and the stream that runs along the border of the lake. Prior to recommending a remediation protocol, multiple lake samples from numerous locations were tested for free chlorine concentration, pH, and temperature to identify areas of poor circulation.

Results

Epidemiologic and Laboratory Investigation

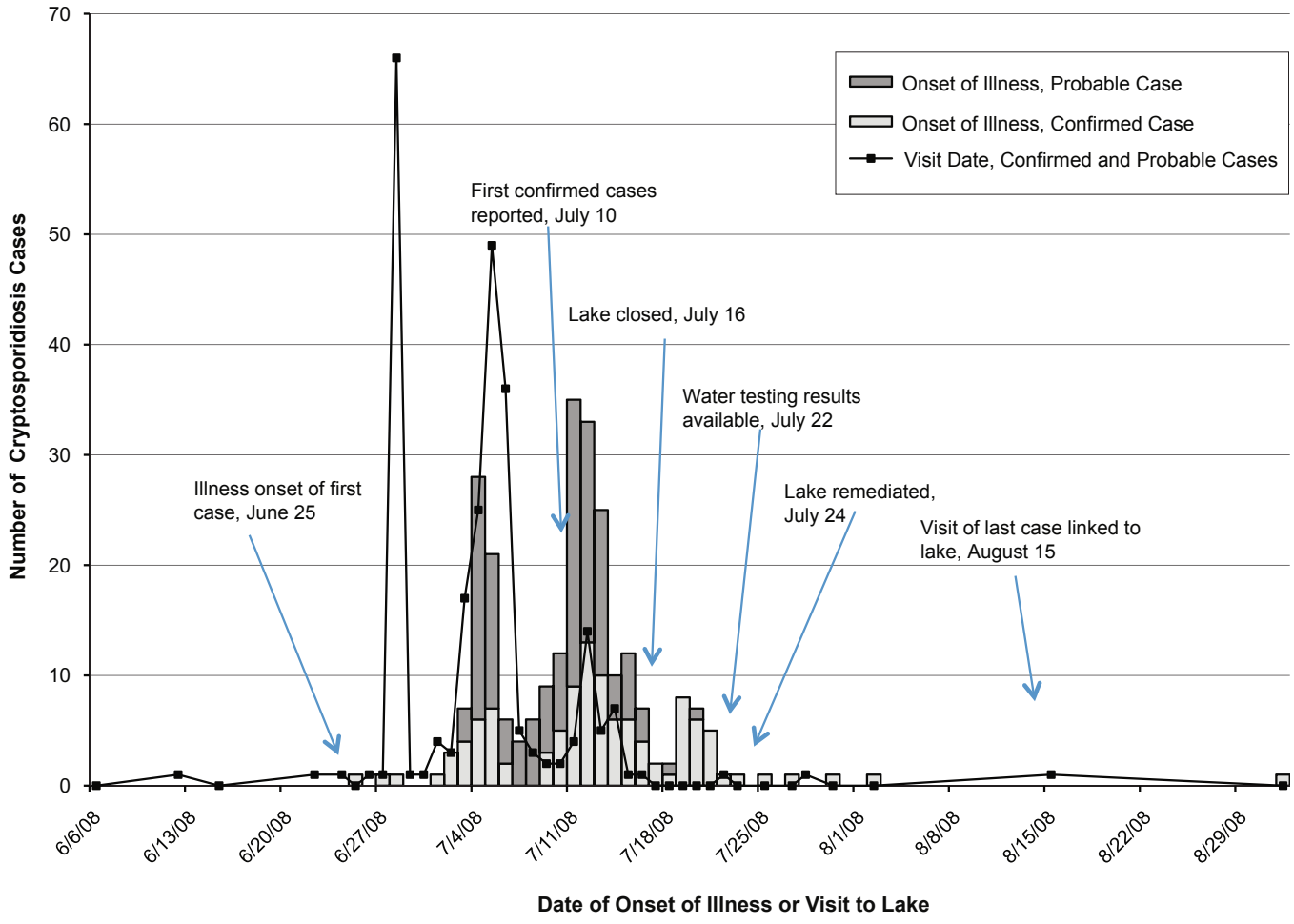
On July 14, a full-scale investigation was begun. On July 16, after the first laboratory-confirmed case with a different exposure date was identified, the lake was voluntarily closed. Investigators identified 112 confirmed and 142 probable case patients. The median age of case patients was 12 years (range: three months–61 years); 132 (52%) were male. The median incubation period was six days (range: 0–18 days). The epidemiologic curve (Figure 1) developed during the investigation demonstrates the three peaks of lake exposure, all of which occurred on weekends. The onset of symptoms then peaked 5–10 days after each exposure peak.

Fifty-six matched pairs were enrolled in the case-control study from among households that visited the lake. Demographic and exposure information collected from the cases and controls are summarized in Table 1. Males comprised 55.4% of cases compared with 28.6% of controls ($p = .009$). The median age of cases was 12.5 years compared with 32 years among controls ($p = .003$). Significant risk factors detected in univariable analysis (Table 2) included swallowing lake water (*OR* = 39.9), putting one's head under water (*OR* = 21.1), entering the lake (*OR* = 8.2), male sex (*OR* = 2.7), and younger age (*OR* = 0.95 for each year increasing age). Multivariable analysis (Table 2) revealed one significant risk factor: swallowing lake water (*OR* = 16.3; 95% confidence interval [*CI*]: 2.5–infinity). No differences between cases and controls were detected in regards to bringing one's own food to the lake, eating concession stand food, eating sno-cones made using water from one of the wells, or exposure to animals or pets.

Twenty-two potential case patients with diarrhea at the time of interview submitted stool specimens for additional testing. *Salmonella*, *Shigella*, *E. coli*, *Campylobacter*, *Y. enterocolitica*, and norovirus were not detected

FIGURE **1**

Probable and Confirmed Cases of Cryptosporidiosis Associated With a Lake—Tarrant County, Texas, 2008 (*N* = 253*)



*One case patient with laboratory-confirmed cryptosporidiosis could remember the date of visit to the lake but not the exact date of symptom onset. The person did report that the symptom onset was after June 20, 2008.

in any of the stool specimens. *Cryptosporidium hominis* was detected in 12 specimens. Ten isolates were of the IaA28R4 subtype and two were of the IaA15R3 subtype. The latter came from stool specimens from two case patients from one family who had visited the lake on July 11.

Environmental Health and Laboratory Investigation

The lake is a sandy bottom lake that reaches a depth of up to 10 ft., contains approximately two million gallons of water, and has an estimated turnover rate of 1.5 days (i.e., the crude estimated time for recirculation of the entire volume of lake water through the filtration system). On summer weekends approximately 2,000 people visit daily. The lake is not considered a pool under Texas code and is not regulated under that code. Four wells on the property feed the lake. A fifth well supplies disinfected water for the concession stand and other potable water needs. Chlorinated water from one well is fed through a circular manifold installed in the deepest area of the lake. Water drawn from the lake bottom is pumped through two rapid sand filters and returned without additional chlorination. The shoreline and bottom are irregular, potentially creating regions of poor circulation. Additional structures on the property include a concession stand; six toilets and a hand washing station that receive water from a separately chlorinated line originating from a well that also feeds the lake; and a septic system that integrates three septic tanks with a dispersion field located >100 ft. from the lake and wells.

The lake's concession stand had passed all health inspections during the 2008 swimming season. TCPH inspectors found no cross connections between the water sup-

TABLE **1**

Characteristics and Exposures Among Participants in the Matched Case-Control Study

General Characteristics	Cases (n = 56)		Controls (n = 56)		p-Value[a]
	#	%[b]	#	%[b]	
Male sex	31	55.4	16	28.6	.009
Age in years: median (range)	12.5	(0.3–61)	32	(0.3–63)	.003[c]
Race/ethnicity					
Caucasian	43	76.8	45	80.4	.61
Hispanic	12	21.4	10	17.9	
Other[d]	1	1.8	1	1.8	
Exposures					
Entered the water	56	100	50	89.3	.01
Put head under water	55	98.2	40	71.4	.0001
Swallowed lake water	49	89.1	21	38.2	<.0001
Brought own food to lake	53	94.6	53	94.6	?[e]
Ate concession stand food	13	23.2	9	16.1	.1
Ate concession stand sno-cone	6	10.7	5	8.9	?[e]
Contact with animals/pets	44	80	41	74.6	.31

[a]All p-values from Cochran-Mantel-Haenszel test and adjusted for matching except where noted.
[b]Occasionally data were missing so the percentage may be calculated using an $n < 56$.
[c]p-Value for two-sample median test.
[d]Other includes Asian and American Indian or Alaska Native.
[e]No p-value calculated as ≤1 discordant pair.

TABLE **2**

Univariable and Multivariable Predictors of Gastrointestinal Illness After Visit to the Lake

Variable	Univariable		Multivariable	
	OR[a]	95% *CI*[a]	*OR*[a]	95% *CI*[a]
Age in years (continuous)	0.95[b]	0.9–1.0[b]	0.97[c]	0.9–1.0[c]
Male sex	2.7	1.2–5.7	3.6	0.9–29.8
Entered the water	8.2	1.2–infinity	•••[d]	•••
Put head under water	21.1	3.6–infinity	4.8	0.4–infinity
Swallowed lake water	39.9	7.1–infinity	16.3	2.5–infinity
Ate concession stand food	5.0	0.6–42.8	•••	•••
Ate concession stand sno-cone	1.0	0–39	•••	•••
Contact with animals/pets	3.0	0.3–28.8	•••	•••

[a]Matched odds ratio. *CI* = confidence interval.
[b]p-value = .0006.
[c]p-value = .27.
[d]Variable not included in the multivariable model.

ply line serving the lake and the restrooms. Additional portable toilets were available on weekends. No evidence of septic system malfunction was found. No fecal coliforms were detected in the three wells that could be assessed. *Cryptosporidium* species were detected in the 120-L composite lake sample by microscopy (U.S. EPA Method 1623) and real-time PCR. *Cryptosporidium* was not detected in the composite well water sample. The parasite was also detected in one filter backwash sample by real-time PCR. Neither isolate could be speciated.

The free chlorine level (range: 0.0–0.6 ppm), pH (range: 7.0–8.0), and water temperature (range: 85°F–88°F [29.4°C–31.1°C]) were measured at multiple points in the lake and measurements were similar. All measurement points were recorded using GPS technology so that the same points could be monitored throughout the hyperchlorination process. The lake was hyperchlorinated to inactivate *Cryptosporidium* on July 24 by the owner under the supervision of TCPH environmental health officials. Hourly samples were collected from five representative locations in the lake and from a port on the recirculation system. Free chlorine levels ≥20 ppm were achieved throughout the lake on July 24 at 10:15 p.m. and maintained for 13 hours. The chlorine level dropped to 8 ppm on July 27 and the lake was reopened. The hyperchlorination protocol required the addition of nearly 1,700 pounds of chlorine. Investigators identified only two cases of cryptosporidiosis associated with the lake after implementation of the hyperchlorination protocol.

Discussion

The report of a small cluster of cryptosporidiosis cases to TCPH by the proverbial "astute clinician" helped identify an outbreak that was linked to a man-made chlorinated lake. The epidemiologic investigation produced an epidemiologic curve that revealed repeated exposure to a contaminant at the lake and a 5–10 day delay between exposure to the lake and symptom onset, which is consistent with the incubation period of cryptosporidiosis. The case-control study determined that the key risk factor for infection was swallowing the lake water. The laboratory and environmental health investigation narrowed down the potential sources of contamination.

Laboratory testing detected *Cryptosporidium hominis*, a species that is predominantly

transmitted anthroponotically, in stool specimens; *Cryptosporidium* species were also detected in the lake and the filter backwash. Together, the epidemiologic, laboratory, and environmental health investigations could eliminate all but two potential contamination sources (i.e., two covered, inaccessible wells and ≥1 human diarrheal fecal incidents in the water). As *C. hominis* was the outbreak's etiologic agent, the contamination of the lake could have been due to introduction of the parasite through ≥1 human diarrheal fecal incidents in the water.

This is the first reported recreational water illness (RWI) outbreak associated with a man-made chlorinated lake. The chlorine levels detected in this lake were too low to inactivate pathogens, particularly *Cryptosporidium*. It should be noted that the outbreak occurred in the context of a community-wide outbreak of cryptosporidiosis. For 2008, more than 3,000 cryptosporidiosis cases were reported in Texas (Yoder, Harral, & Beach, 2010). This was a greater than 14-fold increase from 2007. Over two-thirds of the case patients resided in Collin, Dallas, Denton, and Tarrant counties in the Dallas-Fort Worth metropolitan area.

The emergence of *Cryptosporidium* as one of the leading causes of outbreaks associated with treated RWVs and community-wide cryptosporidiosis outbreaks call for a vigorous national effort to educate the public about the critical role of swimmer hygiene (e.g., not swimming while ill with diarrhea) and not swallowing recreational water. Available data suggest that *C. hominis* might be more virulent than *C. parvum* and that the clinical presentation of *C. hominis* infection varies by subtype (Cama et al., 2008; Hunter et al., 2004). The IaA28R4 subtype of *C. hominis* identified in this outbreak has been identified in several other U.S. RWI outbreaks and is becoming the dominant *C. hominis* subtype in outbreaks and sporadic cases (Xiao et al., 2009; Xiao & Ryan, 2008).

Secondary/supplemental disinfection that can inactivate *Cryptosporidium* (e.g., ultraviolet light or ozone systems [Betancourt & Rose, 2004; Craik, Weldon, Finch, Bolton, & Belosevic, 2001; Rochelle, Upton, Montelone, & Woods, 2005]) and reduce risk of transmission of this extremely chlorine-tolerant parasite needs to be considered as part of standard operation of the nation's treated RWVs (Centers for Disease Control and Prevention, 2007). Of note, CDC does not recommend hyperchlorinating lakes and other natural bodies of water in response to cryptosporidiosis outbreaks.

Pool codes in the U.S. are reviewed and approved by individual state or local public health officials. Although the Virginia Graeme Baker Pool and Spa Safety Act of 2007 (15 U.S.C. §§ 8001 et seq.), which was designed to reduce the risk of entrapment, appointed the U.S. Consumer Product Safety Commission to regulate one limited aspect of pool and spa safety, no other federal agency is responsible for regulating other aspects of treated RWVs. As a result, pool codes can vary widely among jurisdictions and no uniform national standards govern the design, construction, operation, and maintenance of treated RWVs. This disparate approach to RWI prevention can lead to inefficiency and gaps in effective public health policy, as lessons learned from RWI outbreak investigations in one jurisdiction might have to be relearned in another. A national model pool code that captures the lessons learned by all jurisdictions and is based on the latest epidemiologic, laboratory, and environmental health data identifying RWI risk factors or the most effective RWI prevention and control measures is needed.

One such effort to create a model, the national Model Aquatic Health Code (MAHC) (www.cdc.gov/healthywater/swimming/pools/mahc/structure-content), is being sponsored by CDC and led by the New York State Department of Health and an all-stakeholder multidisciplinary steering committee. The MAHC will be a free, open-access, evidence-based model health code that aims to reduce illness and injury associated with treated RWVs. It will set a research agenda for aquatic health and safety, and like the Food and Drug Administration food code, will be updated regularly. The MAHC is a collaborative effort between public health officials and the aquatics sector.

Making the best available standards and practices available for voluntary adoption by state and local agencies, the MAHC should increase the efficiency of environmental health pool programs. This can be accomplished by pooling resources across jurisdictions to create one model code based on the latest science and sharing lessons learned and then making this resource available to state and local jurisdictions as they review and update their public health laws related to the prevention of swimming-associated illness and injury. Effective implementation of a unified approach to RWI prevention involving improved staff and patron hygiene, engineering enhancement, and regulatory improvement should reduce the risk of RWI in the future.

Our investigation had multiple limitations. Because this outbreak occurred in the context of community-wide outbreak and additional concurrent public health emergencies, resources were not available to interview all cases for the case-control study. Recall bias resulting from conducting interviews after weeks had elapsed since infection and the TCPH press conference might have influenced responses from case patients and controls. Two of the five wells could not be accessed for microbial testing, and the investigation was dependent on voluntary cooperation of the beach manager as the lake was not regulated as a pool or lake by Texas code.

Conclusion

Our investigation highlights the importance of close cooperation among epidemiology, laboratory, and environmental health colleagues in response to RWI outbreaks. While the epidemiologic investigation identified cases and risk factors associated with the outbreak and the laboratory investigation confirmed the etiologic agent, it was the environmental health investigation that narrowed down the possible explanations of how the water was contaminated. Only by combining results of the three components of this collaborative investigation could the team conclude that the lake was likely contaminated by ≥1 human diarrheal fecal incidents in the lake and make control recommendations.

Given the importance of the contribution of the environmental health perspective to RWI outbreak investigations, it is troubling that reports to CDC about RWI outbreaks often include laboratory and in-depth epidemiologic data but limited environmental health data. For example, reports to CDC on 89 (66.4%) of the 134 RWI outbreaks (2007–2008) presented either no or inadequate environmental health data. It is unclear whether this is because environmental health investigations are not conducted or because the environmental health data are not reported to CDC. The

shortage of environmental health data from outbreak investigations represents a missed opportunity to better identify the factors that contribute to the contamination of recreational water and implement the most effective RWI prevention and control measures. As collaboration between epidemiology, laboratory, and environmental health are required for the successful completion of this and other outbreak investigations, their collaborative input will also be needed for the development and maintenance of an effective MAHC.

Disclaimer: The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the CDC.

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SPECIAL REPORT

The Need for Congressional Action to Finance Arsenic Reductions in Drinking Water

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Abstract **Many public water systems in the U.S. are unsafe because the communities cannot afford to comply with the current 10 parts per billion (ppb) federal arsenic standard for drinking water. Communities unable to afford improvements remain vulnerable to adverse health effects associated with higher levels of arsenic exposure. Scientific and bipartisan political consensus exists that the arsenic standard should not be less stringent than 10 ppb, and new data suggest additional adverse health effects related to arsenic exposure through drinking water.**

Congress has failed to reauthorize the Drinking Water State Revolving Fund program to provide reliable funding to promote compliance and reduce the risk of adverse health effects. Congress's recent ad hoc appropriations do not allow long-term planning and ongoing monitoring and maintenance. Investing in water infrastructure will lower health care costs and create American jobs. Delaying necessary upgrades will only increase the costs of improvements over time.

Introduction

Increasing scientific data are available on the harmful effects of arsenic in drinking water on human health. Despite previous efforts to ensure that drinking water is safe, arsenic remains a potential health hazard in both urban and rural settings across the U.S. From 2004 to 2009, approximately 1,724 regulated water systems serving over 11 million people exceeded the current 10 parts per billion (ppb) standard (Environmental Working Group, 2009). Since water in different geographical areas contains different levels of arsenic, the risks are unequally distributed across the country, and some of the highest levels occur naturally in some of the poorest areas, such as New Mexico (American Cancer Society, 2011; U.S. Census Bureau, 2010). Many systems remain out of compliance and are unable to afford necessary upgrades. Communities unable to afford improvements remain vulnerable to adverse health effects associated with higher levels of arsenic exposure.

Despite scientific and political consensus that the standard should not be less than 10 ppb (Arsenic Water Standard Delay Amendment, 2001; National Research Council [NRC], 2001), political hurdles remain in implementing it. Since 2003, Congress has failed to provide long-term funding to public water systems to help finance the cost of compliance with the federal arsenic standard for drinking water and reduce the risk of adverse health effects such as cancer. Investing in the country's drinking water infrastructure would also strengthen the nation's economy by creating jobs and a more productive workforce (Krop, Hernick, & Frantz, 2008). New scientific data and bills recently proposed in Congress to revise and reauthorize the Drinking Water State Revolving Fund program (DWSRF), which helps support states in upgrading their drinking water systems, highlight the need for improvements. As drinking water is a necessity of life, it is essential that Congress renew DWSRF to enable all Americans who rely on and trust public water sources to access clean drinking water.

Discussion

Arsenic in Drinking Water

Arsenic may enter drinking water naturally through volcanic action, erosion of rocks, or forest fires, or through human activities such as mining, coal burning, copper smelting, animal feeding operations, or industrial use (U.S. Environmental Protection Agency [U.S. EPA], 2010a). Higher levels of arsenic are generally found in groundwater sources, which small communities often use for drinking water, than in surface water sources such as lakes and rivers, which larger cities rely upon (U.S. EPA, 2010a). Arsenic found in drinking water is primarily inorganic (NRC, 1999). In the U.S., the average arsenic level in groundwater is less than or equal to 1 ppb, and Western states have the greatest number of regulated water systems in the country whose levels exceed 10 ppb (Tiemann, 2007). The U.S. Environmental Protection Agency (U.S. EPA)

TABLE **1**

Examples of Health Data Since 2001 on Arsenic Exposure

System	Effect
—	Mortality (Meliker, Wahl, Cameron, & Nriagu, 2007)
Gastrointestinal/hepatic	Cirrhotic portal hypertension, hepatic angiosarcoma (Agency for Toxic Substances and Disease Registry [ATSDR], 2007); noncirrhotic portal hypertension (International Agency for Research on Cancer [IARC], 2004)
Cardiovascular	Hypertension, cardiac arrhythmias (Guha Mazumder, 2003); atherosclerosis (Simeonova & Luster, 2004); peripheral vascular disease, cardiomyopathy, cardiovascular mortality (Rosenman, 2007)
Neurologic	Subclinical neuropathy (ATSDR, 2007; Tseng, 2003); peripheral neuropathy (Chakraborti, Hussam, & Alauddin, 2003); encephalopathy (ATSDR, 2007)
Skin	Pigment changes (ATSDR, 2007); Bowen's disease (Guo, Yu, Hu, & Monson, 2001); skin lesions (Yoshida, Yamauchi, & Sun, 2004)
Carcinogenic	Bladder, lung, skin, prostate, kidney, liver (ATSDR, 2007)
—	Diabetes (IARC, 2004; Navas-Acien, Silbergeld, Pastor-Barriuso, & Guallar, 2008)

has verified twelve technologies for arsenic removal that have the potential to improve protection of human health and the environment (U.S. EPA, 2007).

Health Consequences of Arsenic Exposure

Arsenic in drinking water can have serious human health consequences and also significant economic consequences for the public health system. The National Research Council (NRC) completed a review of all available health data on arsenic exposure through drinking water in 1999 (NRC, 1999) and published an updated review in 2001 (NRC, 2001).

Arsenic is a group A carcinogen by the oral route (U.S. EPA, 2011a). In 2001, NRC reported that exposure to 10 ppb of arsenic in drinking water is associated with a risk of 30 cancer deaths per 10,000 people drinking the water—30 times U.S. EPA's acceptable rate (NRC, 2001). Exposure to arsenic in drinking water can cause bladder, lung, and skin cancer, and may cause kidney and liver cancer (NRC, 2001). It might be harmful to the central and peripheral nervous systems and the circulatory system, cause birth defects, affect reproduction, and cause precancerous skin lesions and changes in skin pigmentation (NRC, 2001).

It is difficult to determine the exact level of exposure that can lead to a particular adverse health outcome, and increases in cancer are difficult to detect statistically in the U.S. (NRC, 2001). Many studies on arsenic exposure were conducted in areas outside the U.S. with concentrations up to several hundred ppb (NRC, 2001). It remains challenging to study the effects of arsenic exposure in U.S. populations because Americans are very mobile and are likely to ingest drinking water from numerous sources (NRC, 2001). Additionally, arsenic concentrations vary over time and by location and an unknown distribution of other risk factors exists such as smoking, genetics, and diet (NRC, 2001).

Since the 2001 NRC report, new data exist associating adverse health effects with arsenic exposure from drinking water (Table 1). These health outcomes are common causes of morbidity and mortality in the U.S. and place a tremendous economic burden on the health care system. Bladder cancer has the highest per-person treatment costs of all cancers in the U.S., and the fifth-highest overall costs, estimated at $3.4 billion annually (Sievert et al., 2009). Approximately $1 of every $10 of health care expenditures in the U.S. is attributable to direct costs associated with diabetes (Kile & Christiani, 2008). In 2004, the total direct costs associated with treatment for nonmelanoma skin cancer were $1.5 billion (Bickers et al., 2006). Therefore, even small increases in relative risk at low arsenic doses could be of substantial public health importance (NRC, 2001).

Vulnerability of Poor Communities to Higher Levels of Arsenic Exposure

Implementation of the current 10 ppb standard for arsenic in drinking water remains a challenge for water systems that cannot afford compliance costs. For such communities, arsenic can affect vulnerable populations in inequitable ways because they are vulnerable to higher levels of exposure than those who live in areas with lower levels. This creates health disparities between communities that can afford better water quality and those that cannot. Reducing health disparities related to arsenic exposure will benefit the economy and reduce health care costs by helping to prevent disease. A healthier population is also more productive.

One example of this inequitable impact is in Albuquerque, New Mexico. Albuquerque is the only urban area in the country with substantial arsenic concentrations in drinking water (Frumkin & Thun, 2001). In 2001, the city's drinking water contained an average arsenic level of 14 ppb, with levels ranging from nondetectable to 42 ppb (Albuquerque Bernalillo County Water Utility Authority, 2000). Although state averages in 2010 reflect compliance with the 10 ppb standard (Albuquerque Bernalillo County Water Utility Authority, 2010), in 2009, 85 violations of the standard occurred throughout the state in 32 public water systems (New Mexico Environment Department, 2009a). Thus, the arsenic problem has not been resolved and may still pose a health threat to the community.

In 2008, 17% of New Mexico residents lived below the poverty line (U.S. Census Bureau, 2010), and the state ranked 43rd in income per capita in the country (U.S. Census Bureau, 2008). The arsenic in New Mexico's water occurs naturally (New Mexico Environment Department, 2011). A modest elevation in the incidence of bladder cancer has been reported in some areas, indicating a possible causal link (Athas, 2010). According to a 2010 estimate, the state's public water system needs $246 million to maintain a safe water supply (New Mexico Environment Department, 2009b).

In 2010, the New Mexico DWSRF received less than $14 million in federal funding (U.S. EPA, 2010b). In the absence of sufficient federal action to assist communities in decreasing arsenic levels, local governments must assume responsibility for a national public health priority. Consequently, communities unable to afford upgrades are left vulnerable to higher levels of exposure. Delaying essential upgrades increases the costs of the improvements as water systems deteriorate and

drinking water standards become more stringent (Assistance, Quality, and Affordability Act of 2010; Priorities for the Reauthorization of the Safe Drinking Water Act, 1996).

Legislative Background and Approaches to Reducing Arsenic in Drinking Water

In 1974, Congress passed the Safe Drinking Water Act (SDWA), which required U.S. EPA to establish health-based goals to safeguard the nation's public drinking water supplies against both man-made and natural pollutants (Safe Drinking Water Act, 1974). Currently, SDWA applies to about 154,879 privately and publicly owned water systems (Tiemann, 2010). It reaches neither private wells that serve fewer than 25 individuals, which includes approximately 15% of the U.S. population (DeSimone, 2009), nor bottled water (Beverages: Bottled Water, 1995). A 50 ppb standard for arsenic in drinking water was set in 1975 (U.S. EPA, 2001) and was revised in 2001 (Arsenic in Drinking Water, 2001). In 2001, based on the NRC reviews, and considering health and compliance cost concerns, U.S. EPA enacted the current 10 ppb standard (Arsenic in Drinking Water, 2001; U.S. EPA, 2010c). New Jersey adopted a 5 ppb standard in 2006 and remains the only state with a stricter standard than the federal rule (New Jersey Department of Environmental Protection, 2004).

Although regulated water systems were required to comply with the 10 ppb standard by 2006 (Inorganic Chemical Sampling and Analytical Requirements, 2001), many remain unsafe. The federal government has been reluctant to take legal action against municipalities because many lack the financial ability to comply (Duhigg, 2009). To assist public water systems with compliance, the 1996 amendments to SDWA created DWSRF. Under DWSRF, U.S. EPA provides capitalization grants to states to establish clean water state revolving funds (Safe Drinking Water Act Amendments of 1996). These funds are used to provide loans and other financial assistance to local communities and intermunicipal and interstate agencies; states must contribute at least 20% of the amount of the grant made to the state (Safe Drinking Water Act Amendments of 1996). As loans are repaid, those funds may be used for loans for future projects (Safe Drinking Water Act, 2006b).

The 1996 amendments authorized appropriations for DWSRF. They also required U.S. EPA to reserve $10 million from funds appropriated for the grants each fiscal year for health effects studies on drinking water contaminants, particularly groups with higher risks of adverse effects from exposure (Safe Drinking Water Act, 2006c). DWSRF addressed a serious public concern with tightening drinking water standards. In testimony before Congress in 1996, Karl Kohlhoff, president of the American Water Works Association, stressed the consistent lack of federal funding for loan programs for disadvantaged communities in comparison to other federal grant or loan programs: "As more and more regulations are implemented under SDWA, the need for public water system improvements grows ever larger. Reform of SDWA will eliminate unnecessary costs, but large legitimate costs of providing safe drinking water remain (Priorities for the Reauthorization of the Safe Drinking Water Act, 1996)."

Since the federal standard for arsenic in drinking water was revised in 2001, stakeholders have asked Congress to provide funding to improve water infrastructure. Steven Levy, representing the National Rural Water Association, testified as follows: "With a significant turnover in water operators and board members, and the ever-increasing regulatory burden, the need for training and technical assistance remains constant (Assistance, Quality, and Affordability Act of 2010)." Citing a major leak in a water pipeline in 2010 that disrupted Boston's water services for three days, Stephen Estes-Smargiassi, director of planning at the Massachusetts Water Resources Authority, highlighted the need for infrastructure improvements: "Utilities have spent billions of dollars to meet immediate public health priorities; the next critical need is to tackle the issue of an aging infrastructure in order to ensure reliable service and consistent water quality (Assistance, Quality, and Affordability Act of 2010)."

Groups such as the National Association of Corrosion Engineers (2010), Associated General Contractors of America (2010), and Alliance for American Manufacturing (2010) have expressed support for legislation reauthorizing DWRSF to provide reliable funding for infrastructure improvement projects and to create American jobs.

Congress last authorized SDWA in 1996 (Tiemann, 2009). Funding for most SDWA programs expired in 2003, but Congress continues to appropriate funds annually (Tiemann, 2009). Since FY1997, Congress has provided more than $11.1 billion for DWSRF (Tiemann, 2009). Since DWSRF began in 1997 until 2009, state funding programs provided $16.2 billion in low-interest loans to public water systems and entered into over 6,000 assistance agreements (U.S. EPA, 2009a). In 2009, DWSRF provided $1.6 billion in funds (U.S. EPA, 2009a). Over 250 assistance agreements in 2009 totaling over $400 million were made to state-designated disadvantaged communities (U.S. EPA, 2009a). While ad hoc appropriations provide valuable resources, they do not provide a reliable source of consistent funding, inhibiting long-term planning and ongoing maintenance.

U.S. EPA has estimated the national drinking water infrastructure need for the period 2007–2026 at $334.8 billion (U.S. EPA, 2009b). Large community water systems, serving over 100,000 persons, will require $116.3 billion; medium community water systems, serving 3,301–100,000 persons, will need $145.1 billion; small community water systems, serving 3,300 and fewer persons, will need $59.4 billion; and nonprofit noncommunity water systems will require $4.1 billion (U.S. EPA, 2009b).

In the 111th Congress, two bills to revise and reauthorize DWSRF were approved by the respective congressional committees. The Water Infrastructure Financing Act would have authorized $14.7 billion for DWSRF over five years and created a federal grant program with funding priority for small and economically disadvantaged communities (Water Infrastructure Financing Act, 2009). The Assistance, Quality, and Affordability Act, among other provisions, would have reauthorized DWSRF, providing $1.5 billion in 2011 and increasing the authorization each year until it reached $6 billion in 2015 (Assistance, Quality, and Affordability Act of 2010). In a hearing on the Assistance, Quality, and Affordability Act, Massachusetts Congressman Ed Markey emphasized that a variety of stakeholders supported the bill, water systems cannot afford upgrades on their own, and consumers already struggling to pay their water bills would not be able to absorb the cost (Assistance, Quality, and Affordability Act of 2010).

The Water Protection and Reinvestment Act would have provided a novel financing option by creating a water infrastructure trust fund financed through certain product

and corporate taxes, rather than relying on appropriations (Water Protection and Reinvestment Act of 2009). Although arsenic occurs naturally in drinking water, this could hold accountable industries whose activities increase arsenic levels, while promising steadier funding. Unfortunately, these bills died because Congress failed to vote on them before the legislative session ended.

U.S. EPA evaluates a regulation's affordability by determining whether compliance costs would raise the total water cost above 2.5% of annual median household income among small water systems (Tiemann, 2010). The agency determined that affordable compliance technologies are available for every drinking water regulation (Tiemann, 2010). States or U.S. EPA may grant temporary exemptions from a SDWA standard if, due to certain factors, including cost, a system cannot meet the compliance deadline (Safe Drinking Water Act, 2006a). To grant an exemption, the state must hold a public hearing and determine that the exemption would not result in an "unreasonable risk to health (Safe Drinking Water Act, 2006a)." Because of the administrative burden on the states, the exemption authority is seldom used (Tiemann, 2010).

The Obama administration has sought to increase consumer confidence, transparency, and public health protection and to assist small communities in identifying cost and energy efficient treatment technologies (U.S. EPA, 2011b). By promoting development of new technologies and addressing contaminants as groups, rather than individually, it aims to increase cost-effectiveness in treatment (U.S. EPA, 2011b). To increase information for decision making and prevent chemicals from entering drinking water, U.S. EPA began employing statutes such as the Toxic Substances Control Act and the Federal Insecticide, Fungicide, and Rodenticide Act (U.S. EPA, 2011b). Additionally, the agency partners with states to increase access to public water systems monitoring data (U.S. EPA, 2011b). Through such partnerships, U.S. EPA maintains a Safe Drinking Water Information System database, which tracks information on drinking water contamination and violations of SDWA (U.S. EPA, 2011c). This allows the federal government to recognize trends and increase information available to the public.

The Obama administration's strategies represent important advancements for future assessments of the arsenic standard, but threats posed by arsenic in drinking water remain unresolved because the legislative branch of the federal government, under both Democratic and Republican leadership, has failed to reauthorize long-term funding to promote compliance with the 10 ppb standard. Cost is the largest obstacle to meeting the standard (Tiemann, 2010). Cass Sunstein, administrator of the Office of Information and Regulatory Affairs under President Obama, which must approve all proposed federal regulations before they are issued to the public, has recommended creating standards on a sliding scale (Sunstein, 2002). This would involve varying the permitted level of arsenic in a particular water supply in accordance with the cost of upgrading that water system (Sunstein, 2002). Such an approach suggests a lower value for the lives of those in poor areas who cannot afford to meet the strictest standards. Instead, the federal government must ensure that, through programs such as DWSRF, these areas can obtain funds to meet a uniform standard.

Improving the drinking water infrastructure would also strengthen the U.S. economy. According to a report by the U.S. Conference of Mayors, each dollar invested in water and sewer infrastructure increases gross domestic product in the long term by $6.35 (Krop et al., 2008). For each additional dollar of revenue for the water and sewer industry, all industries experience an increase in revenue of $2.62 that year (Krop et al., 2008). Adding one job in water and sewer creates 3.68 jobs in the U.S. economy to support that job (Krop et al., 2008). As the country recovers from its economic crisis, investing in the country's water infrastructure would allow water system to make necessary upgrades while creating American jobs.

In remaining out of compliance with the 10 ppb standard, water systems in the U.S. deviate from international practice. In 1993, the World Health Organization established 10 ppb as the recommended limit for arsenic in drinking water, and the European Union, Japan, Laos, Jordan, Mongolia, Namibia, and Syria adopted that standard by 1999 (Yamamura, 2001). In 1996, Australia adopted a 7 ppb standard (Yamamura, 2001). As American researchers and public health professionals engage in critical efforts abroad to reduce arsenic levels in drinking water, particularly in Bangladesh (Columbia University, 2011), the American public should be able to have confidence in its own supplies.

Recommendations for U.S. Drinking Water Policy

The finding that poor communities are vulnerable to higher levels of arsenic exposure in their drinking water supplies indicates the need for a fundamental revision of Congress's approach to funding safe drinking water. Since funding authority for DWSRF expired in 2003, Congress has provided ad hoc, yearly appropriations to assist water systems with funding necessary upgrades (Tiemann, 2009). As water infrastructure ages and SDWA requirements increase as additional knowledge on harmful effects of arsenic becomes available, Congress must reauthorize DWSRF to provide a reliable source of continuous funding. While achievements gained using annual appropriations must not be overlooked, promising a steady flow of funds promotes long-term planning and ongoing monitoring, training, and maintenance (Assistance, Quality, and Affordability Act of 2010). Without a guaranteed source of funding, a change in Congress's short-term economic priorities one year might come at the expense of the public's health if Congress fails to allocate any funds.

It is equally important that Congress support continued research on the impact of arsenic exposure on human health (Safe Drinking Water Act, 2006c). Epidemiologic monitoring of exposed populations would provide a stronger evidentiary basis to design policy interventions. It could promote an understanding of populations at the highest risk of experiencing adverse health effects due to factors such as nutritional status or genetic susceptibility. Monitoring could also increase awareness of lifestyle practices to reduce exposure.

Long-term financial investments are needed to reduce arsenic levels in public drinking water supplies to meet the national standard and achieve lasting health gains. Policy makers must broadly define benefits related to a policy when performing a cost-benefit analysis. Many drinking water infrastructures have been historically neglected and providing assistance to reduce arsenic levels may drive technological developments that make compliance more affordable.

Conclusion

Clean drinking water is a vital resource. The greatest public interest exists in using public funds to upgrade public water systems. Future scientific data on arsenic exposure will likely reveal additional adverse health effects, or adverse health effects at lower levels of exposure. Delaying improvements will increase infrastructure deterioration and also repair and replacement costs. Since upgrades take time to carry out, it is crucial that Congress reauthorize DWSRF to promote long-term planning and to minimize the amount of time that water systems remain out of compliance. Investing in water infrastructure will not only produce safer water supplies, but also will create thousands of American jobs and reduce health care expenditures. This investment is essential to protect vulnerable populations that cannot afford upgrades and also have some of the highest levels of exposure. The federal government must provide critical resources to create more uniformity in drinking water supplies across the country and assure that in this regard a lower value is not placed on people's lives based on their geographical location.

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GUEST COMMENTARY

Craft Cocktail Considerations: Fundamental Food Sanitation for Modern "Mixology"

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Introduction

The advancement of most professions hinges heavily on its practitioners' continual awareness of emerging trends and its community's effectiveness in steering its work to the highest standards applicable. Observation, regulation, inspection, surveillance, and outreach are indispensable tools for environmental health practitioners but lose potency when activities of interest transpire while professionals are off duty and compliance legacy is indiscernible as communities had vanished long before applicable oversight was developed. The resurgence of "craft cocktails" in the U.S. will be the focus as this article attempts a cursory evaluation of this burgeoning industry's unique exposures from the perspective of environmental health and food safety.

Traditional Craftsmanship of Cocktails

Many larger cities across the country are significantly reembracing the art of how distilled beverages are produced, formulated, and offered. The service and appreciation for "craft cocktails" are among the most prosperous trends in the worlds of hospitality and business as a whole. Informed experts in this niche will curate it as nothing truly new but rather a "coming home" to our ancestral ways that most Americans abandoned in the early 1900s due to Prohibition.

In simplified terms, the difference between "craft cocktailians" and the common, mainstream drink pourers, and distinctness of nomenclature for "mixologists" versus bartenders, are akin to what distinguishes a legitimate chef from a cook: diligent practice, apparent passion, voluntary investment into continual education, pursuit of quality ingredients, preparation from "scratch," and the resulting superior skill sets and abilities to execute sophisticated beverages. That all probably sounds good, and indeed, when practiced authentically, the fruits of the labor also taste "all sorts of good."

So, if we are simply doing again now what we used to then, then why reassess any of it? Most would readily acknowledge that our overall environment has changed drastically since the pre-1920s. Therefore, we must admit that the inherent risk probabilities entailed with similarly dated practices may likely, and deductively, have changed as well. Furthermore, as the employed epidemiological methods advance in how we assess past experience, so does our awareness and accuracy of what truly was or was not harmful in hindsight. In this article, three of the more obvious public health considerations of craft cocktails will be discussed briefly: fresh produce, hand-shaped ice, and raw eggs.

Sanitation of Ready-to-Eat Produce

The incorporation of raw, seasonal produce is one of the hallmarks of mixology. Housemade syrups, pastes, and per-order muddling of fresh fruits, vegetable, herbs, spices, etc., are truly welcomed by enthusiasts of all things natural. These are preferred over processed artificial syrups and packaged products (juices, extracts, purees, etc.). This practice itself is completely advantageous to the consumer. In my opinion, the food protection implication is whether raw produce is being sourced and prepared for use as a non-heat-treated item, as salad ingredients would be handled, versus how garnishes have all too often been unattended to. As a former food safety inspector, I believe the common experience of many food safety inspectors is that many operations perceive and treat garnishes as ornamental accents to food and drink presentation, and so they are not cleaned, handled, and prepared as a food that will be consumed. In the past decade or so, we have seen increasing foodborne illness outbreaks attributed to raw produce, so that dynamic of further agricultural industrialization needs to be factored into all areas that do not cook or otherwise sanitize produce. An ironic salvation in the overprocessed and artificial flavor adjuncts is their probable curing, pasteurization, or other pathogen-control step of some sort. If the cocktail's berries, herbs, and peppers come directly from a farm and were harvested recently, most would agree that such ingredients are celebrated and preferred. What must be assured is that any and all stages of product handling are to align with

its intended direct consumption as a food. Without assuming in either direction, it can be agreed that all libation-destined produce is to be stewarded as a raw apple would—selecting, storing, washing, handling, and serving as a ready-to-eat food and not an optional sanitation-forsaken garnish.

Manual Handling of Drink Ice

An attentive focus on water chemistry is a fundamental baseline in many artisanal industries, such as gourmet coffee and tea, because water, by pure composition, makes up the near entirety of your final product. To a lesser proportion, yet with equal vigilance, craft cocktails demand precision in the production and processing of the ingredient ice. Mixologists typically start with purified water and freeze it at a lower temperature and sometimes into much larger pieces than traditional ice. The "crude" ice then looks like a remarkably transparent block while imparting no flavors and taking much longer to melt; the unaffected flavor and curbed dilution rate truly do justice to the labored-over libation, so those independent elements are well orchestrated and self validated.

In classical bar sanitation inspections, the factors of concern have included cleanliness of the equipment that produces, stores, and dispenses ice. The more diligent environmental health specialists would monitor whether staff ever treated the ice destined for drinks, or "food" ice, as ice to chill food containers, or "cold holding/cooling" ice (i.e., jugs of milk immersed in the same ice supply as what is scooped into iced tea). Craft cocktail ice takes the hazard considerations to another platform. As mentioned, it often comes in large blocks and is thus formed to fit strategically into the serving glass. This is accomplished by holding larger ice pieces in the palm of one hand and chipping excess edges away by using the convex portion of a bar spoon. Some preparations call for further manual smoothing by balling the duller cube in the palms of both hands and using warmth provided by body heat and additionally generated by friction to achieve an ice ball. As a perfect sphere is the shape that has the least amount of surface area possible, such ice would take longest to melt and maximize the drink's enjoyment duration.

The process makes for quite the spectacle and retrieves a neat story for inquisitive onlookers. Unfortunately, theatrical components may not be quite so compatible with applicable public health regulations. Some relevant sanitation requirements can be deduced from the Food and Drug Administration's *Food Code* and the following is an applicable excerpt from the most recent 2009 edition: "FOOD EMPLOYEES may not contact exposed, READY-TO-EAT (RTE) FOOD with their bare hands and shall use suitable UTENSILS such as deli tissue, spatulas, tongs, single-use gloves, or dispensing EQUIPMENT (Food and Drug Administration, 2009)." As many consider ice as the most fundamentally qualifying RTE food, seeing as how contamination cannot be cleaned, cooked, or sanitized out, it appears that something needs to be reconfigured to harmonize the code and said common practice. One can then reasonably layer in generous frequencies of pre-, mid- and post-drink handshaking with patrons and handling of gratuities left on the bar. An optimistic assumption would be that the mixologists are washing hands as chefs do when plating RTE foods. Therefore, practical modifications to control the hazards may be to don proper gloves or diligently wash hands before manual contact with ice or after contacting any contaminant sources (patron's hands, money, wiping rags, etc.). If availability of ample hand-washing time would be prohibitive, as it is in most thriving establishments, then perhaps it is worth considering the designation of another staff member to handle payments exclusively so that those handling RTE food may seamlessly keep their hands sanitary in the process.

Use of Raw Eggs as Final Ingredients

In stride with repopularized practices of a bygone era arrive recipes that were fashionable then. The accelerated use of one particular ingredient postures as the proverbial "elephant in the room" to anyone familiar with foodborne illness risks. Raw chicken eggs are a key ingredient in many classical drinks and their use (white or yolk) affords a certain texture profile that is sought in some cocktails. Per-order cracking of raw shell eggs at the bar is congruent to other elements of craft cocktails in transparently demonstrating authenticity of natural ingredients. In regards to eggs, a recent estimate was that 142,000 Americans are infected annually with *Salmonella* Enteritidis and about 30 of them die (Black & O'Keefe, 2009). The use is often justified by a perception of extremely low risk as recently estimated prevalence odds of *Salmonella* inside shell eggs is below 1% at about one in 20,000 eggs (Centers for Disease Control and Prevention [CDC], 2010). The more humorous justifications come from possibly sincere, but woefully underinformed, assumptions that immersion in alcohol will cure the concern. A dark comedic component ensues with that dynamic since the optimum bactericidal concentration of alcohol is 60%–90% in a solution (CDC, 2009), so the reliance of a cocktail that has the alcohol proof to self disinfect may elude to another public health issue more acutely troublesome than potential for salmonellosis 0.005% of the time. The exclusive use of pasteurized eggs, whether in packaged liquid form or the more presentation-savvy original shell, would naturally be the practical remedial measure.

Conclusion: Innate Characteristics for Maximizing Success

The impression I have gleaned of this industry's horizontal trajectory evokes a certain sense of optimistic potential. Fortunately, the craft cocktail community organically embodies traits that can optimize the balance of the artisan and sanitation; the resident passion, commitment to quality, strong work ethic, affinity for furthering personal education, attentiveness to detail, and genuine interest to conducting business the "right way" can harmoniously bridge the current "cocktailian revival" to contemporary public health requirements. Granted this, skillfully crafted drinks can be enjoyed while adhering to yet another tradition, in that post-consumption regrets are social and not microbiological.

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Did You Know?

There are approximately 79,000 deaths attributable to excessive alcohol use each year in the U.S., which makes excessive alcohol use the third leading lifestyle-related cause of death for the nation.

Source: Alcohol and Public Health Fact Sheets, Centers for Disease Control and Prevention (www.cdc.gov/alcohol/fact-sheets/alcohol-use.htm)

GUEST COMMENTARY

There's an App for That?? Making Public Health Information Obtainable at the Touch of a Button

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County of Sacramento Environmental Management Department

Introduction

Sacramento County's Environmental Management Department (EMD) in California has been recognized for innovative firsts when it comes to communicating the health status of the over 5,000 retail food facilities throughout the county. In January 2007 EMD became the first jurisdiction in the nation to implement a color-coded placard food inspection disclosure system modeled after a successful program implemented in Toronto. The placard system uses three different colors: green, yellow, and red (Figure 1). All fixed retail food facilities receive a color-coded placard at each inspection. The placard is issued according to the number of documented major risk factor violations, which are based on the five Centers for Disease Control and Prevention risk factors and are in line with California Retail Food Code. Over the past five and a half years, EMD has documented a significant reduction of violations because of its disclosure system.

In the last several years, the use of technology, the Internet, and social media tools to disseminate health messages has grown significantly and continues to trend upward. Using a combination of these tools has become an effective way to expand and increase access to credible, science-based health messages. EMD is reaching many more of its residents and visitors by making inspection results available at the touch of the screen on mobile devices (e.g., smartphones; Figure 2), by the use of Quick Response (QR) codes on posted placards, an online home kitchen food safety quiz, and an EMD Facebook page. EMD partnered with the Sacramento County Department of Technology and combined the ingredients of technology and restaurant inspections to provide a first-of-its-kind mobile Web site service (Figure 3). Specially designed for mobile devices, this new food inspection Web site lets the public easily learn about a food facility's current food inspection status as color markers on an interactive map based on the smartphone user's current location (Figure 4). "The idea for a mobile Web site and app came from a health inspector who said, 'Wouldn't it be cool to have the inspection information on an app so people could check it from their mobile phone?'" commented Geoff Marsh, IT manager with EMD. He went on to say that not only is it "cool," it is also beneficial for consumers and the public's health.

FIGURE **1**

Sacramento County's Environmental Management Department Food Inspection Disclosure Color-Coded Placards

Mobile Application

Along with the current inspection status, the mobile app map shows a pop-up information balloon with the most recent inspection date and links to view 1) the most recent inspection report, 2) more inspection history, and 3) nearby food facilities. The data are also available in a list format, with the closest facilities to the user's current location appearing first (Figure 5). The free applications are available in the Android market and iTunes store under "Sac Food" and any smartphone that can display Google Maps can utilize the mobile Web site (m.ffi.saccounty.net).

The application launched in early October 2011 and in the first seven months of the application's launch it had over 900 downloads about equally split between the Android and iPhone platforms. In addition, recent web tracking statistics show that almost one-third of the traffic on the Sacramento County food inspection Web site is from mobile devices. The mobile phone applications and the mobile food inspection Web site benefit Sacramento residents and visitors by making this important public health data easily available on the go. The site is also beneficial to local eateries as advertising for consumers who are looking for a place to dine but are unfamiliar with area. All consumers need to do is use the location services and the list portion of the site and all surrounding restaurants are listed. The site includes not only the expected restaurants and bars, but also grocery stores, convenience stores, school cafeterias, and any other facility that serves food to the public.

In June 2012 EMD received an achievement award from the National Association of Coun-

FIGURE **2**

Mobile Phone Screen Shot of Restaurant Inspection Report

FIGURE **3**

Sacramento County's Environmental Management Department Food Inspection Mobile Phone App

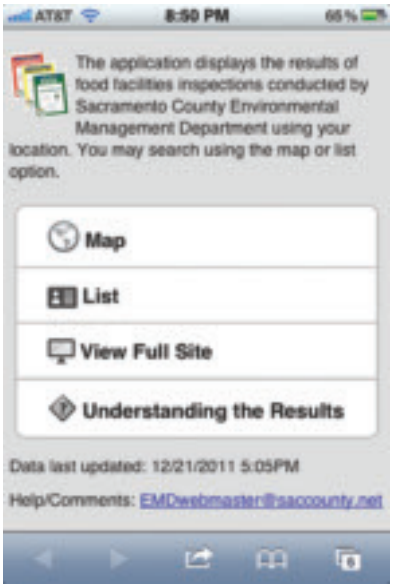

FIGURE **4**

Food Facility Map

ties for the mobile food inspection app. The achievement award program is a noncompetitive awards program that seeks to recognize innovative county government programs.

The creation of EMD's mobile app would not have been possible without the close partnership and collaboration with the IT department. Geoff Marsh, IT manager with EMD, stated that the creation of the application was mostly done by using freeware or shareware software for developing smartphone applications available on the Internet. By using Google Fusion Tables as the data host, the inspection data for the application was Internet accessible and the cost was low (i.e., free). Mr. Marsh also explained that most of the cost came in the form of labor hours because it took as much time to get the right interface (look of the application) as it did to program the application.

FIGURE **5**

Food Facility List

Benefits

Many benefits are available for a jurisdiction to make themselves more accessible to the public with current technology. Providing the current health status of a facility at the touch of a button provides an instant look at a facility. In some ways it can be a factor in pushing facilities to be more compliant when they know how accessible their inspection reports are. Carri Stokes, a resident of Sacramento County, commented, "I love having the app available at my fingertips. It has made narrowing down lunch choices a breeze based on which restaurants appear to be the cleanest!"

Not only does the mobile app work great for the public but the inspectors themselves have said it helps them to be "green" by not having to print out the most recent inspection report in preparation for a routine food facility inspection. It also allows a look at two previous inspections if the need arises to review or document history for compliance.

QR Codes

In addition to the mobile food app, EMD has also added QR codes onto the on-site inspection placards so that diners can scan the placard in the front window to access the mobile Web site and facility information on the spot. By request of the body art industry within Sacramento County, EMD developed a postcard-sized complaint form that includes a QR code. The body art practitioners will be able to place these cards in their shops and an artist or customer will be able to use a smartphone to easily access EMD's Web site to file an official complaint. Scanning the QR code directs the customer to the mobile Web site. QR codes are two-dimensional barcodes that can be read with camera phones equipped with QR code readers.

Online Home Kitchen Food Safety Quiz

In time for the five-year anniversary of the green-yellow-red placard program in Sacramento County, EMD recently posted a Home Kitchen Self-Inspection Survey on its Web site at www.emd.saccounty.net. This survey was modeled after a survey developed by Los Angeles County and is intended to be used as an educational tool by the public. Visitors of the site only need to take a few minutes to answer the questions and find out if their food preparation at home gets a green placard. Once the survey is completed, a modified green placard can be printed and posted in the home kitchen.

Social Media

EMD also has its own Facebook page where up-to-date information about the department, its services, industry workshops, educational courses, legislation, media attention, and other timely environmental health information can be located. EMD hopes these outreach capabilities will improve its ability to interact with and serve the public better.

Future Directions

Other counties in California have also begun to make their program information more easily accessible to the public and provide real-time health and safety information. The Environmental Health Division of Kern County Public Health and San Diego County Environmental Health Division have begun including QR bar codes on restaurant inspection letter grade placards.

Although this is the first mobile app developed by Sacramento County, it will be used as a foundation to develop other projects throughout the county that will serve its residents. The county was able to use the mobile app to identify polling places for residents during the recent June 2012 election. Using the knowledge and experience gained in developing the Sac Food application as a foundation, the county is considering building other types of mobile apps—perhaps a county facility locator, or an app to identify potholes that can send data directly to the transportation department with the GPS coordinates of the location. EMD hopes to use an app in the future for a new safe body art program and to access inspection reports for the more than 200 mobile food trucks operating throughout the county.

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Did You Know?

Facebook has over 845 million active users. There are 250 million photos uploaded and 2.7 billion likes/comments made every day. On average, users share about 415 pieces of content a year on Facebook.

Source: 100 More Social Media Statistics for 2012, The Social Skinny (www.thesocialskinny.com/100-more-social-media-statistics-for-2012/)

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Enumerating the Environmental Public Health Workforce—Challenges and Opportunities

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, 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 services being developed through EHSB include access to topical, relevant, and scientific information; consultation; and assistance to environmental health specialists, sanitarians, and environmental health professionals and practitioners.

The findings and conclusions in this report are those of the author(s) and do not necessarily represent the official position of CDC.

CAPT Mehran Massoudi is the associate director for science in the Scientific Education and Professional Development Program Office at CDC; he has been at CDC for 18 years working in various disciplines, most recently in training and workforce development. Rob Blake is chief of the EHSB at CDC and has been working in the environmental health field for more than 30 years. Larry Marcum is the managing director for research and development and government affairs for NEHA; he is an attorney and has been in a senior management role at NEHA for 22 years.

Workforce enumeration is the foundation for identifying workforce needs. In 2000, the Health Resources and Services Administration (HRSA) sponsored an enumeration of the public health workforce (HRSA, 2000), but since then, no comprehensive enumeration has occurred. The Centers for Disease Control and Prevention (CDC) and HRSA are now collaborating on an effort to determine the number and composition of the U.S. workforce at the federal, state, and local levels.

Limited public health workforce data are being captured by periodic profile studies by the Association of State and Territorial Health Officials (ASTHO, 2011), the National Association of County and City Health Officials (NACCHO, 2011), the U.S. Office of Personnel Management (OPM, 2011a), the Bureau of Labor Statistics (BLS, 2011), and similar surveys. No one source, however, provides complete data on all, or even the majority of, public health workers. One key goal of the CDC-HRSA collaboration is to establish public health workforce enumeration as an ongoing activity—a surveillance-like system—by using existing data sources and focusing first on the governmental public health workforce.

To that end, a case definition for *public health worker* for this phase of the project has been developed that encompasses governmental public health workers at the federal, state, and local levels. The governmental public health workforce was defined as "all persons responsible for providing any of the 10 Essential Public Health Services who are employed in federal, state, or local governmental public health agencies and those providing environmental health and public health laboratory services (University of Michigan/Center of Excellence in Public Health Workforce Studies & University of Kentucky/Center of Excellence in Public Health Workforce Research and Policy [U MI & U KY], 2012)." This case definition might underestimate the total number of public health workers, but it serves as the necessary first step in routinely enumerating and characterizing the nation's governmental public health workforce. Such

a surveillance-like system can provide accurate and timely information to researchers, public health decision makers, health planners, and policy makers.

One of the more difficult groups to enumerate and categorize accurately is the environmental public health (EPH) worker because, of all the public health disciplines, they might be the group with the most diverse assignments. EPH workers in a state health department or in a state environmental protection agency might have similar job functions described within a state personnel system, but as with other public health professions, job titles for EPH workers vary widely and are difficult to enumerate precisely. This can also be observed at the local level and in large cities where EPH workers often are situated in agencies outside the traditional health department. Consequently, NACCHO's and ASTHO's profile studies probably do not capture the data necessary to enumerate EPH workers thoroughly. In contrast, double-counting personnel likely occurs in states with centralized personnel systems where state-funded employees are deployed to the local level.

Given the complexity of the EPH workforce in terms of the specialization of the occupations and workplace settings, conducting an accurate characterization of the workforce is imperative. One of the grandfathers of the EPH profession, Larry Gordon, drew an important distinction between environmental health professionals and professionals working in environmental health. Later, in 2009, a message from then-president of NEHA Welford C. Roberts said, "There is a current need for a comprehensive enumeration of the environmental health workforce (Roberts, 2009)." Enumeration is important because it leads us to question why the EPH profession does not have a standardized curriculum or competency standards and how broad job descriptions and titles can obscure identification of the actual EPH discipline. This stands in stark contrast with the medically based disciplines within public health, which tend to have required board certifications, competency standards, and distinct titles for practicing professionals. Students might perceive this as a barrier to entering EPH, leaving our pipeline supply diminished.

CDC recognizes the importance of enumerating the EPH workforce and is therefore at the forefront of planning strategies to include these workers in the CDC-HRSA collaboration efforts. Recently, the first year report of the collaboration was published by the University of Michigan Center of Excellence in Public Health Workforce Studies and the University of Kentucky Center of Excellence in Public Health Workforce Research and Policy. That report outlines the methodology, results, and recommendations of the first phase of the enumeration project (U MI & U KY, 2012). EPH worker estimates are presented in the tables, although they are undercounted because those workers not employed by the state or local health departments are not included in ASTHO's and NACCHO's profile surveys. The level of undercounting of environmental health workers at the state and local levels varies, depending on the state and local structure.

By using data from the 2011 OPM survey, we determined that an estimated 7,651 EPH workers are in the federal civilian sector of selected U.S. government departments (i.e., the Departments of Health and Human Services, Agriculture, Homeland Security, Defense, Veteran Affairs, and the Environmental Protection Agency) (OPM, 2011b). Data from the 2010 Bureau of Labor Statistics estimates reveal that 37,970 and 32,930 workers are employed by state and local governmental agencies, respectively. These numbers vary considerably from the 2010 ASTHO survey (5,780) and the 2010 NACCHO survey (13,800). As we have discussed, some of the difference might be attributed to the fact that EPH workers are not always employed by the state or local health departments and are thus undercounted in these two surveys; other reasons might be the definition of EPH worker used in the different surveys or the timing of the surveys.

NEHA can help facilitate discussions among ASTHO and NACCHO and other state or local environmental health affiliates and partners to more accurately account for all EPH workers, regardless of employment locations. To have more accurate data on the numbers of EPH workers, more discussions with the partners should occur. In particular, NEHA and CDC's Environmental Health Services Branch will work with selected state partners to understand the enumeration challenges presented when states go through organizational changes. Only through such collaborations can the goal of an accurate and reliable workforce surveillance-like system be realized.

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Did You Know?

The Walter S. Mangold Award was first given out in 1956. The award's namesake, Walter S. Mangold, was the first recipient of the award. Since then, there have only been six years in which the award has not been given out. You can view a complete list of Mangold Award winners at www.neha.org/about/awardinfo.html.

Students Don't Be Left Out!

Applications for the 2013 NEHA/AAS Scholarship Program are now available. Last year, $5,000 was awarded to students with outstanding achievements in environmental health and with public health majors in their schools. If you would like an application or information about the NEHA/AAS Scholarship, do one of the following before the deadline:

Visit

www.neha.org/scholarship/scholarship.html.

Application and qualification information is available to download from NEHA's scholarship Web page.

Write, Phone, or Fax

Cindy Dimmitt with a request for an application and information.

Write: NEHA/AAS Scholarship
720 S. Colorado Blvd., Ste.1000-N
Denver, CO 80246-1926

Phone: 303.756.9090, ext. 300

Fax: 303.691.9490

Deadline: February 1, 2013

DEMYSTIFYING THE FUTURE

Thomas Frey

Inventing Our Next Great Scarcities

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.

Scarcity is defined as an economic condition that arises when people have far greater wants than the available resources. Most often we think about the limited supplies of natural resources, but it includes far more than that.

As an example, in September 2010 China decided to block shipments of rare earth minerals to Japan. Rare earth minerals are used in manufacturing everything from consumer electronics to batteries to defense systems. China only has about 30% of the known supply of rare earth deposits but accounts for about 95% of global production.

While momentarily shaken by this political posturing, Japan quickly reassessed its situation, launched a global search for new rare deposits, established recycling centers to extract the metals from old electronics gear, and cut a deal with Australia, who ramped up their supply of the minerals to meet Japan's needs.

As a result, the demand for China's rare earth minerals has plummeted as they instantly branded themselves as the "untrusted supplier of last resort."

The scarcity in this situation wasn't the supply of minerals. Rather, it was a momentary shortage of creative problem solving, something the Japanese are very good at.

Even though the Internet has turned the world of scarcity on its head, there are tons of imbalances yet to be mined and turned into profitable businesses. These imbalances are what gives society its forward motion, turning problems into opportunities.

Historical View of Scarcity

To understand the scarcity-abundance phenomenon, it helps to look at historically scarce products that somehow lost their pricing advantage.

- **Salt:** Many battles were fought throughout history over what was considered to be the most valuable of spices, salt. One of the more recent examples is the Salt Satyagraha, a Gandhi-led nonviolent protest against the British salt tax in colonial India, which began with the Salt March to Dandi on March 12, 1930. Hundreds of protesters were beaten in this battlefield directed toward breaking down the walls of scarcity. Today, salt is an abundant product, available everywhere for mere pennies.
- **Pearls:** Because they were difficult to find, and divers had to spend countless hours under water to find one, ancient societies dubbed pearls to be some of the rarest of stones. This rarity also made it one of the most expensive pieces of jewelry. But that all changed in 1916 when Japanese

researchers Mise and Nishikawa patented their now famous process for making cultured pearls.

- **Telephone service:** An industry that was built on the scarce one-wire-to-the-home option has been replaced with an abundance of wireless and voice over Internet protocol telephone options.
- **Classified ads:** A business invented by newspaper publishers became a cash-rich industry and the lifeblood for newspapers. Print advertising had the rug pulled out from under it when Craig Newmark created the free self-organizing craigslist.

The scarcity-abundance shift only happened on rare occasions up until the advent of the Internet and electronic commerce. Over the past decade, the World Wide Web has caused this type of shift to happen on a far more frequent basis. Startup visionaries are now scouring the entrepreneurial landscape daily to see where the next great imbalance may occur.

The Great Disruptors

The greatest disruptions in business have happened when something previously in short supply has suddenly become abundant.

Access to world news was once very scarce, but is now widely available. Our access to global music, movies, traditional and alternative medicines, as well as higher education were all once in short supply, but now are widely available. So what's next?

The best way to spot future targets is to look closely at existing revenue streams and assess the level of discontent among customers. In the past, I've used what I call a "customer-abuse index" to determine which industries have the most abusive relationships with their customers. A high customer-abuse index indicates a company or industry is begging to have its financial legs knocked out from under it.

As another piece of the equation, governments will have far greater difficulty protecting industries the way they have in the past. Our global economies are creating unusual ways for ingenious thinkers to circumvent traditional restrictions and regulations.

Finding Scarcity

So what areas of life will maintain their pricing integrity and remain "abundance proof?"

The most obvious one is time. We run up against some hard barriers when it comes to increasing the available amount of time we have in a single day. Yes, we can make ourselves far more efficient and squeeze in a few more accomplishments. Perhaps we'll even be able to clone ourselves some day, but we still have temporal limits we cannot ignore.

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

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LEGAL BRIEFS

Bruce Clark, JD

How to Write an Official Report That Is Defensible in Court

Editor's Note: The *Journal* recognizes the importance of providing readers with practical and relevant legal information and is pleased to bring back the popular Legal Briefs column. In every other issue of the *Journal* this information will be presented by the attorneys at Seattle-based Marler Clark, LLP, PS (www.marlerclark.com). Marler Clark has developed a nationally known practice in the field of food safety. They represent people who have been seriously injured or the families of those who have died after becoming ill with foodborne illness during outbreaks traced to restaurants, grocery chains, and other food suppliers.

Bruce Clark is a principal in Marler Clark. In 1993, Mr. Clark became involved in foodborne illness litigation as an attorney for Jack in the Box restaurants in its *E. coli* O157:H7 personal injury litigation. Since that time, Mr. Clark has been continuously involved in plaintiffs' food- and waterborne illness litigation.

I recently participated in two depositions of public health employees—a state medical epidemiologist and a county public health nurse. Both depositions occurred in contested lawsuits that were part of outbreaks of common foodborne pathogens. Both deponents discussed written reports that lacked clarity and power. It was a good reminder of what makes for that rarest of public health documents: a well-supported, well-reasoned, and well-written official report on an outbreak of any size. Public health employees, like those in most professions, are challenged by the demands of clear, incisive writing, and certainly by the particular environment that any report must withstand in a courtroom.

Written reports on outbreaks are not required and certainly are not done to provide attorneys with ammunition in a lawsuit. But they have utility to record events surrounding an outbreak investigation and to convey useful lessons about both the outbreak itself and the efficacy of epidemiological tools. Good reports document the facts of an outbreak, the course of the investigation, and the conclusions that the data assembled will support. An outbreak report should explain to the reader why the conclusions were reached including how a lack of complete information may have limited the scope of the conclusions.

If you and your report find yourselves in court, start with the understanding that you are not there because the attorneys agree on your report. That means one side is apt to want to emphasize the quality of the report and one side will attack it. So what makes for a defensible report? A well done report:

- is factually dense;
- cites sources;
- discusses limitations;
- notes and discusses alternative hypotheses; and
- recognizes the sharp distinctions between science and the law in the conclusion.

You are the expert; remember that. Use your expertise. Recite the information that was collected and the analyses done. Emphasize the investigative effort while acknowledging the practical limitations of what could be done. You are a public servant. Jurors and judges want to and will believe what you say provided you have not obviously cut corners or jumped to conclusions.

Data are good. Every good public health report is built on incremental details that reflect the nature and scope of what was investigated. Every good report will first introduce the reader to the subject, summarize the data, and note the basic conclusions. Look at any *Morbidity and Mortality Weekly Report* for the basic template. The power of a report comes from the objective data: culture results, genetic analysis, detailed questionnaires, case-control studies, environmental testing, and analysis of alternative explanations. Remember, attorneys are good at nuance, quibbling, and "Isn't it possible?" They are not so good at statistics, basic epidemiology, and the scientific method. Do not worry about the attorney who wants to argue around the periphery of your report. You want to be able to segue back to the data and what they show and do not show. And this is important, too: if it is not in the report, it does not exist. It is very frustrating to "know" something but be unable to convey the fact because you failed to recite it in the report. After-the-fact explanations do not play well in the courtroom.

Any lawyer attacking a report will focus on what the underlying investigation and investigators did not do. Such an attack can be diffused by noting in the report the practical limitations or circumstances, e.g., the outbreak appeared to be over so further environmental testing was not conducted. Your agency has limited resources, but by focusing on the public health goals—stopping spread of infections or identifying pathogen vectors—you will make clear that the efforts reported on were driven by public health policy, not individual discretion.

In addition to attacking the limitations of your report, an attorney with an adverse view will very likely raise alternate explanations. "Did you consider the possibility that this *Salmonella* outbreak was caused by a community-owned lizard?" No explanation is too remote to pursue for an attorney who wants to confuse an issue. But reasonable alternate explanations should be mentioned in your report along with evidence that makes those explanations unlikely.

Understand the burden of proof in a civil lawsuit. Though the wording varies from court to court, the principle is the same: probability; more probable than not; preponderance; in other words, something over 50%. Scientific certainty, <.05, has nothing to do with it. So while your report may conclude that something could not be determined or was unclear or was not statistically significant, remember that conclusion may still meet the burden of proof in a civil case. You can expect the attorneys to drill down on the single issue of whether something is *probably* true or not. If you write with that understanding in the back of your mind, you may save yourself considerable grief should you ever end up in a courtroom.

Of course, your report will not ring with truth if you cannot write a clear sentence. So finish any report with stringent editing, a second pair of eyes to review, clear headings, and another pass through spell check. A written report should only be undertaken when you have time to do the job well or there is a documentation requirement. And if you are going to write a report, better do it while the material is fresh.

Disclaimer: Legal Briefs is published for information purposes only; none of the information is intended to be, nor is, formal legal advice. NEHA and the *Journal of Environmental Health* are not liable or responsible for actions taken on the basis of the information contained in these columns.

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CAREER OPPORTUNITIES

Food Safety Inspector

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.

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

EH CALENDAR

UPCOMING NEHA CONFERENCES

July 9–11, 2013: Hyatt Regency Crystal City at Reagan National Airport, Washington, DC., Area. For more information, visit www.neha2013aec.org.

NEHA AFFILIATE AND REGIONAL LISTINGS

Arizona
March 21, 2013: AZEHA Spring Conference, sponsored by the Arizona Environmental Health Association, Arizona State University, Tempe, AZ. For more information, visit www.azeha.org.

Idaho
March 13–14, 2013: IEHA Annual Education Conference, sponsored by the Idaho Environmental Health Association, Boise State University, Boise, ID. For more information, visit www. ieha.wildapricot.org.

Illinois
November 8–9, 2012: IEHA Annual Education Conference, sponsored by the Illinois Environmental Health Association, Parke Hotel, Bloomington, IL. For more information, visit www.iehaonline.org.

Michigan
March 20–22, 2013: MEHA Annual Educational Conference, sponsored by the Michigan Environmental Health Association, Royal Park Hotel, Rochester, MI. For more information, visit www.meha.net/aec/.

Did You Know?

You can submit your event for possible inclusion in the *Journal's* EH Calendar and on NEHA's Web site calendar of events by going to www.neha.org/events.shtml.

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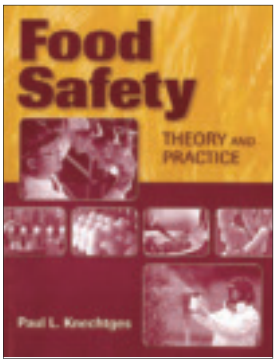
NEHA BOOKSTORE
www.neha.org/store

Food Safety: Theory and Practice

Paul L. Knechtges (2012)

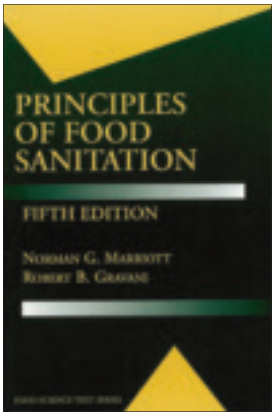


New! **Authored by a NEHA member!** Written from a "farm-to-fork" perspective, this book provides a comprehensive overview of food safety and discusses the biological, chemical, and physical agents of foodborne diseases. Early chapters introduce readers to the history and fundamental principles of food safety. Later chapters provide an overview of the risk and hazard analysis of different foods and the important advances in technology that have become indispensable in controlling hazards in the modern food industry.

460 pages / Paperback / Catalog #1120
Member: $74 / Nonmember: $78

Principles of Food Sanitation (Fifth Edition)

Norman G. Marriott and Robert B. Gravani (2006)

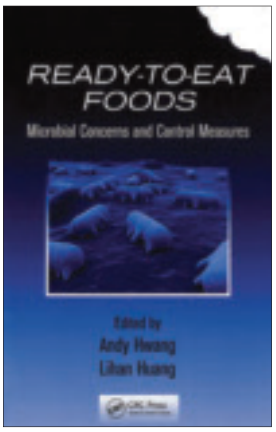


This book provides sanitation information needed to ensure hygienic practices and safe food for food industry and regulatory professionals. It addresses the principles related to contamination, cleaning compounds, sanitizing, and cleaning equipment. It also presents specific directions for applying these concepts to attain hygienic conditions in food processing or preparation operations. The book includes chapters that address biosecurity and allergens as they relate to food sanitation, as well as updated chapters on the fundamentals of food sanitation, contamination sources and hygiene, HACCP, cleaning and sanitizing equipment, and waste handling disposal. Study reference for NEHA's REHS/RS and CP-FS exams.

413 pages / Hardback / Catalog #126
Member: $84 / Nonmember: $89

Ready-to-Eat Foods: Microbial Concerns and Control Measures

Edited by Andy Hwang and Lihan Huang (2010)



With growing consumer demand for ready-to-eat (RTE) foods that are wholesome and require less handling and preparation, the production of RTE foods has increased and their variety has expanded considerably. Since RTE foods are normally consumed directly without cooking, however, concerns exist about their safety. This book supplies an overview of food safety of RTE foods and various categories into which they fall. It also addresses the microorganisms of concern, the effect of processing on the survival of pathogenic and spoilage microorganisms, food safety, practical control measures, and intervention strategies. It is a critical reference for scientists and professionals working on the forefront of food safety.

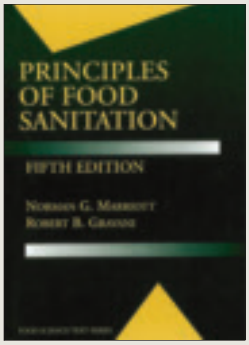
259 pages / Hardback / Catalog #1098
Member: $145 / Nonmember: $150

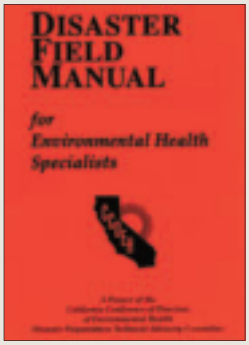
Food Safety Fundamentals: Essentials of Food Safety and Sanitation (Second Edition)

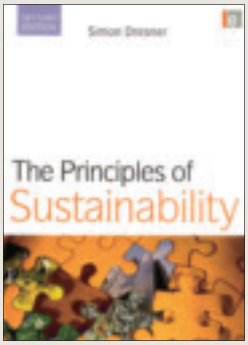
David McSwane, Richard Linton, Nancy R. Rue, and Anna Graf Williams (2010)

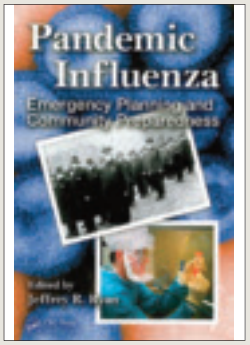
This book incorporates the best food safety and sanitation practices for the overall food industry. It utilizes the latest standards in FDA's *2009 Food Code* and is filled with food service and retail industry photos and easy-to-read charts. The guide is designed to make managers knowledgeable about food hazards, while emphasizing proper food handling practices to enable participants to successfully complete all nationally certified exams. Study reference for NEHA's CP-FS exam.

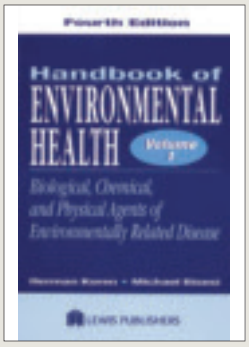
321 pages / Paperback / Catalog #1093
Member: $59 / Nonmember: $69











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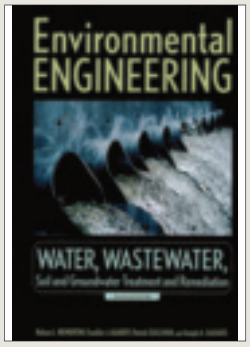

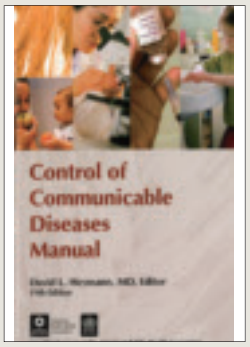

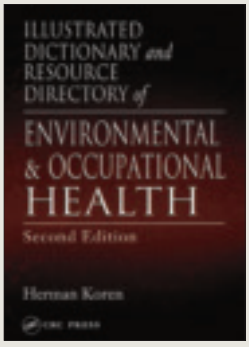

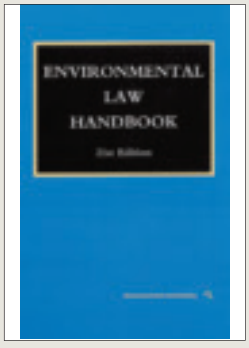

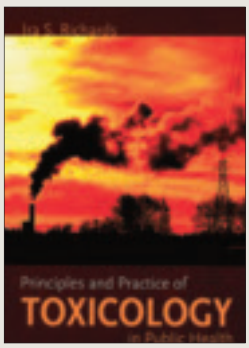

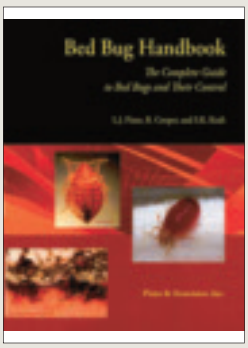

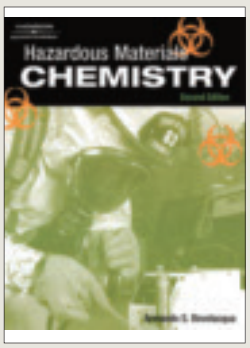

A Tribute

to Our 25-Year Members

The National Environmental Health Association (NEHA) thanks and honors the individuals listed below who have been members of the association for 25 years or longer. NEHA sincerely appreciates their commitment to the association and to the environmental health profession. NEHA asked a few of these members to describe the personal and professional benefits of their tenured membership with the association, as well as why they initially became a NEHA member. Quotes from these responses are sprinkled throughout the tribute.

"I think that the real benefit of NEHA membership has been what has been too casually termed as '*Networking*.' My NEHA membership gives me access to the best and most respected experts on almost every conceivable subject matter; when I run into a problem, one of my first choices for consultation is almost always the NEHA staff or another NEHA member. My NEHA membership provides me with a prideful sense of being part of a proud professional group that has enhanced the quality of life for all of our communities."
Robert E. Harrington, MS, RS, DAAS

a

James M. Abbott, RS
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b

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c

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Brian P. Emanuel
William B. Emminger, Jr.
Cheryl L. Engelman

"I have viewed NEHA as the place for career development in areas such as technology and education. I encourage all new environmental health professionals to join NEHA which will aid in their career development. NEHA membership is also an excellent platform for creating an active network for environmental health specialists."
Ofelia C. Cavazos-Edmondson, REHS

Christopher C. Etcheson, RS
Bruce M. Etchison, RS
Diane L. Evans

f

John M. Fanning, REHS, MPA
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Peggy D. French, RS
Gerald C. Fuhrmann, RS

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John M. Halliwill, REHS
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Russell F. Hanson, REHS, MSEH
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Judy Harrison
Charles Hart, PhD, CIH, CSP, RS
Barry S. Hartfield
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Jack B. Hatlen, MS
Alan B. Hauck, RS
Cheryl Hawkins
Cathy S. Hayden
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Gregory M. Heck
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William Michael Henderson
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Michael E. Herring, REHS, MPH
Peter Heywood
Gary M. Hickman
Charles L. Higgins, REHS
John E. Hiramoto, REHS
Kirk B. Hodges, RS
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Joel M. Hollis
Randall C. Holveck, RS
Charles N. Howard, RS
Paul L. Hutcheon, REHS
J. Dale Hutto

i

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Nancy Ellis Ice, RS

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Jill A. Johnson, RS
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Horace E. Jones, Jr., REHS
Kimball E. Jones
Lisa M. Jones, RS
Robert W. Jue
Ernest M. Julian, PhD

k

Brian P. Kaiser, CSP, CHMM, RPIH
Samuel R. Kalafat
Shawn A. Kalemkarian
Frank E. Kellogg, RS, MPH

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Joy Keniston-Longrie
Harvey D. Kern, MS, REHS
Patricia A. Kerst, REHS
Glen F. Kinney
Michael J. Kirby
Philip B. Kirkwood, Jr.
David C. Klusman
Alan D. Knapp, RS
David A. Knauf
Paul L. Knechtges, REHS
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Peter J. Kolodziej, RS
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Jim Langevin, RS
Roland Everett Langford, PhD
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Frank S. Lisella
Patricia A. Livingston
Robert M. Livingston, RS
Robert E. Looby, RS

> "Personally and professionally I feel fortunate to have had the opportunity to meet and work with so many of the luminaries of our field. And now, watching the young environmental health specialists taking their place in our ever expanding and challenging field, is a reward in and of itself. NEHA has provided the venue in which I have been able to network and grow within the field of environmental health. The more one contributes to his or her profession, the more he or she gets back in personal and professional satisfaction."
> *Charles D. Treser, MPH, DAAS*

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Charles K. Love, RS
Cherié L. Lowry, RS
David F. Ludwig, MPH
Ross D. Lytle, RS, MS

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Adam R. Rocke
Connie Rocke, REHS
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Stanley I. Rooker, RS/REHS

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Paul J. Scaglione
Sue Scheurer
Edward A. Schmidt, MPH
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Alan R. Schroeder
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Jennifer Lamb Sullivan, RS
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Mark D. Swartz
Robert J. Swensen, EHS

t

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Ryan Talken
Kenneth Tannen, RS
John H. Teel
Colin K. Thacker, RS-E
Dennis Thayer, RS
Peter D. Thornton, MPH, RS
Richard J. Thoune, RS, MS, MPH
John G. Todd, DrPH, RS

"I joined NEHA because I considered it to be an investment in my professionalism. To me, NEHA membership is a commitment to the work and mission of public health. Being on the board of directors was confirmation that NEHA is an organization that is always looking forward and adapting to changes in the profession, to changes in technology, and to new research that affects our profession."
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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.*

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($100-$499)

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

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Huntington Beach, CA

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Grove City, OH

Bette J. Packer, REHS
Andover, MN

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

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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.*

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Dousman, WI

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($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.*

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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)
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- ❍ 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 _____

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Living Machine Systems
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Madison County Health Department
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Maricopa County Environmental Services
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Mars Air Doors
Steve Rosol
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MindLeaders
www.mindleaders.com

Mitchell Humphrey
www.mitchellhumphrey.com

Mycometer
www.mycometer.com

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

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

National Restaurant Association
David Crownover
www.restaurant.org

National Swimming Pool Foundation
Michelle Kavanaugh
www.nspf.org

NCEH/ATSDR (National Center for Environmental Health/Agency for Toxic Substances and Disease Registry)
www.cdc.gov

New Hampshire Health Officers Association
jbjervis03833@yahoo.com

New Jersey State Health Department
James Brownlee
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

Oneida Indian Tribe of Wisconsin
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Orkin
Zia Siddiqi
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Ozark River Hygienic Hand-Wash Station
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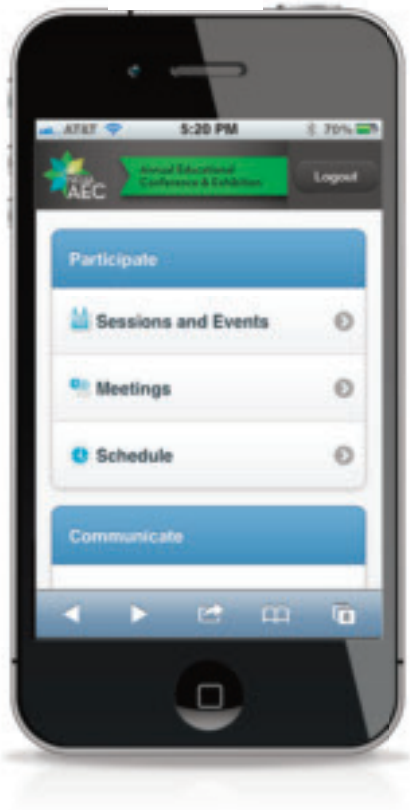

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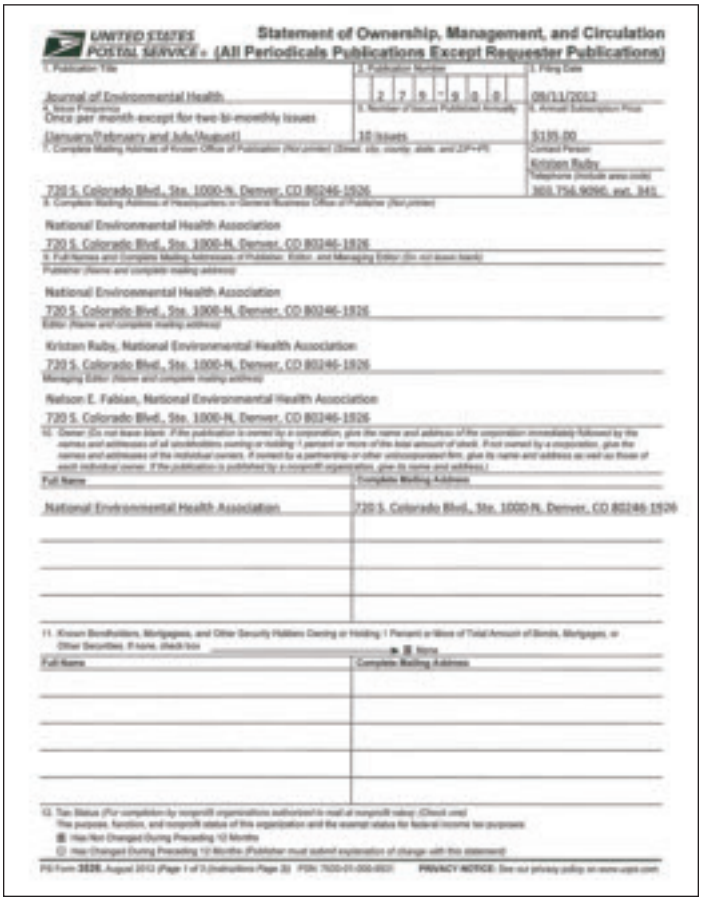

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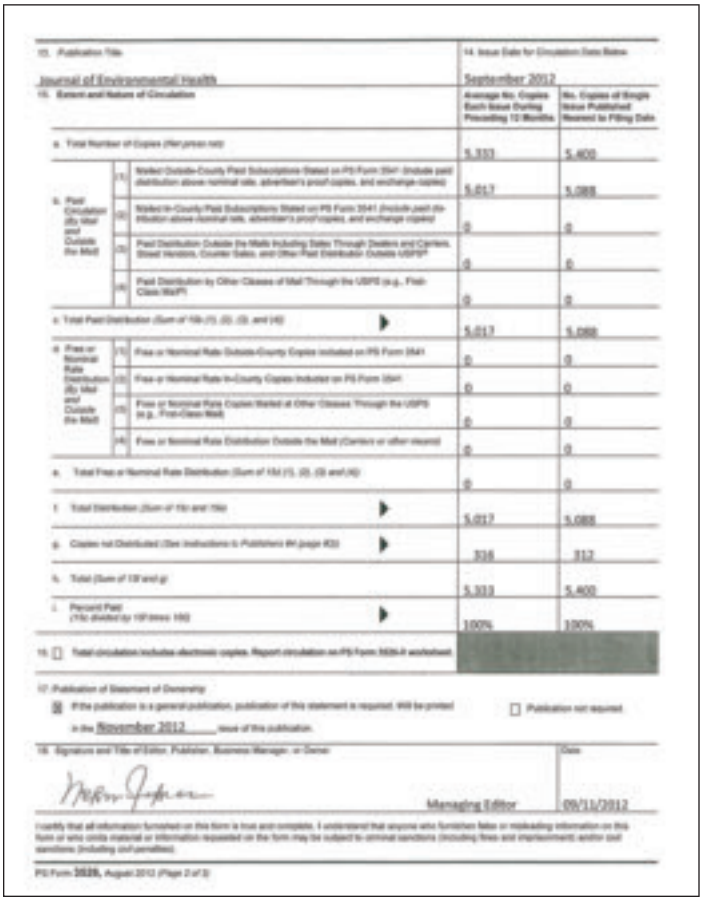

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fession. That informs us that continuing education options to conferences (such as inexpensive online learning) *must* remain a high priority for NEHA.

- NEHA members have a clear interest in attending AECs in different and unusual places. Seventy-four percent of the respondents to this survey indicated either a strong or moderate interest in attending an AEC in Canada (with just over half of our members indicating that they would be strongly interested in such a venue).
- Despite this impressive level of interest, 73% of the respondents indicated that they had no to poor levels of funding support for attending a conference outside of the U.S. A telling 54% indicated that *no* funding support would be available.
- Eleven percent of the respondents indicated that they would fund their own attendance at such an event and another 48% indicated that depending on circumstances, they too might be willing to fund their own attendance.
- If we were to meet in Canada, Vancouver would seem to be the preferred location—though the interest in Montreal and Toronto (and even other Canadian cities) was also noteworthy.

I think it's fair to say that these results offer a mixed verdict on the part of the membership about the idea of holding another AEC in Canada any time soon. Our board will now sift through these results and consider them as we look at potential Canadian cities to take our conference to in the years ahead. (From our history shelf, I would note that I've seen this situation once before. In working our way up to the decision to meet in Anchorage in 2004, we had strong indications that the membership would NOT support holding our annual conference so far away, even though there was clear excitement within the membership for holding an AEC there. For the record, our attendance numbers *did* come through and many attendees referred to it as one of NEHA's best site location decisions ever. In making that decision, however, I can also share that our board at that time was as nervous as it was daring!)

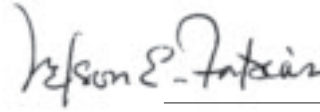
Turning then to the comments—as I earlier implied—they were absolutely fascinating! And there were so many of them! It was extremely gratifying that so many members cared enough to take precious time from their days to talk to us about this survey and its implications. It was also clear that in many instances, feelings and opinions (which were all anonymous) were strong! Trust me. We took notes on what you said! Some of the more interesting comments were as follows:

- Other places not in the 50 U.S. states where our members want us to hold an AEC include Dublin; Bali; Puerto Rico; Berlin; Calgary; Jamaica; Turks and Caicos Islands; Victoria; U.S. Virgin Islands; Auckland; London; Bahamas; Cancun; Halifax; Havana; Prague; Moscow; countries within the Pan America Health Organization; Guantanamo Bay; Collingwood, Ontario (Blue Mountain Resort); Iceland; and Banff.
- A surprisingly large number of people expressed preferences for Hawaii and Alaska.
- One member scolded us and said that they were going to consider dropping their membership because asking these questions showed a real lack of vision on NEHA's part.
- A fair number of members indicated that with the economy the way it is, we should limit ourselves to meeting in the U.S. and that we should spend our money here.
- A lot of members thanked us for asking these questions.
- A lot of members also expressed their support for NEHA and they thanked the association for the good work it is doing.
- A number of members expressed concern with having to get a passport in order to attend a meeting in Canada.
- One person noted that "things must be slow in Denver" for us to put out a survey like this!
- Noteworthy concern was expressed about governmental employees being able to get approval to attend an out-of-country AEC.
- Some members encouraged us to conduct more activity with our colleagues in Canada.
- A number of members told us that the quality of the program was more important than the venue. (Translation: A high-quality program would draw no matter where it was held.)
- Even more members indicated that if they are spending their own money, they want to travel to a location that is safe, family friendly, and/or fun and interesting.
- One member accused the staff of pushing this when the NEHA board was against it. (To be clear, the NEHA board asked the staff to do this survey. No one is pushing anything! What we are pushing is a constant effort to be adventurous, creative, and yet in step with the membership.)
- A few people talked about getting NEHA to smaller cities where costs would be lower.
- There were a number of positive comments on the quality of the Canadian cities being considered.
- A good number of members commended the association for considering holding a meeting outside of the U.S.
- Scores of members came back with recommendations on which U.S. cities NEHA should consider for future AECs (independent of the specific issue of meeting in Canada).

Through these comments, we learned more about the very real world our members work in, the constraints you have, and the hopes you maintain. While we gained plaudits for being open to meeting outside the U.S., it was also obvious that considerable frustration exists with funding barriers and bans on travel for meetings outside the U.S. Similarly, on the one hand, NEHA was congratulated for thinking about building relationships with the international community and especially with our nearby Canadian colleagues. On the other hand, we were also advised that in these difficult economic times, we had an obligation to support the U.S. economy and keep our annual event here.

As I mentioned earlier, all of these comments will be shared with our board, as the board (and only our board) makes the final decision when it comes to AEC site selections. If you would like to continue this conversation, I would encourage you to contact your regional vice president, NEHA's President Brian Collins, and/or me. All contact information is listed in the *Journal* on pages 52–53.

Thank you so much for responding as fully you did!



nfabian@neha.org

MANAGING EDITOR'S DESK

Nelson Fabian, MS

An Annual Educational Conference in Canada? Your Fascinating Feedback on the Question!

In NEHA's quest to offer conference experiences in attractive and interesting cities, our board has recently considered the idea of taking an Annual Educational Conference (AEC) to Canada—as we did in 1992 when we met in Winnipeg. Before we make a decision like this, however, our board wanted to first get some sense from the membership as to its interest in such a venue and its financial ability to get there. To get this information, our board directed that the membership be surveyed on this idea. That survey has now been completed. Since the results were so interesting and even illuminating in regards to the world of our members and since you really deserve to know what the results were, I am making my column this month a report back to you on what the survey said and taught us.

To begin, the response to our survey has been extremely gratifying. Over 700 responses were submitted (with more still trickling in). In addition to answering the survey questions, many members also took the time to compose thoughtful comments that furthered our understanding of the membership's perspectives and values. Thank you!

Starting first with the survey results, they were as follows.

Question: If cost were not a factor, how interested would you be in attending an AEC in Canada?

Very interested	51%
Somewhat interested	23%
Interested but company policies prohibit my attendance	12%
No interest in attending an AEC outside U.S.	11%
Have never attended an AEC	2%

Through these comments, we learned more about the very real world our members work in, the constraints you have, and the hopes you maintain.

Question: What level of support by your employer is available to allow you to attend an AEC outside of the U.S.?

High support (complete funding of expense)	12%
Moderate support (at least 50% of funding covered)	15%
Low support (less than 50% of funding of expenses)	19%
No support	54%

Question: If funding by your employer was not an option, would you use your own funds to attend an AEC in Canada?

Yes	11%
No	41%
Maybe—it would depend on several factors	48%

Question: Do you believe that funding support by your employer will change over the next three years?

Yes, there are positive indications that current funding will change	6%
No, it is unlikely that current funding levels will change	69%
Unknown	25%

Question: Of the three cities being mentioned, Montreal, Toronto, and Vancouver, do you have a preference?

Montreal	20%
Toronto	23%
Vancouver	45%
Other	12%

As for the many comments—they lend themselves to the following observations:

- Funding for conference attendance continues to be a significant challenge for our profession. Many of our members tend to occupy higher-level positions in their programs. If their funding prospects for the next three years are bleak, the situation is probably even worse across the entire pro-

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