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ABOUT THE COVER

Rapid proliferation of hydraulic fracturing ("fracking") facilities has led to concerns about human exposure to airborne pollutants, notably fine particulates ($PM_{2.5}$, particles with a diameter of 2.5 µm and smaller) and crystalline silica (quartz). Fine particulates have been identified by U.S. EPA as a cause of cardiovascular and lung disease including lung cancer. In our cover feature this month, "$PM_{2.5}$ Airborne Particulates Near Frac Sand Operations," the authors describe their first-of-its-kind pilot study to measure $PM_{2.5}$ around frac sand mines. Five of the six study sites had $PM_{2.5}$ levels above the U.S. EPA annual standard of 12 µg/m^3.

See page 8.

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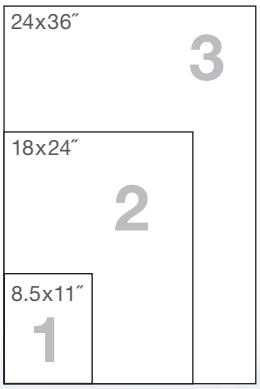

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PRESIDENT'S MESSAGE

Bob Custard,
REHS, CP-FS

More Than the Minimum

Deciding who to hire and promote is the most important role of an environmental health manager. Talented and highly motivated professionals create exceptional environmental health programs. Lackluster employees produce mediocre or even failing programs. Without exception, top-quality programs don't exist without top-quality people.

So how, as a manager, does one distinguish between talented and highly motivated job applicants and those who will never rise above mediocrity? Some of the things I always consider are the experiences gained, training courses completed, and credentials earned *that were not required* by the applicant's current employer or academic program.

Highly motivated professionals always do more than the minimum required. They seek out training opportunities and obtain credentials that make them stand out among their peers. They look for new challenges and opportunities to gain experience in new areas of their field. They are lifelong learners and their passion for their profession is clear from their continuing dedication.

Broaden Your Experience

Environmental health is an incredibly diverse field. Most of us are highly competent in one or two subdisciplines of environmental health but often have limited knowledge in many other areas. As our careers progress, without some experiences that broaden our expertise and perspectives, we risk becoming pigeonholed in a single subdiscipline of environmental health. Ultimately this will prevent us from achieving our true potential and may become very career limiting.

> *Highly motivated professionals always do more than the minimum required.*

One way that top-notch environmental health professionals can break out of their box is by volunteering for special projects at work that broaden their experience. Perhaps that might be development of training materials, helping build a Web site, assisting an epidemiologist with interviews of those ill with possible foodborne illness, or participating in a job exchange with a person working in another area of your department. In some cases, there are opportunities for cross training or temporary assignments in a new area of environmental health or a related field such as industrial hygiene, housing, land use planning, or sanitary engineering.

Beyond the workplace there are many opportunities to volunteer with local nonprofit organizations. Even in volunteer positions that don't require environmental health skills, one often has the opportunity to develop key leadership skills.

In the professional setting, your local or state environmental health association would welcome your service as a committee member or officer. On the national level, NEHA frequently needs volunteers to serve as peer reviewers for the *Journal of Environmental Health*, as subject-matter experts, as technical advisors to those developing the Annual Educational Conference & Exhibition, as social media contributors, or as reviewers for credential exams.

ACTION ITEM: Try volunteering for a special assignment that will broaden your experience. In doing so you will develop new skills or abilities, make new contacts, and gain new perspectives.

To volunteer with NEHA, go to www.neha.org/membership-communities/get-involved.

You can make a difference by donating just an hour or two of your time each month.

Deepen Your Knowledge

As budgets for education and training at most public and many private employers have tightened over the last few years, some environmental health specialists have found little available in the way of employee-sponsored continuing education. Meanwhile, the science that underlies our work as environmental health professionals has continued to advance.

Top-notch environmental health professionals, however, have found other ways to deepen their knowledge and sharpen their skills in response to the reduction in the amount of employee-sponsored training available. Many are attending more regional and state trainings and conferences sponsored by NEHA's state affiliates. Others are applying to attend training paid for by third parties such as the International Food Protection Training Institute's

Especially for Enviromental Health Managers and Supervisors: Staff Development Is Your Responsibility

Our legacy as managers and supervisors is the quality of the professionals we have trained and mentored to follow us after we have gone. What are you doing to encourage and support your staff in obtaining the additional training, experience, and credentials that will make them ready for promotion? Here are 10 concrete suggestions:

- Give staff special assignments that will broaden their experience.
- Cross train staff in areas of environmental health outside their primary area of work.
- Continually let staff know about the training opportunities that are open to them.
- Support attendance at NEHA affiliate educational conferences through paid time to attend even if you can't pay for the travel or registration costs.
- When applying for grants, include funds in the grant budget for staff to travel to environmental health conferences to present the results of their grant project.
- When possible, allow flexible work schedules to allow staff to take college courses towards an advanced degree.
- Work to create a system of pay incentives for staff who obtain degrees or credentials beyond the minimum required.
- Purchase a set of REHS/RS study materials that can be shared among the persons in your work unit.
- Allow staff who are studying for their REHS/RS to create a study group at work that meets for one or two hours each week.
- Work with environmental health units in adjacent areas to create a free local training event each quarter that features speakers on relevant topics.

Especially for Students: More Than the Minimum Qualifications = Employment

Students need to know that a degree in environmental health or biology will usually meet the minimum qualifications for an entry-level job in environmental health, but seldom, by itself, will it land them a job. In order to stand out among 20 or more qualified applicants, they need something more. Experience, training, and credentials move resumes to the top of the pile.

About half of those who are hired into entry-level environmental health positions have left the profession within five years. The turnover is lower, however, among those who have had some previous relevant career experience and know that environmental health is a good career fit for them. For this reason, hiring managers look for applicants with experience that applies the applicant's scientific knowledge in a setting that requires a lot of interaction with the public.

Relevant experience may be a summer job working in a restaurant where one learns food safety basics and gains customer service experience. It may be a part-time job lifeguarding at a swimming pool where one learns basic pool health and safety and gains experience working with the public and enforcing rules. Better yet would be an internship at a local health department or with the U.S. Public Health Service or volunteer experience with the local Medical Reserve Corps.

If a job applicant's experience is combined with relevant training and certification, the application is even stronger. An applicant who had the initiative to obtain training and certification as a food protection manager or as a pool operator has a much stronger application than the applicant who just worked as a restaurant cook or as a pool lifeguard. Typically these certifications can be obtained with about 16 hours of training at a cost of less than $200 each.

The strongest applicants among recent graduates are those who take the Certified Professional-Food Safety (CP-FS) exam or the Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) exam and pass it immediately after graduation from an accredited environmental health academic program. In some states, an REHS/RS is required for all environmental health professionals working independently in the field. Hiring an REHS/RS assures a manager that the new employee will be able to work independently in the field immediately following their initial training.

(IFPTI's) Fellowship in Food Protection Program or the Centers for Disease Control and Prevention's (CDC's) Environmental Health Training in Emergency Response Operations (EHTER Ops) course. Still others are joining groups like Toastmasters International to polish their speaking skills.

Many environmental health professionals are accessing the rapidly increasing number of free webinars and online training courses. For those working in food safety, the Food and Drug Administration's (FDA's) Office of Regulatory Affairs University (ORAU) offers dozens of training courses through their ORAU training portal for environmental health professionals working in local, state, and tribal governments. Others are using CDC's e-learning portal to take the Environmental Assessment of Foodborne Illness Outbreaks course. For those preparing for their Registered Environ-

continued on page 12

$PM_{2.5}$ Airborne Particulates Near Frac Sand Operations

Kristin Walters
Jeron Jacobson
Zachary Kroening
Crispin Pierce, PhD
University of Wisconsin–Eau Claire

Abstract **The rapid growth of hydraulic fracturing for oil and gas extraction in the U.S. has led to 135 active "frac" sand mines, processing plants, and rail transfer stations in Wisconsin. Potential environmental health risks include increased truck traffic, noise, ecosystem loss, and groundwater, light, and air pollution. Emitted air contaminants include fine particulate matter ($PM_{2.5}$) and respirable crystalline silica. Inhalation of fine dust particles causes increased mortality, cardiovascular disease, lung disease, and lung cancer. In the authors' pilot study, use of a filter-based ambient particulate monitor found $PM_{2.5}$ levels of 5.82–50.8 µg/m³ in six 24-hour samples around frac sand mines and processing sites. Enforcement of the existing U.S. Environmental Protection Agency annual $PM_{2.5}$ standard of 12 µg/m³ is likely to protect the public from silica exposure risks as well. $PM_{2.5}$ monitoring around frac sand sites is needed to ensure regulatory compliance, inform nearby communities, and protect public health.**

Introduction

Hydraulic fracturing ("fracking") is a process where a mixture of sand, water, and hydrocarbon additives is injected under high pressure into the ground thousands of meters vertically then horizontally to extract oil and gas. The force of injection fractures formations such as the Marcellus Shale, and the sand particles prop open fissures for subsequent oil and gas extraction. Sandstone from upper Midwest formations, including Jordan, Wonewoc, Mt. Simon, and St. Peter Formations contains sand grains that are spherical, of substantial compression strength, and appropriate size (commonly 20/40 mesh, 840–420 µm diameter) for fracking operations. Frac sand mines and processing plants (to remove larger- and smaller-sized particles not used in operations) are concentrated in the upper Midwest but present throughout the U.S. and Canada (Frac Tracker, 2014). Including rail transfer sites, 135 are now active in Wisconsin (Wisconsin Center for Investigative Journalism, 2013; Wisconsin Department of Natural Resources [DNR], 2012; Wisconsin Geological and Natural History Survey, 2013). Rapid proliferation of these facilities—more closely located near population centers than traditional sand and gravel pits—has led to concerns about human exposure to airborne pollutants, notably fine particulates ($PM_{2.5}$, particles with a diameter of 2.5 µm and smaller) and crystalline silica (quartz). To our knowledge, this is the first publication of measured $PM_{2.5}$ concentrations around frac sand facilities.

The Wisconsin Department of Natural Resources does not regulate silica and has required less than 10% of frac sand mines and processing plants to measure the larger PM_{10} fraction of airborne particulates (particles with a diameter of 10 µm and smaller). This size fraction is not as closely associated with human health effects as fine particulates, however, and has a much higher U.S. Environmental Protection Agency (U.S. EPA) ambient limit of 150 µg/m³, compared to 12 µg/m³ for $PM_{2.5}$ (U.S. EPA, 2014).

Fine particulates have been identified by U.S. EPA as a cause of cardiovascular and lung disease including lung cancer. Three comprehensive studies of urban air pollution have found that each 10 µg/m³ increase in long-term average $PM_{2.5}$ concentration was associated with

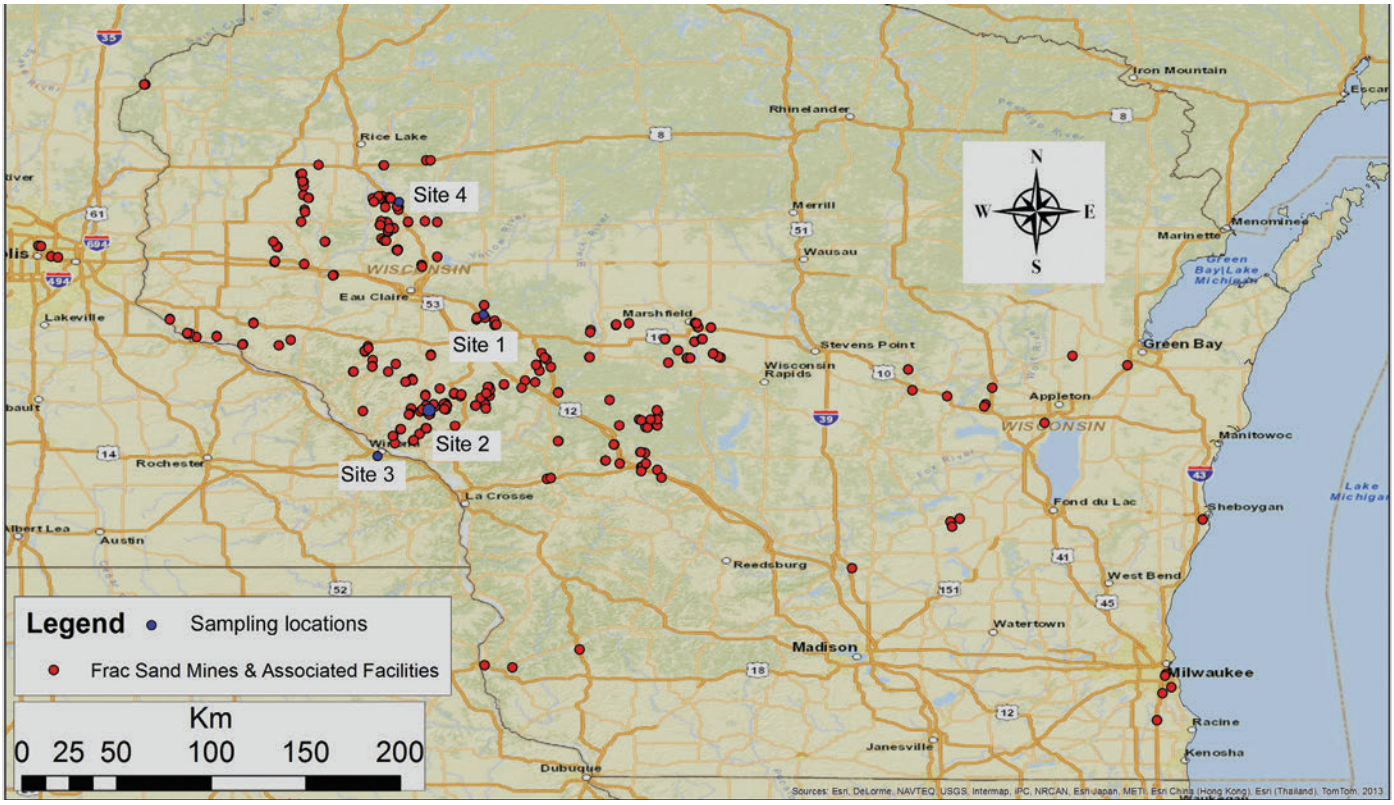
- a 4% to 14% increased risk of death from all natural causes;
- a 6% to 26% increased risk of death from cardiopulmonary/cardiovascular disease (including stroke); and
- an 8% to 37% increased risk of death from lung cancer (Lepeule, Laden, Dockery, & Schwartz, 2012; Martinelli, Olivieri, & Girelli, 2013; Pope et al., 2002).

In recognition of this particulate size toxicity, the U.S. EPA recently reduced the annual $PM_{2.5}$ public exposure standard from 15 to 12 µg/m³.

Crystalline silica (quartz) is a particularly important component of the $PM_{2.5}$ size range and is occupationally associated with silicosis and lung cancer (Collins, Salmon, Brown,

FIGURE **1**

Sampling Locations and Wisconsin Frac Sand Facilities



Base map from FracTracker.org.

Marty, & Alexeeff, 2005; Park et al., 2002). "Freshly fractured" silica appears to be two to five times more reactive with animal lung tissue compared to "weathered" silica, though weathering occurs within several days and with exposure to water (Vallyathan et al., 1995). Respirable (PM_4) quartz has recently been measured at levels above occupational standards at hydraulic fracturing sites (Esswein, Breitenstein, Snawder, Kiefer, & Sieber, 2013).

Our examination of Mine Safety and Health Administration inspection reports (www.msha.gov/drs/drshome.htm) found that in 41 measurements of respirable particulates, crystalline silica comprised an average of 14.5%. By enforcing the U.S. EPA $PM_{2.5}$ annual standard of 12 µg/m^3, communities would then be expected to be exposed to a maximum of 12 µg/m^3 x 14.5% = 1.74 µg/m^3 crystalline silica, about half of the 3 µg/m^3 standard now used by California, New Jersey, and Minnesota (Collins et al., 2005); New York, Texas, and Vermont have more stringent standards (Wisconsin Department of Natural Resources, 2011).

Statistically verified public health effects from long-term exposure to fine particulates including silica would likely require decades of surveillance and costly "federal reference method (FRM)" particulate monitors. The rapid proliferation of frac sand plants and corresponding public concern, however, as well as the dearth of available ambient particulate air quality monitoring, mandate systematic new efforts to quantify public health risks. To address this imminent need for data, our pilot study focused on 24-hour "snapshots" of $PM_{2.5}$ concentrations around frac sand plants in Wisconsin and Minnesota. Shared interest in this topic has led to collaborations with environmental science faculty at the University of Wisconsin–Stout and the University of Iowa Environmental Health Sciences Research Center.

Methods

Four sampling sites of convenience in Wisconsin and Minnesota were chosen based on proximity to frac sand operations and protection of monitors on private property (Figure 1). Six nominal 24-hour ambient air samples were collected with an SKC DPS (deployable) sampler using the $PM_{2.5}$ sampling head (Patterson et al., 2010). Sampling conditions included calm and high wind flow, rain, and snow, at distances of 30–1,300 m from operations (Table 1). PVC filters were weighed pre- and post-exposure six times using a Mettler Toledo AT261 DeltaRange balance. Field blanks accompanied the DPS sampler and demonstrated no net mass changes. Filter conditioning was considered unnecessary after filters showed no mass changes after

several days in desiccators or humidified chambers. DPS flow rate was calibrated to 10 L/min using a field rotameter. The $PM_{2.5}$ sample inlet was mounted 2 m high and away from buildings and trees as described in U.S. EPA sampling protocol (U.S. EPA, 2007).

Airborne $PM_{2.5}$ concentrations were calculated as follows:

$$PM_{2.5}\ (\mu g/m^3) = (\text{Filter mass}_{end} - \text{Filter mass}_{start})/(\text{Sample duration} * \text{Flow rate})$$

Sample standard deviations (*SD*) were calculated as follows:

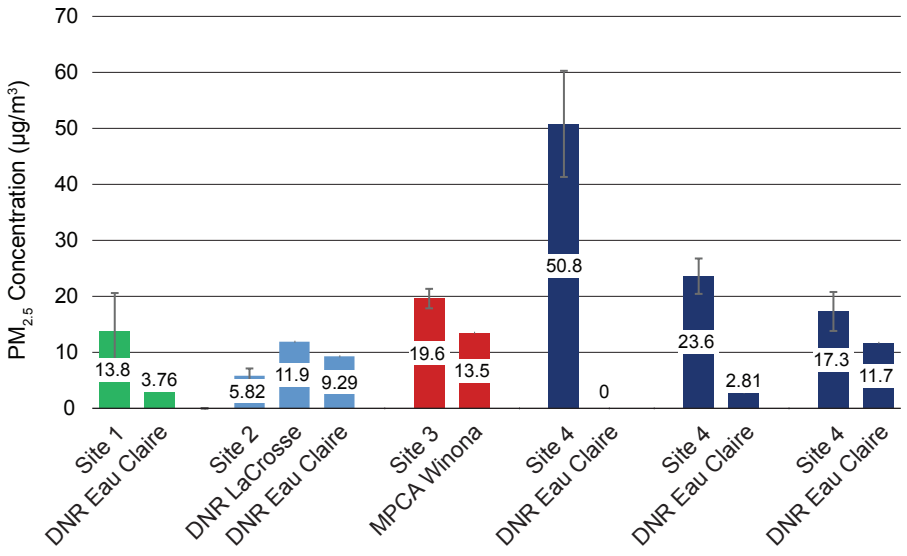
$$s.d._{sample} = (\sqrt{s.d._{pre\text{-}weight}^2 + s.d._{post\text{-}weight}^2})/(\text{Sample duration} * \text{Flow rate})$$

Temperature, humidity, wind speed and wind direction, and GPS coordinates were also recorded at each site.

Measured $PM_{2.5}$ concentrations were compared to the nearest Wisconsin Department of Natural Resources (DNR, 2014) and/or Minnesota Pollution Control Agency (MPCA, 2014) reported $PM_{2.5}$ levels, matched hour-for-hour to sampling times.

FIGURE **2**

Six Measured and Simultaneous Department of Natural Resources (DNR)-Reported Regional $PM_{2.5}$ Concentrations at Four Frac Sand Sites



$PM_{2.5}$ = particulate matter ≤2.5 µm in diameter; MPCA = Minnesota Pollution Control Agency. Error bars represent mean +/- *SD*.

Results

$PM_{2.5}$ levels of the six samples ranged from 5.82 to 50.8 µg/m³ (Table 1). One location (site 4) that was sampled three times on different days had threefold different levels (50.8 vs. 17.3 µg/m³). This observation is consistent with increased precipitation and wind speed causing lower levels of $PM_{2.5}$. Extent of frac sand facility activity also appears to affect measured fine particulates, with lowest levels near a small inactive mine (site 2, Table 1).

Five of the six samples had $PM_{2.5}$ levels higher than corresponding DNR or MPCA regional background levels. Variability among sample sites, between measured and DNR/MPCA reported values, and standard deviations from multiple filter weighings within measurements are visible in Figure 2.

Discussion

The U.S. EPA regulates ambient $PM_{2.5}$ both as the three-year annual average level of 12 µg/m³ to protect against long-term health effects as well as the 98th percentile level of 35 µg/m³ to protect against short-term effects (U.S. EPA, 2009). Our limited data set found that five of the six samples were above the 12 µg/m³ average value (Table 1) and the 98th percentile value for the three site 4 measurements was 49.7 µg/m³, higher than the U.S. EPA value of 35 µg/m³.

Higher wind conditions (site 1), heavy snowing (site 3), and heavy rain conditions (site 4 on May 19–20, Table 1) may have contributed to lower $PM_{2.5}$ levels. The site with the smallest, inactive mine (site 2) had the lowest $PM_{2.5}$ concentration. Measured fine particulate levels are likely due to a combination of regional pollution, car and diesel truck exhaust, local industrial pollution, and frac sand particulate emissions.

Results from our study are limited due to the small sample size, and longer-term sampling both at the same site and across sites is needed to better establish chronic exposure levels of $PM_{2.5}$ to residents, workers, and commuters around frac sand sites. Colocation and testing of direct-reading instruments with U.S. EPA FRM instruments would provide options for testing of air quality by local health departments using less-expensive and easy-to-interpret instruments. We are currently testing the TSI DustTrak 8520 and 8530 aerosol monitors (battery-operated, portable light-scattering laser photometers) used extensively in particulate measurement (Chang et al., 2001; Kim, Magari, Herrick, Smith, & Christiani, 2004) as well as the Dylos DC1100 consumer air monitor. These, along with the SKC DPS, are being tested against Andersen dichotomous filter-based FRM monitors in control and frac-sand ambient environments.

Conclusion

With rapidly increasing frac sand mining, processing, transportation, and use in hydraulic fracturing, health departments and elected officials face unanswered questions about potential health risks. This research, together with other data of a similar nature we have collected, is suggestive of an increase of ambient $PM_{2.5}$ levels as a result of these activities. We propose the establishment of longer-term $PM_{2.5}$ monitoring with both direct reading and FRM particulate samplers, as well as silica-specific monitoring efforts, to ensure regulatory compliance, inform nearby communities, and protect public health.

TABLE **1**

Locations, Sampling Times, and Measured $PM_{2.5}$[a] Concentrations Near Frac Sand Mines and Processing Plants

Location	Date	Time	$PM_{2.5}$ (µg/m³ +/- *SD*)	Coefficient of Variation	Field Notes
Site 1	April 19–20, 2013	13:30–14:00	13.8+/- 6.79	49%	30 m from enclosed conveyor. Windy/snowing (4/19), clear/slight wind (4/20).
Site 2	July 13–14, 2013	0:00–0:00	5.82+/-1.30	22%	~1000 m from small inactive mine. One hour light rain.
Site 3	January 17–18, 2014	20:46–18:57	19.6+/-1.74	8.9%	500 m from inactive plant. Heavy snow.
Site 4	August 3, 2013	12:00–17:47	50.8+/-9.48	19%	200 m and 1300 m from two active plants. Sampled 347 min.
Site 4	November 22–23, 2013	15:09–16:44	23.6+/-3.16	13%	200 m and 1300 m from two active plants.
Site 4	May 19–20, 2014	16:50–17:15	17.3+/-3.48	20%	200 m and 1300 m from two active plants. Heavy rain on May 19.

[a]$PM_{2.5}$ = particulate matter ≤2.5 µm in diameter.

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Did You Know? You can find information on credentials, certifications, education and training, e-Learning, and careers under the professional development tab of NEHA's Web site at www.neha.org/professional-development.

President's Message
continued from page 7

mental Health Specialist/Registered Sanitarian (REHS/RS) exam, there are 15 Environmental Public Health Online Courses totaling over 45 hours of training on the South Central Public Health Partnership Web site. For NEHA members there are now more than 300 hours of courses and presentations available online through NEHA e-Learning.

ACTION ITEM: Seek out a new training opportunity to deepen your knowledge or sharpen your skills. Below are links to some of the training opportunities described above.

- IFPTI Fellowship in Food Protection Program: www.ifpti.org/fellowship
- CDC EHTER Ops Course: https://cdp.dhs.gov/training/program/hh
- Toastmasters International: www.toastmasters.org
- FDA ORAU: www.fda.gov/Training/ForStateLocalTribalRegulators/ucm119016.htm
- Environmental Assessment of Foodborne Illness Outbreaks: www.cdc.gov/nceh/ehs/eLearn/EA_FIO/index.htm
- Environmental Public Health Online Courses: www.cdc.gov/nceh/ehs/eLearn/EPHOC.htm
- NEHA e-Learning: www.nehacert.org

Build Your Credentials

Top-notch professionals know that credentials give them credibility with the people they work with. NEHA offers several environmental health credentials including the REHS/RS, the Healthy Homes Specialist (HHS), the Certified Professional-Food Safety (CP-FS), and the new Certified in Comprehensive Food Safety (CCFS) credential.

Every environmental health professional working independently in the field should hold the REHS/RS credential. It reflects demonstrated knowledge of the full range of environmental health issues that one might encounter in the course of one's career. Even in states where an REHS/RS is not required to practice, it is the recognized standard for our profession.

Additional credentials beyond the REHS/RS are important to demonstrate in-depth knowledge of particular areas of practice. In states that require an REHS/RS to practice, these credentials identify one as someone who is motivated to do more than the minimum that is required of them.

ACTION ITEM: Earn a new credential. Credentials are evidence of demonstrated knowledge of a particular area of environmental health and one's commitment to excellence.

For information on NEHA credentials, go to www.neha.org/professional-development/credentials.

Seneca, a first-century Roman philosopher, famously said, "Luck is what happens when preparation meets opportunity." What are you doing to prepare for your next career opportunity?

Bob Custard
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INTERNATIONAL PERSPECTIVES

Chlorhexidine to Maintain Cleanliness of Restroom Door Handles

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Abstract **Restroom internal door handles have the potential to become contaminated by pathogenic bacteria, particularly because frequent breakdowns occur in hand hygiene. Cleaning these door handles periodically could reduce this cross-contamination risk. The sustained effect following cleaning with chlorhexidine could be beneficial in restroom facilities as cleaning episodes are of necessity at time intervals. The cleaning efficacies and residual effects of Sani Cloth CHG 2% wipes were investigated in a double-blinded randomized crossover controlled trial in a school setting. No significant difference occurred in initial cleaning efficacy; however, following a six-hour period of use by pupils of the restroom facilities, the internal door handles wiped with Sani-Cloth CHG 2% wipes were significantly less contaminated than those with the control wipe (14% v. 32%, p = .02). Cleaning with Sani-Cloth CHG 2% wipes demonstrated significant improvements in the continuous cleanliness of restroom door handles during use with this simple and inexpensive technique.**

Introduction

The internal door handle of a restroom facility is usually the last contact of the hand of the user following hand washing. The Centers for Disease Control and Prevention (CDC) define hand washing as the vigorous, brief rubbing together of all surfaces of lathered hands, followed by rinsing under a stream of water (CDC, 2009). It is likely that these internal door handles can become contaminated with pathogens when handled by multiple people following potentially unhygienic activities (Wojgani et al., 2012). Due to frequent use, cross contamination may occur particularly when frequent breakdowns occur in hand hygiene. A study conducted in a secondary school of 120 students found that after using the restroom, 58% of female and 48% of male students washed their hands (Guinan, McGuckin-Guinan, & Sevareid, 1997). A study examining university students found that after urinating, 69% of females and 43% of males wash their hands, while after bowel movements 84% and 78%, respectively, do (Thumma, Aiello, & Foxman, 2008). CDC estimates that hands transmit 80% of all infections (CDC, 2013). It can be assumed that the internal door handles are likely to be exposed to pathogenic bacteria and an increased risk exists of people transmitting infections as a result of using them (Barker, Vipond, & Bloomfield, 2004). Reducing exposure to pathogenic bacteria could have a positive impact on health. Indeed, improving hand hygiene in schools has been shown to reduce absenteeism (Lau et al., 2012).

In practice, the cleaning of handles cannot normally occur between each restroom user. Cleaning episodes may be typically every six hours in institutions and public facilities although national standards do not exist. Previous work regarding the cleaning of other fomites suggests that Sani-Cloth CHG 2% wipes could be effective in the decontamination of internal door handles and in addition offer residual antimicrobial activity after repeated contacts. The wipe contains 70% isopropyl alcohol with 2% chlorhexidine (Safety Data Sheet, 2007) and has an antimicrobial residual effect (Cummings et al., 2013; Hong, Morrow, Sandora, & Priebe, 2013; Howell et al., 2013), thereby retaining cleanliness of the handles for a duration despite ongoing use. An alternative wipe is the Tuffie 5 wipe. This polypropylene wipe contains cationic acid surfactants, amphoteric surfactants, and EDTA (Vernacare, 2010).

We aimed to study the residual effectiveness of the Sani-Cloth CHG 2% wipe on internal restroom door handles in a school environment by comparing it with the Tuffie 5 wipe.

Methods

The Queen Elizabeth Hospital Research Governance Committee approved our study. The

TABLE **1**

Number of Door Handles Contaminated

Time Frame	Sani-Cloth CHG 2%	Tuffie 5	*p*-Value
Immediately after cleaning	1 ($n = 24$)	4 ($n = 24$)	.35
Six hours after cleaning	10 ($n = 72$)	23 ($n = 72$)	.02

study was logged with the hospital's audit department.

We performed our study in a school of 400 pupils sharing 11 restroom facilities. It is estimated that each internal door handle in a facility has an average of 50 interactions per day. Toilet facilities are not cleaned by staff during the school day. Only a limited number of staff at the school and students involved in our study were made aware of the research, so no change occurred to the routine use of toilet facilities. Students were not instructed to wash their hands in a particular way.

Design

This design was a double-blinded randomized crossover controlled trial. The people cleaning, swabbing, and plating were blinded to the cleaning agent used for each facility to remove any potential bias. The locations were randomized using a sealed envelope technique and the cleaning agents were swapped after 10 days to ensure that the results were independent of the location investigated.

Standard Swabbing, Transport, and Plating Procedures

A set procedure was used to control the amount of time and area swabbed for each handle. The sampler was blinded to the cleaning method used. Three drops of sterile saline were used to moisten a sterile rayon-tipped transport swab in order to improve the uptake of bacteria from the handle. The handles were swabbed using a "zigzag" technique with 20 turning motions across the whole handle, covering both the front and the back. A code was used to label each of the swabs, and the technicians were blinded to the coding system used. The swabs were inserted into a charcoal transport medium for transfer to the hospital microbiology laboratory. At the laboratory, the swabs were inserted into 3 mL sterile water and vortexed for 15 seconds. Before being plated onto Columbia Agar with horse blood, serial dilutions of the swabs were made and then the numbers of CFUs were counted.

Study 1: Baseline Data

The internal restroom door handles at 11 separate sites around school were swabbed on two consecutive days to collect the baseline data. The swabs were put in 3 mL of sterile water, vortexed, and then left for 24 hours. After 24 hours they were vortexed for 15 seconds before diluting and plating.

Standard Cleaning Procedures

Each facility had a numbered code. A sealed envelope technique was used to randomize the locations of the restroom facilities. The locations of the first four envelopes selected were cleaned for the first 10-day period with Sani-Cloth CHG 2% and the remaining four with Tuffie 5 wipes. After 10 days the cleaning agents for each location were swapped following thorough washing.

Cleaning occurred at 8:30 a.m. from Monday to Friday for a 20-day period. The cleaners were investigators who were blinded to the type of wipe used. The entire handle was cleaned at each location for a 10-second time period in a standardized manner.

Study 2: Immediate Cleaning Efficacy

For a six-day period, the eight handles were swabbed at 8:30 a.m. immediately after cleaning. The cleaning, swabbing, and plating were carried out using the techniques stated in the standard procedures above.

Study 3: Residual Effect

The handles were swabbed six hours after cleaning following normal usage by students. After the first five days, a predetermined interim analysis was carried out to detect if the study was likely to be futile.

Study 4: Examining Possible Transfer of Antimicrobial Activity to the Samples (Confounding Effect)

It is important to assess whether the antimicrobial activity of either cleaning agent could be transferred to the agar plates. In order to test for this possible confounding variable, four handles were cleaned with Tuffie 5 wipes and four with Sani-Cloth CHG 2% wipes on one single day. They were then swabbed immediately afterwards. This then ensured that any transfer of cleaning agent to the transport medium that occurred in studies 1–3 was duplicated. Two plain swabs were included as controls. All swabs were put in 3 mL of sterile water and vortexed for 15 seconds and incubated with a standard dose of *E. coli* and *Staphylococcus aureus*. They were then left for 24 hours. Following this they were vortexed and dilutions made before being plated and counted in the same manner as studies 1–3. If a confounding effect due to transfer of the cleaning agent into the laboratory samples were present, then the colony counts following transfer of that agent should be less than control.

Statistical Analysis

The study data were analyzed using a two-tailed Fisher's exact test. Growth of less than 4 CFUs was predetermined to be insignificant (local microbiology laboratory standard).

Results

Study 1: Baseline Data

Nineteen of the 22 results (86%) were positive for growth (≥4 CFU) with a median of >1,000 CFU.

Study 2: Immediate Cleaning Efficacy

Sani-Cloth CHG 2% and Tuffie 5 wipes were equally effective at cleaning (Table 1) with no significant growth on 23 out of 24 (96%) and 20 out of 24 (83%) of the door handles, respectively ($p = .35$).

Study 3: Residual Effect

Following a six-hour period of use by pupils of the restroom facilities, the internal door handles wiped with Sani-Cloth CHG 2% were significantly less contaminated than those

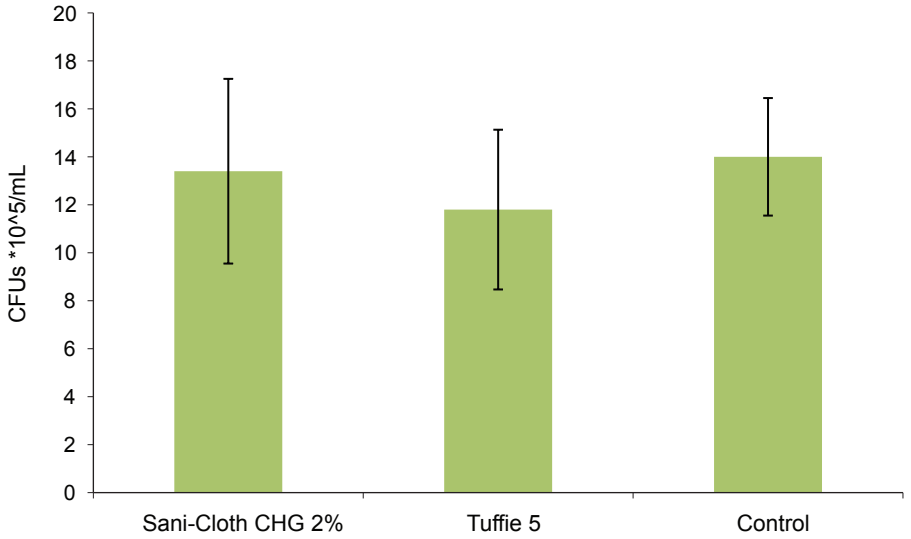
with the Tuffie 5 wipes (14% v. 32% growth at ≥4 CFU, p = .02, Table 1). Swabs on two separate days were excluded because they could not be analyzed within 48 hours and both had an overgrowth of concordant bacteria (*Pantoea agglomerans* and *Rhizobium* sp.); these were deemed by the blinded microbiologist to be excluded due to sampling, storage, or laboratory error.

Study 4: Examining Possible Transfer of Antimicrobial Activity to the Samples (Confounding Effect)

No significant difference occurred in the number of CFUs among the Sani-Cloth CHG 2%, Tuffie 5, and the control (Figure 1).

FIGURE **1**

Examining the Transfer of Antimicrobial Activity to the Growth Medium (Mean and Standard Deviations, p = ns)



Discussion

Our study expands on prior research (Cummings et al., 2013; Howell et al., 2013), demonstrating a significant residual effect of Sani-Cloth CHG 2% wipes on hospital equipment.

Our baseline data demonstrated that 86% of door handles were positive for bacterial contamination. The colony counts were high for all locations, indicating that significant contamination of door handles occurred on a daily basis. Sani-Cloth CHG 2% and Tuffie 5 wipes were both effective immediately after cleaning at decontaminating door handles, with no significant growth on 23 out of 24 and 20 out of 24 handles, respectively. After a six-hour period of use of the restroom facilities, Sani-Cloth CHG 2% wipes were significantly more effective at preventing bacterial recontamination than the Tuffie 5 wipes.

No significant difference occurred between Sani-Cloth CHG 2%, Tuffie 5, and the control in the number of CFUs, demonstrating that the antiseptic activity had not been carried into the transport medium and so a confounding effect was not seen with our sampling and laboratory analysis technique.

Our study had limitations. Although we cannot be certain that all the door handles were equally contaminated in the six-hour period, we believe that the crossover study design in relation to the cleaning facilities and the total number of days studied mitigate against this. Potential for errors may have existed in microbial processing, storage, and transport. All the samples collected on two days of the study were excluded as the majority of the agar plates for these days were heavily contaminated with concordant organisms. The excluded days were both Fridays and due to time limitations the bacteria were not plated until the following Monday (protocol violation). Possible future studies could investigate from Monday to Thursday to avoid this. No routine cleaning of the toilet facilities was carried out by staff during the school day, so the handles were not wiped between samples. We cannot discount the fact that students may have cleaned the handles themselves, although this seemed unlikely under routine usage. Again, the crossover study design aimed to mitigate against this being a confounding variable.

Other papers have commented on the need for neutralization of the chlorhexidine before plating (Kampf, 2008, 2009; Kampf, Hoffer, & Rüden, 1998; Kampf, Shaffer, & Hunte, 2005; Reichel, Heisig, & Kampf, 2008), but we were unable to demonstrate any residual antimicrobial effect from either cleaning agent when compared with the control (study 4). A potential limitation of our approach would be if the inoculation dose of bacteria was so large that it overwhelmed the inhibitory effect of transferred cleaning agent. Mean colony count for control in this study was within the range of counts measured in studies 1–3, suggesting that the chosen bacterial load appropriately mimicked the other studies.

The advantage of the residual effect may help to minimize the spread of bacteria between users. Sani-Cloth CHG 2% wipes are inexpensive with each wipe costing $.03 (based on individually wrapped wipes) and are an effective cleaning method. We have suggested to the company that they should produce inexpensive canisters that can be used in community settings such as restroom facilities for targeted disinfection of high risk objects that are handled by multiple people after hand washing.

All antiseptics have irritant properties and this needs to be given consideration. Although exposure to chlorhexidine is common, allergic contact dermatitis is rare (Tahoka & Nixon, 2013).

In the studies of chlorhexidine on laryngoscope handles (Howell et al., 2013) and reusable bougies (Cummings et al., 2013) the residual effect sizes were 42% to 22% and 33% to 0%. We observed a similar residual effect in our study. We conclude that the regular use of Sani-Cloth CHG 2% wipes on restroom door handles offers a straightforward and efficient process of reducing the spread

of bacteria, with the additional benefits of the residual antimicrobial effect over the usual cleaning method used.

Conclusion

Baseline data illustrated that sufficient growth occurred on the internal restroom door handles in a school environment to investigate the impact of cleaning. This also provides empirical evidence of the potential for an association between surfaces and cross contamination.

Both Sani-Cloth CHG 2% and Tuffie 5 wipes were effective at cleaning in terms of immediate cleaning efficacy.

A double-blinded randomized crossover controlled trial demonstrated the superior residual antimicrobial effects of the Sani-Cloth CHG 2%, in part lasting six hours. The handles cleaned with these wipes were significantly more successful at preventing recontamination than those with Tuffie 5 wipes.

The inner handle of the restroom door is the last point of contact of potentially damp washed hands prior to leaving the facility. We recommend cleaning of the inner handle of restroom facilities with Sani-Cloth CHG 2% wipes.

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GUEST COMMENTARY

2014 Ebola Outbreak: Implications for Environmental Health Practice

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Abstract **Environmental health practitioners deal with assessing risk of potential environmental contaminants from a variety of sources, including infectious disease such as Ebola virus disease (EVD). Therefore, they are uniquely qualified to contribute to epidemiological discussions of the interactions between agent-host-environment and how those interactions might be disrupted to stop the spread of EVD. Occupational health contributions on the proper use of personal protective equipment are particularly relevant for diseases lacking vaccination and treatment such as EVD. Occupations that may be at increased risk of exposure include health workers, laboratory workers, cleaning crews (for hospitals, ambulances, travel facilities, etc.), transportation workers (e.g., airlines, public transportation, taxis), sanitation workers, and morgue workers. Raising awareness professionally and publicly is an important step to stopping the spread of EVD.**

Introduction

Ebola. The word is enough to cause worldwide fear and ignite heated political debate in the U.S. Public health has historical roots in examining the etiology and risk factors associated with the environment, both biological and chemical. Early historical examples of environmental health practices to combat infectious disease include malaria and cholera. Environmental health practitioners address issues of risk and exposure in their routine work and therefore are uniquely positioned to offer insights about response to the recent Ebola outbreak. The goal of this article is to highlight the role of environmental health practitioners in dealing with emerging infectious diseases such as Ebola and highlighting available resources.

Etiology and Natural History of Ebola

Ebola virus disease (EVD) is a hemorrhagic fever in the viral family Filoviridae, genus *Ebolavirus*. Of five known species, three have been associated with large outbreaks among humans. Ebola is transmitted among mammals through contact with bodily secretions and fluids including blood, breast milk, feces, saliva, semen, sweat, urine, and vomit (Centers for Disease Control and Prevention [CDC], 2014a). Fruit bats are thought to be the natural host for the virus, and other animals that have been associated with the virus include chimpanzees, gorillas, monkeys, antelope, and porcupines (World Health Organization [WHO], 2015a).

The virus can be introduced to humans in the same manner through contact with an infected animal's bodily fluids or secretions. Cases have been associated with butchering and eating bush meat (CDC, 2014a). Transmission occurs through broken skin or mucous membranes (CDC, 2014a). Human-to-human transmission occurs through direct contact with bodily fluids and secretions or through indirect contact with contaminated surfaces (e.g., bedding, clothing, needles, or medical equipment). No known cases exist of air- or waterborne transmission (CDC, 2014a). People can continue to transmit the virus as long as it is present in their system, even after symptoms have disappeared. The World Health Organization (WHO, 2015a) reports that men can continue to transmit the virus through semen up to seven weeks after recovery from illness, and the Centers for Disease Control and Prevention (CDC, 2014a) report that the virus has been found in semen for up to three months, although it is unclear whether the virus is spread through postrecovery sex.

In humans, exposure to *Ebolavirus* leads to EVD, a severe, acute infection, with an incubation period (time from infection to onset of symptoms) ranging from 2 to 21 days. Humans are not contagious until they develop symptoms, which include sudden onset of fever and fatigue, muscle pain, headache, sore throat, vomiting, and diarrhea. EVD can also cause kidney and liver impairment as well as internal and external bleeding. Because the initial symptoms are similar to other illnesses, EVD can be difficult to diagnose and is confirmed through laboratory tests (WHO, 2015b).

No vaccine for EVD is currently approved for use in humans although clinical trials are

proceeding on an expedited schedule (WHO, 2015b). No proven treatment exists, either, although several potential treatments are currently being evaluated, including drug therapies, immune therapies, and blood products. Hydration (oral and intravenous) and other supportive symptom-specific care can improve survival (WHO, 2015b).

Epidemiological Perspective

EVD is a relatively new disease to humans, with the first cases reported in 1976 in rural areas of Central Africa, simultaneously appearing in Sudan and Democratic Republic of the Congo (DRC) (Médecins Sans Frontières [MSF], 2015; WHO, 2015a). The case-fatality rate ranges from 25% to 90%, depending on the viral strain (MSF, 2015; WHO, 2015a). The 2014 West Africa outbreak of the Zaire strain began in Guinea in March, and had widespread transmission in Guinea, Liberia, and Sierra Leone. Nigeria, Mali, and the U.S. had localized transmission traced to travel-associated cases, and Senegal, Spain, and the United Kingdom had travel-associated cases (CDC, 2015a). As of February 1, 2015, 22,444 cases had been reported (13,810 were laboratory confirmed) and 8,959 deaths in the three hardest hit countries in West Africa (CDC, 2015a), resulting in a 40% case-fatality rate, down from the 50% case-fatality rate reported by CDC in mid-October 2014.

A separate and unrelated Ebola outbreak in DRC was reported to WHO on August 26, 2014. That outbreak was geographically limited; all cases were traced to an index case related to butchering bush meat. The outbreak was declared over on November 21, 2014. A total of 66 cases (38 laboratory confirmed) resulted in 49 deaths, or a 74% case-fatality rate (CDC, 2014b).

The West Africa outbreak did not receive widespread attention in the U.S. until July 2014, when two Americans providing health care in Africa contracted the disease and were brought to the U.S. for treatment. The first case of Ebola diagnosed in the U.S. occurred September 30, 2014, when a traveler from West Africa tested positive approximately one week after developing symptoms. The patient died October 8, 2014, becoming the first U.S. fatality. Within days of his death, two health care workers who treated the index patient tested positive, were treated in isolation units, and later recovered. Also in October, a separate travel-related case involving an aid worker recently returned from Guinea was diagnosed, treated, and released (CDC, 2014c).

Public Health Response and Implications for Environmental Health Practitioners

Identify and Isolate

A key conceptual model in epidemiology is to look at the "epidemiologic triangle" of agent-host-environment within the context of person, place, and time. Because no vaccine and no proven treatment to cure EVD exist, the main focus for public health has been to stop the spread of the disease. Ebola has no natural host in the U.S., so the disease is directly related to travel contacts. Airport and hospital screening seeks to identify those who may have travel-related contact. CDC issued risk assessment and response guidelines specific to the EVD crisis (CDC, 2014d). Thus far in the U.S., volunteer aid workers returning from West Africa have been at increased risk but are not considered high risk unless they have had direct contact with the virus (such as contact with bodily fluids without personal protective equipment [PPE] or through a subcutaneous needle prick). Medical students who travel to Africa during the course of their studies may also be a potential subpopulation requiring direct active monitoring and restricted travel upon their return to the U.S., as are individuals who visit friends or family in Ebola-stricken areas.

Primary prevention includes isolating symptomatic individuals and using contact tracing to quickly identify individuals who may have been exposed to the virus (CDC, n.d.). Potentially exposed individuals are monitored (or self-monitored) for 21 days from the date of last contact with the symptomatic individual for any signs of symptoms. Monitoring includes checking the body temperature twice a day. At the first sign of increased temperature, the individual should be moved into isolation as a precaution. While monitoring, isolation is not warranted but travel may be restricted at the discretion of local or state health authorities. Such restrictions may entail maintaining a no-contact distance of three feet from other individuals and not using public transportation. If disease free at the end of the incubation period, the individual is considered not at risk for developing EVD (CDC, n.d.). The federal government has urged states not to unilaterally impose quarantines, but U.S. military personnel sent to Ebola regions are required to remain in quarantine for 21 days upon return (Starr, 2014).

Use of GIS mapping applications can provide a visual display of EVD dispersal across geographical space and time, as well as a web of contacts who may require follow-up monitoring during the critical 21-day time period. WHO considers the epidemic to be over in a defined geographic area (i.e., an administrative unit or country declared "disease free") when no new reports of EVD have occurred within 42 days.

Risk Communication and Health Education

CDC has a wide variety of health education materials available through its Ebola resources Web site (see www.cdc.gov/vhf/ebola/resources/index.html), including fact sheets, posters, flipbooks, infographics, and videos. Most are targeted toward the general public but some are also designed for specific subpopulations such as workers in health care settings, airlines, airports, and cargo ships. WHO also has multiple resources available online, including brief messages designed for sharing on social media (see www.who.int/csr/disease/ebola/messages/en/). Primary prevention messages directed toward the general public include being vigilant about possible travel-related exposure, practicing hand hygiene with frequent and thorough hand washing, and safe sex (condom usage) for those who have recovered.

Occupational Health

Another important form of primary prevention includes consistent, proper use of PPE by health care workers and others at risk of contact with contaminated materials to disrupt the chain of transmission. Although the Occupational Safety and Health Administration (OSHA) had hospital safety standards and training guidelines in place for infectious disease situations well before the 2014 Ebola outbreak (see www.osha.gov/SLTC/healthcarefacilities/infectious_diseases.html), the concerns of frontline medical personnel and the infection of two nurses led to the October 20, 2014, CDC release of new guidelines for health care workers' use of PPE (CDC, 2014e; Emergency Department Management, 2014). Widespread media debate has occurred about how much

preparation and training U.S. health care workers have received in the use of and access to PPE, and the revision of CDC guidelines is seen as a direct response to these complaints.

The Ebola scare highlights the need for regular rigorous training, adequate access to PPE, and knowledge of how to safely put on, and possibly even more importantly, take off, PPE. Workers need timely updates about changes in recommendations or policies. They need to know what to do to protect themselves and those they treat, and to feel comfortable and competent implementing response plans. For those working with patients already identified as being potential EVD patients, health care workers should ensure that PPE is properly in place (no exposed skin) before entering the isolation room. Laboratory workers who handle possible EVD specimens are also at high risk and need to remain vigilant about proper adherence to lab safety protocols and use of PPE. Other occupations that may be at increased risk of exposure include cleaning crews (for hospitals, ambulances, travel facilities, etc.), travel industry employees (e.g., airlines, public transportation, and taxi drivers), sanitation workers, and morgue workers. These occupations should also have response plans in place and access to PPE such as gloves and masks.

Related to the use of PPE is the importance of disinfecting contaminated areas with approved cleaning agents (such as bleach) and safely removing contaminated materials through primary containment in biohazard packaging and eventual disposal (such as incinerating contaminated clothing and bedding). Again, OSHA has preexisting resources specifying safety procedures for infectious diseases, as well as an Ebola-specific Web site (Occupational Safety and Health Administration, n.d.). Such guidelines would apply not only in health care settings but also for public transportation cleaning crews with suspected Ebola contamination.

In West Africa, burial customs have contributed to the spread of EVD. Part of the international response has been to train burial teams to safely dispose of corpses and disinfect the buildings after the removal of the body. In the U.S., guidance for handling the remains of those who die of infectious disease were in place prior to the EVD outbreak, but CDC tailored EVD-specific guidelines for U.S. hospitals and mortuaries (CDC, 2015b). Bodies of deceased EVD patients should be handled only by workers wearing PPE and handling should be kept to a minimum. The body should be wrapped in a plastic shroud, and double bagged in leak-proof zippered plastic bags. The outside surface of the bags should be cleaned and disinfected before being transported. Mortuary personnel should also wear PPE when handling the bagged remains. The bags should not be reopened at any point, and the body should be cremated or placed in a hermetically sealed casket for burial (CDC, 2015b).

Administrative controls can also contribute to reducing risk by making sure that adequate personnel are on duty to monitor PPE donning and removal procedures. Cohort scheduling for health care workers assigned to isolation units can help build trust in the treatment team as well as track potential exposures. Scheduling is also an important consideration to prevent errors related to worker fatigue.

Food Safety

Although CDC and WHO educational materials indicate that EVD is not food- or waterborne, environmental health and public health practitioners should remain vigilant about food and water safety, particularly in West Africa. EVD has been directly associated with bush meat in Africa, and CDC (2014f) has issued Ebola-specific reminders to the U.S. public that bush meat is illegal and poses a potential risk of disease (not limited to Ebola). Food safety precautions in Africa ought to consider the food supply chain but not limit risk assessment to bush meat hunting, butchering, and processing. Assessment should consider any potential spread of *Ebolavirus* into domesticated farm animals, particularly in light of changing land use patterns. Likewise, access to clean water supplies continues to be important. Because Ebola is spread through bodily fluids and secretions, practitioners should consider the possibility that water supplies could potentially become contaminated.

Emergency Response/Disaster Preparedness

Environmental health specialists working in emergency response/disaster preparedness are specifically trained to function as coordinators under adverse circumstances. They have training in leadership, logistics, and communications as well as having practical experience running an emergency operations center. They routinely work across a range of local, regional, and state entities, both public and private, to build capacity prior to emergency situations so they can be flexible when responding to emergencies.

Conclusion

Environmental health encompasses a wide variety of subspecialties, many of which do not deal directly with response to infectious diseases such as the Ebola outbreak. The crisis highlights important lessons, however, for the profession and for the general public.

Lesson 1: Make Use of Existing Resources

We need not reinvent the wheel each time a new disease emerges. Risk assessment and risk communication are common functions performed by environmental health practitioners, so application to a specific disease should not require extensive retraining. OSHA guidelines have been in place for years to protect workers from exposure to infectious disease. PPE needs to be readily accessible for those most likely to come in contact with bodily fluids, and workers need to be trained well enough that they feel comfortable with PPE protocols. Cleaning and disinfection methods are also addressed by OSHA, which attempts to balance safety from infectious agents with exposure to harsh chemicals. Web pages dedicated to a specific concern, such as the Ebola Web sites created by WHO, CDC, and OSHA, create a centralized resource where relevant information is easy to locate. In addition to print materials, videos and webinars can provide online materials that are accessible and timely.

Lesson 2: Supplement With Tailored Messages

Existing resources can be linked to tailored messages, especially those based on risk communication. Disease-specific Web sites provide a location for posting messages tailored to specific at-risk populations, such as business travelers, health care workers, mortuary workers, and airline personnel. Tailored messages can also address specific concerns or misconceptions about the outbreak (mosquitoes do not transmit Ebola, for example). Updates, new training materials, and messages tailored to professionals can be directed through professional organizations, networks, and LISTSERVS as well.

Lesson 3: Coordinate the Response

WHO prepared a 10-component toolkit and checklist for countries to assess their capacity to respond to EVD (WHO, 2015c). Created to help African nations coordinate their response, the kit identifies focus areas for outbreak response, including overall coordination, rapid response, public awareness and community engagement, infection prevention and control, case management, epidemiological surveillance, contact tracing, laboratory capacity, points of entry, and overall budget (WHO, 2015c). Having a clearly established command structure will facilitate a coordinated response across multiple professions and decrease opportunities for miscommunication of information to the public.

Lesson 4: Take Responsibility Individually and Collectively

Ultimately, the success of any response to infectious disease rests on the actions of individuals. As members of society, each person must take personal action and responsibility to identify risk and protect health. The government guidelines focus on risk assessment. Correctly identifying level of risk is dependent upon accurate responses to screening questions. For individuals considered to be at any level of increased risk, accurate monitoring of body temperature and limiting exposure to the general public are important preventive measures for society.

Environmental health practitioners deal with assessing risk of potential environmental contaminants from a variety of sources, including infectious disease. Therefore, they are uniquely qualified to contribute to epidemiological discussions of the interactions between agent-host-environment and how those interactions might be disrupted to stop the spread of disease. Occupational health contributions regarding the proper use of PPE are particularly relevant for diseases lacking vaccination and treatment, such as EVD. Environmental health professionals have an important role to play in responding to EVD, particularly by making use of existing resources and skills.

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DIRECT FROM AAS

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Mentoring Is for Everyone—Make a Plan, Find Your Role

Editor's Note: In an effort to provide environmental health professionals with relevant information and tools to further the profession, their careers, and themselves, NEHA has teamed up with the American Academy of Sanitarians (AAS) to publish three columns a year in the *Journal*. AAS is an organization that "elevates the standards, improves the practice, advances the professional proficiency, and promotes the highest levels of ethical conduct among professional sanitarians in every field of environmental health." Membership with AAS is based upon meeting certain high standards and criteria, and AAS members represent a prestigious list of environmental health professionals from across the country.

Through the column, information from different AAS members who are subject-matter expects with knowledge and experience in a multitude of environmental health topics will be presented to the *Journal*'s readership. This column strengthens the ties between both associations in the shared purposes of furthering and enhancing the environmental health profession.

Sheila Pressley is the associate dean of the College of Health Sciences at Eastern Kentucky University (EKU). She is also the interim director of the Master of Public Health program at EKU and holds the rank of professor in the Department of Environmental Health Science.

As we mature and develop in our personal and professional lives, our perception of mentorship changes and we begin to see how broad the definition of mentoring can be.

As I reflect on my years in high school, I think back to my principal and to the teachers who took a special interest in me and encouraged me to remain focused. That was a great example of mentorship to me at the time and remains as one of the most important times in my life. As an undergraduate student at Western Carolina University, I thought of a mentor as someone who would guide me through my college career and help me make employment connections. It was there that I met my long-time mentor and eventual colleague, Professor Joe E. Beck. As was expected, I became a mentor because of my involvement with environmental health and with various organizations on campus.

I realized the true power of mentorship when I left college and began the next chapter of my life. As I moved through my career as a practitioner, I began to see a mentor as someone who could help in adjusting to a new workplace or to a new responsibility. I have always had great mentors around me and I owe my success to a number of individuals—many of whom are NEHA and American Academy of Sanitarians (AAS) members! Environmental health has always been a very close-knit profession and mentorship has been a part of what NEHA's Annual Educational Conference (AEC) & Exhibition have helped to accomplish for decades. My introduction to NEHA was actually at a Student National Environmental Health Association (SNEHA) meeting as an undergraduate at Western Carolina University. As a professional woman who continues to develop her career, I have mentored several students, young practitioners, and new faculty over the years. I have learned that a good mentor must also be a good mentee and be able to assume a number of changing roles such as that of a listener, a confidant, a motivator, and many other necessary roles to help others excel in life.

What is your definition of mentoring? Is it a series of chance encounters at a professional meeting or venue, or is it the purposeful process of getting to know another professional who may influence you in some way? In today's world of instant access to digital information and technology, it's easy to see why students and young professionals sometimes turn to social media or other sources for career guidance and personal development. These are wonderful sources of information when coupled with the attention and time of a mentor. As I touched on earlier, mentoring comes in many forms and circumstances. Merriam Webster's dictionary defines the term "mentor" as a *trusted guide or counselor*. The mentors I have connected with helped me to

maneuver difficult situations and move ahead with my life. Joe E. Beck taught me more than I could ever share in this article or even put into words, but suffice it to say that he showed me the true power of mentorship. We began as strangers and we went full circle to become colleagues. Our future generations of environmental health leaders deserve to have that from us. As the landscape of environmental health continues to change, and as our current leaders retire and move on, we will need new professionals to replace them and this is where mentoring culminates (Roberts, 2010).

We should not count on mentoring to happen by chance or accident; we must be purposeful in using our time to mentor our future leaders. In other words, we need a plan to implement the process of developing the next generation of leaders in environmental health.

AAS has always taken the time and interest to mentor students and young professionals who want to be leaders in our profession. AAS has done so with the collaboration and support of NEHA for many years. Past mentoring opportunities at NEHA with AAS include one-on-one sessions with AAS members, panel discussions, roundtable scenarios, and a student lounge where conference attendees could connect with each other. While these opportunities have worked and should continue, the challenges in reaching young professionals and students are different today than they were for past generations. Mentoring is most effective when done in person; however, getting mentors and mentees together at the AEC and other conferences like it is cost prohibitive. Without the advantages of SNEHA and other events I was fortunate enough to attend, how can we bring young professionals and students together with mentors? Using social media such as LinkedIn, Twitter, and Facebook will help, but we still need more to bring everyone together. We need a strategic plan that AAS, NEHA, and other affiliate organizations can participate in to expand and strengthen the mentoring opportunities for young professionals and students. So if you're a practitioner and you have a college degree, that means you know how to plan, right? As it turns out, that is not always the case. We may often have good intentions, but creating a plan and putting it into action is easier said than done. Why is that? Because "true planning requires that we identify the desired outcome and the values that outcome will deliver, then form a vision and contrast it against other potential outcomes (Beck & Pressley, 2007)." Instead of planning, most of us like to sail into the future and see how it goes. This will not work for the current and future needs of environmental health because we have to consider the alternative outcomes. What if we don't have enough faculty members to teach at accredited environmental health science bachelor's programs to produce new professionals to mentor? What funds will be available to get new professionals and students to future AECs so they can meet new mentors? How will the workforce demands be different for future professionals?

I have been fortunate to have many types of mentors throughout my life and I want to give that to those who will follow me. I accept the challenge of creating a mentoring structure that will give life to future generations of environmental health professionals. What will your role be? There are enough needs for everyone to be involved. Make your presence known, share your knowledge, and get involved in some way. You can mentor someone for a short time or you can make a lifetime commitment—as so many have in environmental health. Obviously, the impact will be greater if you devote more time. I have the incredible fortune of helping undergraduate and graduate students everyday in my role as a professor and an academic administrator. I can say with certainty that the future of our profession depends on your involvement as a mentor and/or a supporter of mentoring. To create successful outcomes, universities have had to become more intrusive in teaching and mentoring their students. We can no longer assume that students understand how to embrace a mentor or know how to create a plan for their lives. This is where you and I can make a difference in shaping the future of environmental health. Join me and together we can ensure that our next generation is ready for the challenges ahead. **Keep Calm and Become a Mentor!**

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DIRECT FROM ATSDR

LCDR Elena Vaouli, MPH, REHS/RS

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Using soilSHOPs to Reduce Community Exposures to Lead in Soils

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

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

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

LCDR Elena Vaouli is an environmental health scientist for ATSDR and a commissioned Officer with the U.S. Public Health Service. She leads the ATSDR soilSHOP Workgroup and established a regional soilSHOP collaboration to host numerous events in New York, New Jersey, and Puerto Rico. Ana Pomales-Schickli is an environmental health scientist for ATSDR. She has coordinated and participated at various soilSHOP events around the Philadelphia area.

Introduction

In metropolitan areas throughout the U.S., historic use of lead-based paint, leaded gasoline, and the presence of former lead smelters has left a legacy of soil lead contamination. People, particularly children, are vulnerable to lead toxicity, which contributes to poor health and educational deficits. Although the prevalence of childhood lead poisonings in the U.S. has steeply declined in the past two decades (Centers for Disease Control and Prevention [CDC], 2011), children remain at risk for lead exposures, particularly children who live in urban environments or other areas with lead-based industrial histories. The Centers for Disease Control and Prevention estimate that over half a million U.S. children between the ages of one to five have blood lead levels high enough to damage health (CDC, 2015). The growing trend of urban and community gardening poses new challenges with regard to health messaging and balancing the numerous benefits of growing your own food versus potential human health risks from exposures to lead-contaminated soils and produce. To address these unique challenges and help increase awareness about the hazards of lead, the Agency for Toxic Substances and Disease Registry (ATSDR) promotes and supports innovative environmental health education events called soilSHOPs (see photo on page 25).

An Innovative Solution: soilSHOPs

The name soilSHOP stands for Soil Screening, Health, Outreach, and Partnership. The soilSHOP approach is a tool for implementing a unique type of environmental health education and outreach. soilSHOPs are based on the "Soil Kitchen" concept created by an international collective of artists and other creators who explore environmental and social topics through art projects (Future Farmers, 2011). The original Soil Kitchen was a temporary art installation project commissioned by Philadelphia's Office of Arts, Culture, and the Creative Economy. It coincided with the 2011 National Brownfields Conference cosponsored by the U.S. Environmental Protection Agency (U.S. EPA). In addition to providing information sessions and free soup to the community, the Soil Kitchen provided X-ray fluorescence (XRF) analyses for lead, arsenic, and cadmium, as well as other soil quality parameters.

soilSHOP event, Utica, New York (2015)

ATSDR's soilSHOP expands on the original Soil Kitchen concept to provide one-on-one tailored health education and services directly to community members to prevent lead exposure. ATSDR's soilSHOP model incorporates four components: soil screening, health education, community outreach, and partnership. It offers free soil screening services to attract residents to attend the event, yet the main intent of these events is to provide health education and other related support services to raise awareness about lead and other environmental hazards in their specific community.

The emphasis of a soilSHOP event is on education; it is not meant to characterize the extent of soil lead contamination in the community. Rather, it is an educational tool that can help prompt the conversation about the problem of lead and hopefully raise awareness to reduce exposures.

Elements of a soilSHOP

A soilSHOP event comprises three steps: (1) residents bring in samples of their yard soil, (2) the soil is screened for lead levels (and other heavy metals) using an XRF at no cost to the resident, and (3) health educators engage one-on-one with residents about their specific soil lead results and discuss ways to reduce their exposure to lead in soil. Prior to each event, considerable community outreach is conducted to encourage event-day attendance and to provide instructions on how to properly collect a soil sample (Figure 1). Complimentary activities can be added to a soilSHOP to help tailor the event to meet the needs and interests of the community, such as offering urban gardening talks, blood lead screening services, and soil quality testing.

Soil Screening Limitations

At soilSHOP events, soil samples are screened with a handheld XRF. The main benefit of the XRF is that it allows for quick, real-time soil lead results. Although XRF is a well-accepted and commonly used field instrument for screening soils for heavy metals, limitations exist to this type of screening. For example, sample preparation and moisture content may affect the precision and accuracy of the result. In addition, soil samples may not be representative of an entire yard or neighborhood. Soil screening results will likely vary widely depending on factors such as where the sample was collected in the yard, at what depth it was collected, and what the conditions of the soil were at time of sampling. In other words, one soil sample will not tell a complete story.

Key Health Messages

At soilSHOP events, participants commonly ask, "Is my soil safe?" The answer will vary by individual soil lead result, activity type (e.g., child's play area, vegetable garden), and duration and frequency of the exposure.

ATSDR encourages soilSHOP planners to discuss and develop health messages prior to the event. soilSHOP partners may want to ensure consistent messaging to prevent confusion among event participants (Sidebar).

Outreach and Partnerships Are Key

At its core, the soilSHOP is about community health promotion and teaching individuals and families how to reduce exposure to lead in soil. Critical components are the collaboration and active participation of community members, community organizations, and other agency representatives. Each soilSHOP is tailored to the interests and needs of the community hosting the event. Investment in considerable preevent outreach increases community engagement and event-day attendance. Partnerships lead to synergistic resource leveraging. At past soilSHOP events, partners have offered on-site blood lead screenings, urban gardening demonstrations and tours, and advice or information on additional soil quality testing. After the event, soilSHOP teams have supported community mapping efforts (Figure 2) and postevent community engagement and education. Partners have also provided general health services including fitness (e.g., Zumba) activities, nutrition counseling, and blood pressure screenings. Potential partners include universities, nongovernmental organizations, local businesses, and federal and state health and environmental agencies. Strategic leveraging of partner resources leads to win-win situations for both the soilSHOP team and for the communities served.

Benefits

soilSHOP events highlight the numerous benefits of safe gardening. Because soilSHOPs can be scaled and tailored to match the avail-

Agency for Toxic Substances and Disease Registry soilSHOP Recommended Key Messages

- There is no known safe blood lead level.
- Lead is common in urban settings.
- Lead poisoning is a preventable disease.
- Avoid exposures to all sources of lead.

able resources and interests of communities, they can be designed to address a wide range of community concerns like lead poisoning prevention, urban gardening, environmental justice, brownfields and land reuse sites, and children's health. The planning and implementation process stimulates creative and synergistic partner resource leveraging and encourages multiorganizational collaboration. This, in turn, enhances capacity of local personnel and programs. The benefits of fostering strong relationships can lead to empowerment of stakeholders to initiate and sustain future soilSHOP events.

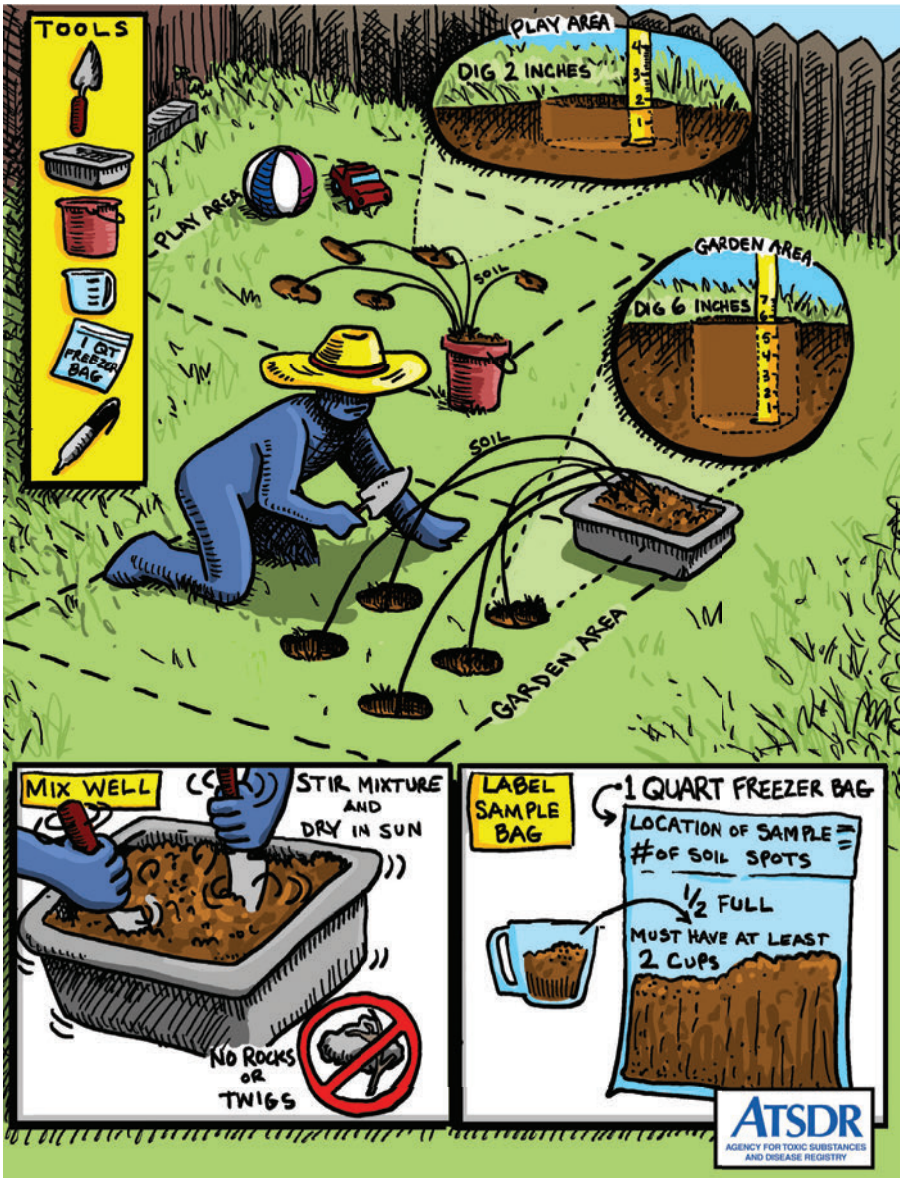
Successes

ATSDR has hosted nine soilSHOP events since the original Soil Kitchen in 2011. U.S. EPA, University of Pennsylvania, and others have hosted several other events. At an organizational level, soilSHOP events have been well attended by community members, local elected officials, and media sources. ATSDR has established soilSHOP collaborations spanning seven states and including more than 50 partners in government, academia, and community groups. Resource leveraging has resulted in substantial cost savings across all partners. For example, the New York/New Jersey soilSHOP collaboration pooled resources to hold five soilSHOP events in just two years, and enjoyed partner cost savings of more than $100,000.

Over 1,000 soil samples have been screened across the country in major cities like Philadelphia and New York City and in smaller towns like Utica, New York. Environmental health education was provided directly to over 500 families. In Newburgh, New York, soilSHOP event planners secured

FIGURE **1**

User-friendly soilSHOP Soil Sampling Instructions



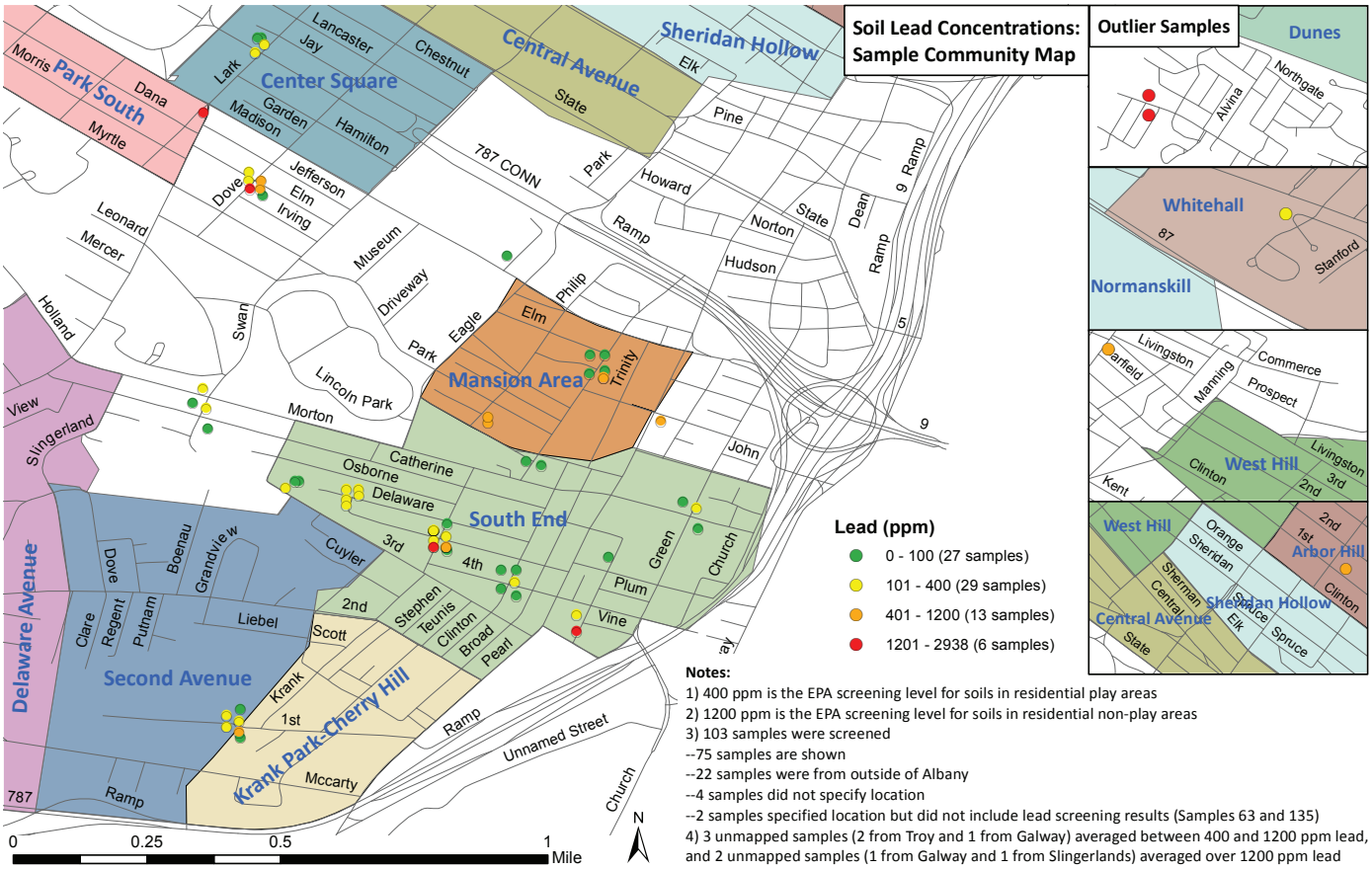
county health services resulting in blood lead testing for 22 previously unscreened children under age five. Event participants routinely received referrals for blood lead testing, soil lab testing, and gardening resources.

Available Resources

Word has spread about the value of soilSHOP events, and ATSDR has received numerous requests for soilSHOP information and resource materials. In response to these demands, ATSDR is developing a soilSHOP toolkit and resources (Figure 3) to provide the public with easily accessible and user-friendly resources for planning and conducting soilSHOP activities. ATSDR intends to deploy web-based soilSHOP materials so that resources are publicly available to a wide audience. To request more information or for updates, e-mail us at soilshop@cdc.gov.

FIGURE **2**

Albany Community Map of soilSHOP Soil Lead Results



DISCLAIMER: This map shows lead screening results from a Spring 2015 soilSHOP. Residents collected the samples and the analytical data quality is a field screening level. soilSHOPs provide an opportunity for free soil screening and one-on-one discussions with health educators to raise awareness regarding lead health risks, particularly those associated with urban soils. During the soilSHOP, health and environmental experts discussed soil screening results with each resident and shared information on ways to reduce potential exposures to lead in soils. The map is not meant to delineate "high" and "low" areas of contamination or identify sources of lead.

FIGURE **3**

Sample soilSHOP Logo

soilSHOP

Screening, Health Outreach and Partnership

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Rodent Control and Public Health: A Description of Local Rodent Control Programs

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 these columns, EHSB and guest authors share insights and information about environmental health programs, trends, issues, and resources. The conclusions in this article are those of the author(s) and do not necessarily represent the views of CDC.

Lisa Brown is a senior program analyst with the National Association of County and City Health Officials (NACCHO) and focuses her work on environmental health, pandemic preparedness, and catastrophic response. CDR Joe Laco is an environmental health officer at CDC. He works within the Division of Emergency Environmental Health Services of EHSB.

From the 1900 San Francisco bubonic plague epidemic to the 2012 Yosemite National Park hantavirus outbreak, rodents have been a feature of the environment and can compromise the public's health (Bonnefoy, Kampen, & Sweeney, 2008). In addition to potentially carrying parasites and pathogens, Norway rats, roof rats, and house mice have been destroying infrastructure, infesting houses and businesses, and damaging property for centuries. To this end, the National Association of County and City Health Officials (NACCHO) and the Centers for Disease Control and Prevention (CDC) performed a profile of nine rodent control programs across the nation within large local municipalities (Sidebar 1). The goal of the project was to understand the current capacity of local rodent control programs across the U.S. and identify best practices, challenges, and technical assistance needs (Sidebar 2).

A majority of the surveyed programs were located in a comprehensive vector control program in the environmental health division of the local health department. In New Orleans, however, the Mosquito, Termite, and Rodent Control Board within the city's department of homeland security assumed the operations of the program from the health department as they felt the duties were more aligned with those of the board. A majority of the programs were supported by local funds. Only two programs, Los Angeles County and Shelby County, Tennessee, are funded by service fees. In Shelby County, the program is fully funded through a state-legislated vector control fee. Overall, funding for a majority of the programs has either decreased or remained the same within the past five years. Of the five programs who noted a decrease in funds, these reductions resulted in significant staffing and activity cuts. For example, in Los Angeles County the program previously addressed rodent complaints from owner-occupied properties for free, but now has a pay-for-service fee.

All of the programs use integrated pest management (IPM) concepts in their rodent control efforts (Centers for Disease Control and Prevention [CDC], 2006). Largely complaint based, five programs conducted a variety of proactive activities. Generally, the number of complaints reported within the past year ranged from 10 to 2,000 per month depending on the jurisdiction. Some programs provided services beyond investigating complaints, with activities ranging from selective baiting of manholes to conducting thousands of inspections. In New York City, the Rodent Reservoir Analysis project identified and studied "rat reservoirs" in local neighborhoods. Inspectors set out bait for the rats, closed up burrows, and worked with

the community on best practices. In Philadelphia, the program staff includes mechanics who perform rat-proofing services each year, such as repairing plumbing and filling holes. None of the programs are charged with tracking rodent-borne illnesses or rodent-related injuries/bites, but rely upon notifications from their epidemiology divisions. Among the nine surveyed sites, zero human cases of rodent-borne diseases have been confirmed in the past year; however, some programs reported rodent-related injuries/bites. Not all of the programs have the capacity to capture rodents and test for pathogens. Los Angeles County previously found rodents carrying a number of human infectious agents, specifically strains of *Rickettsia* (Abramowicz, Rood, Krueger, & Eremeeva, 2011) and *Bartonella* (Gundi, Billeter, Rood, & Kosoy, 2012) species bacteria.

The programs indicated that controlling rodent populations is difficult when it is largely complaint based. Additionally, participants described a lack of understanding of rodent control by property and business owners, as well as a lack of science and research on the subject. Public education is a priority for every program surveyed. All programs make a great effort to inform the public about the importance of rodent control, from the New Orleans Pest Control Academy to San Francisco's educational meetings with the local Professional Gardeners Association. In Austin, Texas, the rodent control program successfully educates and reaches out to many different local populations, such as the Spanish-speaking community. Additionally, all programs collaborate extensively with other local departments or organizations. In Washington, DC, the program works closely with the Department of Public Works to provide public, live web chats or "Rat Summits" to discuss rodent-control practices. In New York City, the program leads the Mayor's Rodent Task Force with more than 20 city departments. In Multnomah County, Oregon, the program partnered with local universities to conduct research and found local rodents testing positive for human diseases like hepatitis E, leptospirosis, and toxoplasmosis.

Some of the most significant challenges for rodent control include a lack of funding and resources. With enough staff, funding, public education, resources, and technology, programs think that rodent control can be even more successful. Rodents play a significant role in transmission of a large number of diseases, and in many places rodents live in close contact with humans (Firth et al., 2014). While many rodent control programs have seen reductions in rodent populations and rodent-borne illness as a result of their work, it has been difficult to sustain these positive outcomes long-term. Framing rodent control as a public health issue and collaboration among public health professionals and their communities will help create long-term and more successful solutions to control rodent populations and keep rodent-borne diseases at bay.

A comprehensive profile for each participating program will soon be made available on the NACCHO Web site (www.naccho.org).

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Participating Jurisdictions

- San Francisco Department of Public Health
- Shelby County Health Department (Memphis, TN)
- Los Angeles County Public Health Department
- Austin/Travis County Health and Human Services Department (Austin, TX)
- Multnomah County Health Department (Portland, OR)
- New York City Department of Health and Mental Hygiene
- Washington, DC, Department of Health
- City of New Orleans Department of Health

Methods

- NACCHO and CDC invited nine cities representing the diversity of the nation to participate in a profile of their rodent control programs.
- NACCHO conducted in-depth telephone interviews with each participating program.
- Key questions and priority areas for the program assessment questionnaire were developed through research and consultation with rodent control subject-matter experts.
- The questionnaire contained sections that corresponded to the 10 Essential Environmental Public Health Services (CDC, 2011).

U.S. Department of Housing and Urban Development Secretary's Awards for Healthy Homes

The U.S. Department of Housing and Urban Development (HUD), in partnership with NEHA, was pleased to announce the inaugural Secretary's Awards for Healthy Homes earlier this year. The award-winning programs described below recognize excellence in healthy housing innovation and achievement that benefits the health of low- or moderate-income families in three categories: Cross Program Coordination Among Health, Environment, and Housing; Public Policy; and Public Housing/Multifamily Supported Housing. The winning programs were presented their awards at NEHA's Annual Educational Conference (AEC) & Exhibition, July 13, 2015, in Orlando, Florida.

Cross Program Coordination Among Health, Environment, and Housing

Alaska Native Tribal Health Consortium (ANTHC)

Respiratory Health and Housing Challenges

Alaska Native children suffer from a high burden of respiratory illness resulting in high costs of treatment and increased morbidity and mortality. Hospitalizations for lower respiratory tract infection among Native children of southwest Alaska occur at rates that are seven-fold higher than that of the general U.S. population (Singleton et al., 2012). One in four infants from this region is hospitalized annually with acute respiratory infections (Hennessy et al., 2008), and hospitalization rates of respiratory syncytial virus (RSV) in infants are among the highest ever documented (Karron et al., 1999).

According to a report prepared by the Cold Climate Housing and Research Center in collaboration with the Alaska Housing Finance Corporation, housing needs in Alaska are significant (Alaska Housing and Finance Corporation, 2014), possibly contributing to the high burden of respiratory disease. Residents often seal homes tightly and disable ventilation systems to prevent heat loss, which can lead to a higher risk of indoor air quality problems and moisture build up in the home. Nearly 60% of homes lack adequate ventilation, some of which have no ventilation system at all (Alaska Housing and Finance Corporation, 2014). Considering the high burden of respiratory disease and inadequate housing, a need exists for environmental health programming to address the problem. This summary provides an overview of the first attempt to develop and test a large-scale healthy homes program to improve indoor air quality and respiratory health in Alaska.

ANTHC's Healthy Homes Program

ANTHC provides comprehensive medical and preventative health services for Alaska Natives and American Indians residing in Alaska (www.anthctoday.org). In 2009, a pulmonologist at ANTHC contacted a representative from the organization's environmental health program to suggest that inadequate housing and poor indoor air quality was contributing to the respiratory disease symptoms of her patients. This phone call set off a chain of events that led to the establishment of the healthy homes program at ANTHC.

Partnering for Success

Recognizing the value of collaboration in environmental health, ANTHC's first step in establishing the new program was to reach out to partners with unique capacity to perform the work. This involved forming key partnerships with tribal housing authorities, Alaska's HUD office, U.S. Environmental Protection Agency's Region X office, regional tribal health organizations, and the local Centers for Disease Control and Prevention program. To date, over eight Alaska Native Tribes, 10 external organizations, and five programs within ANTHC have made contributions.

Program Activities

Program activities began in fall of 2011. The overall approach is to identify 15 homes per year where children with the most serious and frequent respiratory conditions reside. Participants are identified by review of electronic medical records and discussions with medical providers. The next step is to perform a comprehensive home assessment to identify home modifications that are likely to improve indoor air quality. The most common home modifications are installation of passive wall vents, replacing old leaky wood stoves with new more efficient models, and addressing mold and moisture issues. Education is provided to encourage occupant behaviors that lead to improved air quality, such as proper use of the vents and burning dry instead of wet wood. Effectiveness of the modifications is ongoing, but involves longitudinal review of electronic medical records and a series of questionnaires administered with families at five points over a two-year period. Context is added to the respiratory health data by pre- and post-intervention comparison of air sampling results for particulate matter, volatile organic compounds, and carbon dioxide.

Achievements to Date

At the time this summary was written, modifications to improve indoor air quality had been completed in 60 homes. Initial results show an improvement in air quality in regards to volatile organic compounds, particulate matter, and carbon dioxide following home modifications and education. The lung health questionnaires, to be verified by medical chart reviews, suggest fewer missed days of school, fewer hospitalizations, and fewer clinic visits for respiratory illness. Final results should be available in late 2016, and the authors plan to submit a full manuscript to the *Journal of Environmental Health*.

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Children's Mercy Hospitals and Clinics

Jordan's family has some visitors. The four-year-old's parents have been struggling to manage his asthma and he has had several visits to the doctor's office recently and, unfortunately, a hospitalization. The visitors are from the Children's Mercy Hospital (CMH)-based healthy home program that helps the family understand possible asthma "triggers" (a new term for the family) in and around their home that, when Jordan is exposed, makes his asthma worse or more difficult to control. View a short video about Jordan's case at www.youtube.com/watch?v=GwpdBwKmfxo.

Since 2001, CMH Environmental Health (CMH-EH) has worked under this philosophy to help all families manage potential environmental health risks. Today, this recognition has evolved into an array of unique and innovative programs and services not often found at a stand-alone, regional pediatric hospital. Because of the range and variety of patients served by CMH, the environmental health team divides the referrals they receive into three categories: asthma case management; lead poisoning case management; and other health conditions including allergies, eczema, cystic fibrosis, and children who are immune-compromised and therefore vulnerable to some common environmental conditions. Referrals are also received from outside health care providers as well as families hearing about the program through community partners. All of the patients with these different conditions may be offered assessment services through the Healthy Home Program (HHP). Two successful programs are briefly described.

Asthma Friendly Home Partnership

In 2012, CMH-EH used funding from the Health Care Foundation of Greater Kansas City to revamp its case management services for asthma to create the Asthma Friendly Home Partnership (AFHP). Through the AFHP, families can be referred for assistance through any in-patient department or outpatient CMH clinic, or they can be referred by a community health provider or from a safety net clinic. Once referred, we use a predictive index that combines past utilization based on asthma acute care visits (ACVs), results of an administered asthma control test (ACT), and an environmental risk test to create a total asthma risk index. Based on a patient's index score they are stratified into low, medium, or high risk for the likelihood of future health utilization. CMH has used this utilization model as part of the recent establishment of a high-risk asthma protocol at the hospital that includes an automatic referral to the CMH-EH for environmental health consultation. For AFHP, the higher a child's asthma risk, the more intensive the level of case management and interventions offered to the family. All AFHP families receive home-focused education and healthy home resources: an Asthma Friendly Home Kit and manual at no cost. For some high-risk families, and when grants have been available, the AFHP provides funding to make home repairs to remove any asthma-related home concerns identified by the CMH-EH team.

In a review of the ACVs and ACT score of AFHP participants, of the 71 families that received a home assessment and basic interventions, a statistically significant ($p < .05$) reduction occurred in ACVs for these asthma patients pre/post participation. For 44 children where the ACT score was available pre/post participation, a statistically significant ($p < .05$) improvement occurred in ACT scores for these patients.

CMH Childhood Lead Poison Prevention Partnership

In September 2012, the Kansas Department of Health and Environment (KDHE) lost CDC funding for childhood blood lead surveillance activities. The loss of funding led to the elimination of key activities and a shift of core public health functions away from the state to local health departments and private entities. Prior to the loss of funding, KDHE staff was responsible for case management of the approximately 400 confirmed cases of elevated blood leads (EBL) (≥10 µg/dL) in Kansas a year.

For the past 18 months, CMH-EH, the Mid-America Pediatric Environmental Health Specialty Unit at CMH, and the Kansas City, Missouri, Health Department, using their own funding, have collaborated to provide medical consultation and case management for children with EBL in Kansas. Approximately 120 Kansas children with EBL ≥5 µg/dL have been followed by CMH and the Kansas University Hospital-Poison Control Center, and of these, 74 children had an EBL greater than 15 µg/dL. Funding is limited, however, and does not allow all children to receive case management. In addition to medical consultation and case management, the CMH-EH has provided phone education for all families and environmental investigations of 12 home residences to help determine the etiology of the lead poisoning. In a recent analysis of the impact of this program, a statistically significant reduction was found ($p < .05$) in the EBL concentration of children where follow-up EBL testing was performed.

We have been fortunate over the years to obtain the financial support of the HUD Office of Lead Hazard Control and Healthy Homes and used those funds to create community-based programs and perform health home research to expand the knowledge of the role environmental exposure plays in pediatric disease. Millions of families across the nation face an everyday struggle to manage their child's health and successful programs like ours benefit from having this important funding available to assist them in improving the lives of their children.

Public Policy

Breathe Easy Coalition of Maine

In response to a mounting number of complaints about secondhand smoke from residents in multiunit housing and their health care providers, the Smoke-Free Housing Coalition of Maine, a program of the Breathe Easy Coalition of Maine, was formed in 2002. Its stated mission was to protect residents in multiunit housing from involuntary exposure to secondhand smoke. Key partners such as the American Lung Association of Maine were consulted, tenants in public housing were surveyed, and strategies for educating landlords and empowering tenants were researched and adopted.

Paramount to the coalition's mission were the facts that 1) smoke-free housing is much less expensive for landlords than maintaining rental units where smoking is allowed, and 2) providing smoke-free housing is legal in the U.S. The coalition focuses on distributing information, educational activities, data collection through surveys of residents and property owners/managers about smoke-free policies, and providing decision makers and housing authorities with information and technical assistance needed to adopt smoke-free policies. The coalition has made a substantial impact that has resulted in smoke-free housing becoming the norm, rather than the exception, for thousands of tenants in Maine.

Public Housing/Multifamily Support Housing

Wisconsin Housing and Economic Development Authority

Highland Commons, located in West Allis, Wisconsin, just west of Milwaukee, is a 50-unit, multifamily development designed to meet the special needs of tenants recovering from mental illness. The development opened in September 2012 and replaced a foreclosed, severely blighted building determined to be unsalvageable.

Cardinal Capital Management (CCM) obtained financing from the Wisconsin Housing and Economic Development Authority (WHEDA) to demolish the existing structure and construct a new building to provide housing and supportive services for persons recovering from mental illness. In 2010 WHEDA allocated $976,371 in low-income housing tax credits and in the summer of 2011 WHEDA approved a $6,500,000 construction loan and a $785,000 permanent loan to help finance Highland Commons.

In addition to CCM and WHEDA, the success of Highland Commons was made possible through a collaboration of strong partners including the Milwaukee Center for Independence, the City of West Allis, Reichl Construction, the Milwaukee County Behavioral Health Division, the Milwaukee County Division of Housing, and HUD. Providing housing stability for persons recovering from mental illness was just part of the equation for Highland Commons. To be successful, long-term residents also needed on-site supportive services to increase daily living skills and successfully manage their disability.

A state-of-the-art green built development, Highland Commons held its grand opening in September 2012 with all units occupied. Units are set aside for low-income households at 60% of the county median income. Supportive services and activities are provided on site at no charge to residents.

The goal of Highland Commons is to reduce stress and the often resulting aggression by addressing the need for privacy, security, and serene surroundings. Well-lit and bright apartments and common spaces, a fitness room, computer lab and free Internet access, landscaped grounds with an outdoor patio, and a vegetable garden are all geared to help residents live the healthiest life possible.

Highland Commons incorporates a supportive living model of services that allows individuals recovering from a mental illness to live independently in permanent housing with services that are matched to their individual needs. The Milwaukee County Division of Housing contracts with Our Space, a nonprofit organization, to provide programs and services. Our Space became the service provider for Highland Commons in January 2015 and employs a full-time supportive apartment coordinator who works to ensure that residents have access to counseling, case management, psychiatry, pharmacy, and other services. By having a daily, on-site presence with a strong emphasis on open communication between tenants, service providers, building management, and neighbors, issues can be resolved before becoming problems.

Maintaining meaningful activity and ongoing support are key to the long-term success for residents at Highland Commons. The large, bright community room with a kitchen is the hub for a multitude of activities as well as peer-based support groups. The groups are developed with resident input and are extremely well attended. Support groups deal with anger management, alcohol and other drug abuse prevention, smoking cessation, mental health education, socialization and recreational activities, meal planning, and symptom management.

Nearly two years after the opening of Highland Commons, reports showed marked improvements in the health and well-being of residents.

No less than 50 adults living with and recovering from severe and persistent mental illness are now living in affordable housing. At least 300 planned activities are held during a 12-month period that focus on services and support necessary to provide a recovery-oriented community.

According to the Milwaukee Center for Independence, the original service provider for Highland Commons, as of July 31, 2014:

- 86% of residents had an increase in daily living skills, surpassing a projected level of 70%.
- 80% of residents remained free from psychiatric hospitalization or primary care sensitive visits by using peer support services and attending recovery groups. A projected level of 70% achievement was surpassed.
- 82% of residents remained in their lease for one year or longer, thus demonstrating an increase in housing stability. A projected level of 80% achievement was surpassed.

Two years after its grand opening, Highland Commons has helped improve the quality of life for its residents with an increase in daily living skills, a decrease in psychiatric hospitalizations, and access to safe and stable affordable housing.

Did You Know?

Two and a half billion people do not have access to proper sanitation, including toilets or latrines. World Toilet Day (WTD) is a campaign to motivate and mobilize millions around the world on issues of sanitation. Originally established by the World Toilet Organization in 2001, this day to draw attention to global sanitation issues is marked each year on November 19. In 2013, the United Nations (UN) passed a resolution recognizing WTD as an official UN international day. Learn more at www.un.org/en/events/toiletday/.

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Interested applicants can send their resume to: Bill Flynn at Fax: 818-865-0465. E-mail: Bill.Flynn@ul.com.

EH CALENDAR

UPCOMING NEHA CONFERENCE

June 13–16, 2016: NEHA's 80th Annual Educational Conference & Exhibition, San Antonio, TX. For more information, visit www.neha.org/aec.

NEHA AFFILIATE AND REGIONAL LISTINGS

California

March 21–25, 2016: 65th Annual Educational Symposium, hosted by the California Environmental Health Association, Oakland, CA. For more information, visit www.ceha.org.

Michigan

March 15–18, 2016: Annual Education Conference, hosted by the Michigan Environmental Health Association, Bay City, MI. For more information, visit www.meha.net/AEC.

Ohio

April 18–20, 2016: Annual Education Conference, hosted by the Ohio Environmental Health Association, Columbus, OH. For more information, visit www.ohioeha.org/annual-education-conference.aspx.

TOPICAL LISTINGS

Food Safety

November 17–20, 2015: Food Safety Consortium, organized by FoodSafetyTech, Schaumburg, IL. For more information, visit www.foodsafetyconsortium.org.

November 17–20, 2015: Integrated Foodborne Outbreak Response and Management (InFORM) Conference, sponsored by the Centers for Disease Control and Prevention, Enteric Diseases Laboratory Branch and Outbreak Response and Prevention Branch; Association of Public Health Laboratories; U.S. Department of Agriculture, Food Safety and Inspection Service; and the Food and Drug Administration, Phoenix, AZ. For more information, visit www.aphl.org/conferences/Pages/InFORM.aspx.

Preparedness

November 17–18, 2015: 1st Annual Conference hosted by the Association of Healthcare Emergency Preparedness Professionals, Omaha, NE. For more information, visit www.ahepp.org/conference.

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

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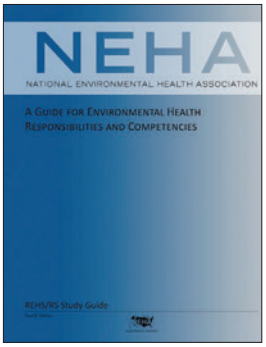
REHS/RS Study Guide (Fourth Edition)

National Environmental Health Association (2014)

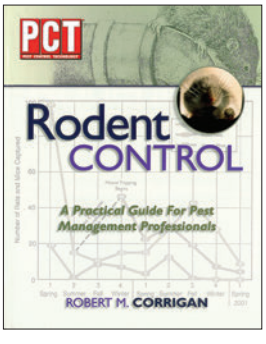


The Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) credential is NEHA's premier credential. This study guide provides a tool for individuals to prepare for the REHS/RS exam and has been revised and updated to reflect changes and advancements in technologies and theories in the environmental health and protection field. The study guide covers the following topic areas: general environmental health; statutes and regulations; food protection; potable water; wastewater; solid and hazardous waste; zoonoses, vectors, pests, and poisonous plants; radiation protection; occupational safety and health; air quality; environmental noise; housing sanitation; institutions and licensed establishments; swimming pools and recreational facilities; and disaster sanitation.

308 pages / Paperback / Catalog #EZ3010
Member: $149 / Nonmember: $179

Rodent Control: A Practical Guide for Pest Management Professionals

Robert M. Corrigan (2001)



This book emphasizes a hands-on, practical approach to rodent pest management in structural environments. It is written for pest management professionals and other personnel involved in rodent control work. The integrated pest management (IPM) approach is stressed throughout the text, beginning with a detailed chapter on conducting inspections, followed by individual chapters addressing the importance of sanitation and rodent proofing of our buildings to manipulate environments and render them less attractive and conducive for rodent infestations.

355 pages / Hardback / Catalog #1101
Member: $49 / Nonmember: $54

Certified Professional-Food Safety Manual (Third Edition)

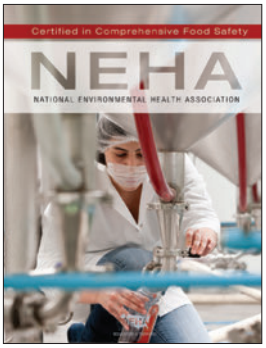
National Environmental Health Association (2014)

The Certified Professional-Food Safety (CP-FS) credential is well respected throughout the environmental health and food safety field. This manual has been developed by experts from across the various food safety disciplines to help candidates prepare for NEHA's CP-FS exam. This book contains science-based, in-depth information about causes and prevention of foodborne illness, HACCP plans and active managerial control, cleaning and sanitizing, conducting facility plan reviews, pest control, risk-based inspections, sampling food for laboratory analysis, food defense, responding to food emergencies and foodborne illness outbreaks, and legal aspects of food safety.

358 pages / Spiral-bound paperback / Catalog #EZ9020
Member: $179 / Nonmember: $209

Certified in Comprehensive Food Safety Manual

National Environmental Health Association (2014)



The Food Safety Modernization Act has recast the food safety landscape, including the role of the food safety professional. To position this field for the future, NEHA is proud to announce its newest credential—Certified in Comprehensive Food Safety (CCFS). The CCFS is a midlevel credential for food safety professionals that demonstrates expertise in how to ensure food is safe for consumers throughout the manufacturing and processing environment. It can be utilized by anyone wanting to continue a growth path in the food safety sector, whether in a regulatory/oversight role or in a food safety management or compliance position within the private sector. The *CCFS Manual* has been carefully developed to help prepare candidates for the CCFS exam and deals with the information required to perform effectively as a CCFS.

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Walter S. Mangold Award

The Walter S. Mangold Award recognizes an individual for extraordinary achievement in environmental health. Since 1956, this award acknowledges the brightest and the best in the profession. NEHA is currently accepting nominations for this award by an affiliate in good standing or by any five NEHA members, regardless of their affiliation.

The Mangold is NEHA's most prestigious award and while it recognizes an individual, it also honors an entire profession for its skill, knowledge, and commitment to public health.

Nominations are due in the NEHA office by **March 15, 2016.**

Visit www.neha.org/walter-s-mangold-award for application criteria.

NEHA SABBATICAL EXCHANGE PROGRAM TO ENGLAND OR CANADA

NEHA offers wide-ranging opportunities for professional growth and the exchange of valuable information on the international level through its longtime Sabbatical Exchange Program.

The sabbatical may be taken in England, in cooperation with the Chartered Institute of Environmental Health, or in Canada, in cooperation with the Canadian Institute of Public Health Inspectors. The sabbatical can be from two to four weeks, as determined by the recipient. If selected, the sabbatical ambassador receives up to **$4,000** as a stipend, depending on the length of the sabbatical, and up to $1,000 for roundtrip transportation.

The application deadline is March 1, 2016.

Winners will be announced at the NEHA 2016 Annual Educational Conference (AEC) & Exhibition in San Antonio, Texas, in June 2016. Recipients will complete the sabbatical between August 1, 2016, and June 1, 2017. The sabbatical ambassador will give a required report of their experience at the 2017 AEC in Grand Rapids, Michigan.

To access the online application, visit www.neha.org/sabbatical-exchange-program.

SUPPORT THE NEHA ENDOWMENT FOUNDATION

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

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

Thank you.

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

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Sandra Long, REHS, RS
Plano, TX

Ned Therien, MPH
Olympia, WA

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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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Alicia Collins, REHS
Lilburn, GA

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Lovettsville, VA

Dr. Trenton G. Davis
Butler, TN

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Denver, CO

Carolyn Harvey, PhD, CIH, RS, DAAS, CHMM
Richmond, KY

Keith Johnson, RS
Mandan, ND

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Cheyenne, WY

Lynne Madison, RS
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Longview, WA

LCDR James Speckhart, MS
Silver Spring, MD

21st CENTURY CLUB ($500–$999)

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

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Plano, TX

Peter M. Schmitt
Shakopee, MN

Dr. Bailus Walker, Jr.
Arlington, VA

SUSTAINING MEMBERS CLUB

($1,000–$2,499)

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

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Metairie, LA

George A. Morris, RS
Dousman, WI

Vince Radke, MPH, REHS, CP-FS, DAAS, CPH
Atlanta, GA

Walter P. Saraniecki, MS, LDN, LEHP, REHS/RS
Indian Head Park, IL

AFFILIATES CLUB

($2,500–$4,999)

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

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

EXECUTIVE CLUB AND ABOVE

($5,000–$100,000)

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

NEHA ENDOWMENT FOUNDATION PLEDGE CARD

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

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

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

Signature _____ Print Name _____

Organization _____ Phone _____

Street Address _____ City _____ State _____ Zip _____

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

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

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MAIL TO: NEHA, 720 S. Colorado Blvd., Suite 1000-N, Denver, CO 80246, or FAX to: 303.691.9490. 1511JEHEND

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Accela
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Advanced Fresh Concepts Corp.
www.afcsushi.com

AIB International
www.aibonline.org

Albuquerque Environmental Health Department
www.cabq.gov/environmentalhealth

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

American Academy of Sanitarians (AAS)
www.sanitarians.org

American Chemistry Council
www.americanchemistry.com

Arlington County Public Health Division
www.arlingtonva.us

Association of Environmental Health Academic Programs
www.aehap.org

ATSDR/DCHI
www.atsdr.cdc.gov/hac

Building Performance Center, a Department of The Opportunity Council
www.buildingperformancecenter.org

Cabell-Huntington Health Department
www.cabellhealth.org

Chemstar Corporation
www.chemstarcorp.com

Chesapeake Health Department
www.vdh.state.va.us/lhd/chesapeake

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

City of Milwaukee Health Department, Consumer Environmental Health
http://city.milwaukee.gov/Health

City of Phoenix, Neighborhood Services Department
www.phoenix.gov/nsd

City of St. Louis Department of Health
www.stlouis-mo.gov/government/departments/health

Coconino County Public Health
www.coconino.az.gov

Colorado Department of Public Health & Environment, Division of Environmental Health and Sustainability, DPU
www.colorado.gov/pacific/cdphe/dehs

Custom Data Processing, Inc.
www.cdpehs.com

DEH Child Care
www.denvergov.org/DEH

Digital Health Department, Inc.
www.dhdinspections.com

Diversey, Inc.
www.diversey.com

Douglas County Health Department
www.douglascountyhealth.com

DuPage County Health Department
www.dupagehealth.org

Eastern Idaho Public Health District
www.phd7.idaho.gov

Ecolab
www.ecolab.com

EcoSure
charlesa.arnold@ecolab.com

Erie County Department of Health
www2.erie.gov/health

Florida Department of Health in Sarasota County
http://sarasota.floridahealth.gov

GLO GERM/Food Safety First
www.glogerm.com

Health Department of Northwest Michigan
www.nwhealth.org

Hedgerow Software Ltd.
www.hedgerowsoftware.com

ITW PRO Brands
http://itwprofessionalbrands.com

Jackson County Environmental Health
www.jacksongov.org/EH

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

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

Kenosha County Division of Health
www.co.kenosha.wi.us

Kent County Health Department
www.accesskent.com/Health/health_department.htm

Linn County Public Health
health@linncounty.org

Maricopa County Environmental Services
jkolman@mail.maricopa.gov

McDonough County Health Department
www.mchdept.com

Mesothelioma Lawyer Center
www.mesotheliomalawyercenter.org

mesotheliomalawyers.com
www.mesotheliomalawyers.com

Micro Essential Lab
www.microessentiallab.com

Mid-Iowa Community Action
www.micaonline.org

Mitchell Humphrey
www.mitchellhumphrey.com

Multnomah County Environmental Health
www.multco.us/health

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

National Registry of Food Safety Professionals
www.nrfsp.com

National Restaurant Association
www.restaurant.org

National Swimming Pool Foundation
www.nspf.org

New Mexico Environment Department
www.nmenv.state.nm.us

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

North Bay Parry Sound District Health Unit
www.myhealthunit.ca

NSF International
www.nsf.org

Omaha Healthy Kids Alliance
www.omahahealthykids.org

Oneida Indian Tribe of Wisconsin
www.oneidanation.org

Orkin
www.orkincommercial.com

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

PinnacleHealth Lead and Healthy Homes Program
www.pinnaclehealth.org

Presby Environmental, Inc.
www.presbyenvironmental.com

Pride Community Services
www.prideinlogan.com

Procter & Gamble Co.
www.pg.com

Prometric
www.prometric.com

QuanTEM Food Safety Laboratories
www.quantemfood.com

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

Seattle & King County Public Health
www.kingcounty.gov/healthservices/health.aspx

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

Skillsoft
www.skillsoft.com

Sonoma County Permit and Resource Management Department, Wells and Septic Section
www.sonoma-county.org/prmd

Starbucks Coffee Company
www.starbucks.com

StateFoodSafety.com
www.statefoodsafety.com

Stater Brothers Market
www.staterbros.com

Steton Technology Group, Inc.
www.steton.com

Target Corp.
www.target.com

Texas Roadhouse
www.texasroadhouse.com

The Steritech Group, Inc.
www.steritech.com

Tri-County Health Department
www.tchd.org

Underwriters Laboratories, Inc.
www.ul.com

Waco-McLennan County Public Health District
www.waco-texas.com/cms-healthdepartment

Washington County Environmental Health (Oregon)
www.co.washington.or.us/HHS/EnvironmentalHealth

Waukesha County Public Health Division
sward@waukeshacounty.gov

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

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

WVDHHR Office of Environmental Health Services
www.dhhr.wv.gov

XTIVIA
www.xtivia.com

Educational Institution Members

American Public University
www.StudyatAPU.com/NEHA

East Central University
www.ecok.edu

East Tennessee State University, DEH
www.etsu.edu

Eastern Kentucky University
http://eh.eku.edu

Michigan State University, Online Master of Science in Food Safety
www.online.foodsafety.msu.edu

The University of Findlay
www.findlay.edu

University of Illinois Springfield
www.uis.edu/publichealth

University of Vermont Continuing and Distance Education
http://learn.uvm.edu

University of Wisconsin–Oshkosh, Lifelong Learning & Community Engagement
www.uwosh.edu/llce

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www.uwstout.edu

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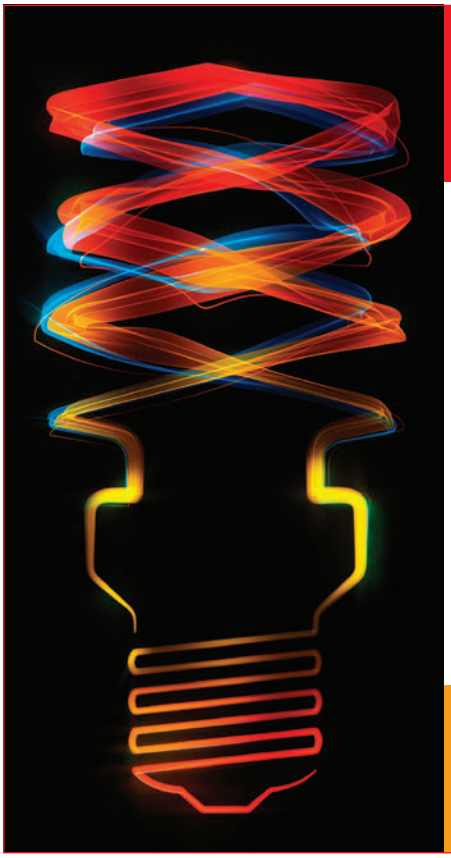

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interest in human health, and that's where we come in.

As time proceeds, let's build on the four foundational areas that frame much of the work we have elected to do. First, lets continue to maintain credibility through **remediation**. We are often requested to participate in emergency responses or assess health threats because of our basic science expertise and knowledge of environmental factors. When our profession is called upon, let's answer the call, and dare to move beyond regulatory functions. Become an expert in root cause analysis, address why something occurred, and tender our recommendations for ensuring this does not happen again. An example of this is *Legionella* mortality. We should advocate for standard water sampling for premise plumbing just like retail food outlets undergo routine food service inspections.

Second, let's enter the **health promotion** business in earnest. As climate-related precipitation patterns continue their march into unpredictability, let's become more conversant in emerging issues such as cisterns and rain barrels and have an answer ready for the inevitable question "Is it safe?" If so, under what conditions? Will standing water attract vectors? What other factors should we be considering?

Third, we need to tool ourselves to become more active in **advocacy**. I recognize many in the governmental sector are unable to actively engage in educating law makers as a function of limitations on governmental employees. Having said that, as I craft this message, the Centers for Disease Control and Prevention/ National Center for Environmental Health (CDC/NCEH) proposed Fiscal Year 2016 (FY16) budget for safe water has been zeroed out by the Senate and cut by the House. The last time I looked the adult human body is comprised of 50%–75% water. Safe water is about as essential as clean air and wholesome food. I trust I have made my point.

Fourth and last, let's assert **leadership**. Let's insert ourselves in the national and local conversation on water and put the public's interest into public health conversations. A trillion gallons a year of water lost through poor infrastructure is unconscionable. Let's work with our colleagues at the American Water Works Association, among others, to draw attention to this national issue and tender recommendations for improvement, even in these days of austerity.

Finally, we can't ask reporters to do something that we are not willing to do ourselves: connect the dots. I sense we are entering an era of the limits on growth and possibilities as a function of water management. Think about agriculture in California if you need to visualize what I am referring to. We are uniquely qualified to raise these issues in a comprehensive manner because our members are everywhere across the country and can see firsthand what news outlets are reporting to the world at large. Let's use our local presence and expertise to bring sound science and a sense of responsibility to the conversation. How about a water management strategy and policy session at the 2016 Annual Educational Conference & Exhibition in San Antonio?

My 1970s self would be jazzed at the prospect of such a session.

Dave
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Did You Know?

Legionnaires' disease is caused by a type of bacterium called *Legionella*. The bacterium is named after a 1976 outbreak when many people who went to a Philadelphia convention of the American Legion suffered from this disease. A milder infection, also caused by *Legionella* bacteria, is called Pontiac fever.
Source: www.cdc.gov/legionella/index.html.

DirecTalk MUSINGS FROM THE 10TH FLOOR

David Dyjack, DrPH, CIH

The Aqueous Solution

It was 1978. Barry Gibb of Bee Gees fame had nothing on me. I sported a golden tan, requisite two-day stubble beard, mirror aviator shades, and a puka shell necklace. I cringe at the very thought of my lifeguarding years. But what years they were, and so much has changed since the glory of my youth. My memorable experiences with water at that time were largely limited to my own near-drowning experience at the Outer Banks and analyzing pool water samples for chlorine and alkalinity.

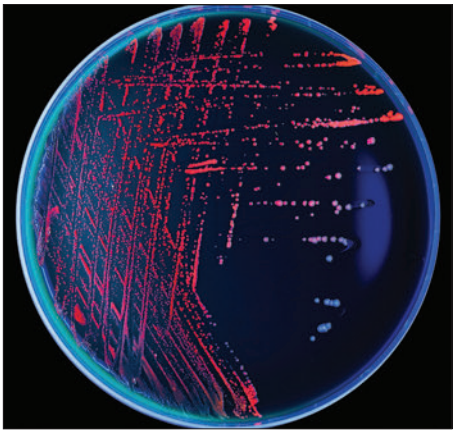
Fast forward 40 years—the Bee Gees are mostly gone, as are my hair and necklace. Ugh. Water is now so much more than a basis of employment and near-death experiences; it is a victim of national mismanagement.

Various news outlets have over the last few months described a water system under stress. A taste of the town includes articles on subjects at once familiar and exotic:

From the familiar/"here we go again" camp:

- **Premise plumbing/*Legionella*—***Legionella* contamination has been linked to multiple deaths in New York. The Illinois Department of Public Health has reported a fourth death from Legionnaires' disease after an outbreak at a western Illinois veterans' home. Six inmates at California's San Quentin prison have been diagnosed with Legionnaires' disease. A pharmaceutical factory is closed in North Carolina due to the bacteria.
- **Drought—**roughly 1,100 U.S. counties face drought risk and water shortages for the foreseeable future.
- **Aging infrastructure—**each year roughly one trillion gallons of fresh water are lost in the U.S. through plumbing leaks and water main breaks. In Los Angeles alone, there are almost 6,800 miles of water mains, of which approximately 435 miles require replacement at an estimated cost of $1.3 billion by 2025.
- **Spills—**the Gold King mine spill resulted in a discharge of more than three million gallons of toxic wastewater into the Animas River in Colorado.

> *We don't have a water crisis, we have a management crisis.*



Source: PathCon Laboratories, Norcross, GA.

Legionella *streak plate.*

From the exotic/emerging camp:

- **Microbeads—***The New York Times* recently reported that tiny plastic pieces of polypropylene or polyethylene that are used in toothpaste and other products have begun showing up in fish tissues. Reportedly, the flesh of many fish is "festooned" with tiny plastic beads.
- **Algae toxins—***The Toledo Blade* reported that a Lake Erie algal bloom producing microcystin toxins is one of the largest in history.
- **Recreational waters—**the *Houston Chronicle* reported a 14-year-old boy's death from the amoeba *Naegleria fowleri*, sometimes referred to as the "brain-eating" amoeba. Death is caused by primary amoebic meningoencephalitis associated with swimming in contaminated surface waters.
- **Cisterns—**rain water collections systems. Who owns that water anyway?
- **Toilet to tap—**technology exists, but society seems reluctant to entertain the idea.
- **Antidepressants in tap water—**yes, and you are likely consuming tiny quantities of Prozac and Effexor.

We don't have a water crisis, we have a management crisis.

And management crises are amenable to intervention. The individual articles crafted by reporters cited above are well written and appropriately characterize the environmental conditions in which their constituencies have an interest. Where they fail spectacularly is connecting the dots. The issues outlined in this column should sober anyone with an

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