Environmental Health

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Volume 81, No. 9 May 2019

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PRESIDENT'S MESSAGE

Vince Radke, MPH, RS,
CP-FS, DLAAS, CPH

ack in the early 1980s, I was director

noise. They identified levels of 55 dB outdoors and

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wash their hands after using the restroom, the duration of hand washing does not reach the recommended time to ensure that hands are effectively cleaned. Berry and coauthors (2014) found that the average time that individuals wash hands after using the restroom was 8.1 s, with the range being 0.52–57.7 s. The Food and Drug Administration recommends that when washing hands, you should:

"(3) Rub together vigorously for at least offered enough statistical power (for = .05, = 0.50, = 78; power = 0.865) to determine the statistical significance noted above.

First, the plates were examined to determine the results (Figure 1). We used microscopic examination to identify cellular morphology and reaction (Figure 2). The bacteria cultured from the unused (control) chips were morphologically similar throughout each plate (Table 1). Bacteria on the unused casino chips consisted of gram-positive bacillus (rodlike) populations on all plates analyzed (Table 2). According to the World Health Organization, , , and are common gram-positive bacteria that colonize human hands. Although gram-positive bacteria colonize the hands to a greater extent than gram-negative bacteria, a greater diversity of bacteria, fungi, and viruses are key features in the human hand microbiome compared to alternative sources of bacterial populations on inanimate objects (Cosseau et al., 2016; Wenzler, Fraidenburg, Scardina, & Danziger, 2016). Although outside the scope of this experimental design, the population of bacteria found on the unused chips might originate from the manufacturing and packaging process rather than direct human contact, thus explaining the low diversity of bacteria present on the surface of the chips.

The blood agar plates containing bacteria from the used chips displayed higher diversity of bacteria and fungi (Table 2). There were roughly 32% fungi and 68% bacteria on each plate. With the use of selective media and coliform media, we detected the presence of , a type of coliform and common food poisoning-related bacterium (Addis & Sisay, 2015). Plates 2, 4, 5, 6, 8, 11, and 12 contained both gram-positive and gram-negative bacillus and gram-negative cocci (spherical-like) bacteria. Furthermore, the identification of gram-negative cocci bacteria on plate 11 suggests the presence of genera , , or , which are causative agents for meningitis, sinusitis, and bronchopneumonia, and can be transmitted by genital-to-hand contamination (Wenzler et al., 2016; Zapka et al., 2011).

The presence of capsular and lipopolysaccharides increases pathogenicity and antiphagocytic qualities suitable for evading the human immune system and can provide genetic diversity for increased multidrug-resistant populations (Arora, Devi, Chadha, & Malhotra, 2009). The differences in bacteria and morphology found is typical of fomites that have been in contact with a multitude of people.

Limitations of the study include genus and species identification of the diverse microbial communities present on used and unused chips using molecular identification, such as DNA sequencing, genomics, or proteomics. Additionally, swabbing might underestimate the total populations on the various surfaces of the chips, because swabbing does not access microbes embedded in the textured layers of the surface. The human hand influences the spread of disease, leaving and picking up microbes with each touch. With the use of standardized methods and increasingly larger studies, we will increase our understanding of the impact of casino chip sanitation on health outcomes.

Of the 78 tests completed, each test produced results that are considered usable for this study. We counted the number of bacteria or fungi colonies that grew in the agar Petri dish. For bacteria, the 78 usable results had a mean of 14.03 colonies and a standard deviation of 7.61 with a range of 1–33 colonies; alternatively, the fungi resulted in a mean of 1.44 colonies and a standard deviation of 1.92 with a range of 0–10 colonies. The test showed a mean of 2.1 colonies and a standard deviation of 3.74 with a range of 0–19 colonies. The coliform test was negative for each case.

The ANOVA results [(1,76) = 43.56, < .001] indicated a statistically significant difference between the amount of bacteria found on used versus unused chips. According to the Bonferroni results, used chips have a higher mean score related to the number of bacteria found than that of unused chips, with a significance of < .01. This study's measure of explained variation, however, shows that 36.43% of the variance in bacteria levels is explained by the differences between used and unused chips. Additionally, the fungi results were also statistically significant [(1,77) = 99.89, < .001], where 56.79% of the variance is explained by the difference between the used and unused chips. Finally, the results were also statistically significant [(1,77) = 92.22, < .001], where 54.82% of the variance is explained by the difference between the used and unused chips.

ANOVA was also performed to determine any differences in the swabbed areas (i.e., obverse, reverse, and edge). The bacteria, fungi, and found were not statistically significant for bacteria [(2,77) = 1.19, > .05], fungi [(2,77) = 0.68, > .05], or [(2,77) = 1.87, > .05]. The variance between the differences in the sections was 3.07% for bacteria, 1.77% for fungi, and 4.74% for .

Finally, the bacteria, fungi, and found on the obverse, reverse, and edge

FIGURE **1**

Sample Blood Agar Plate

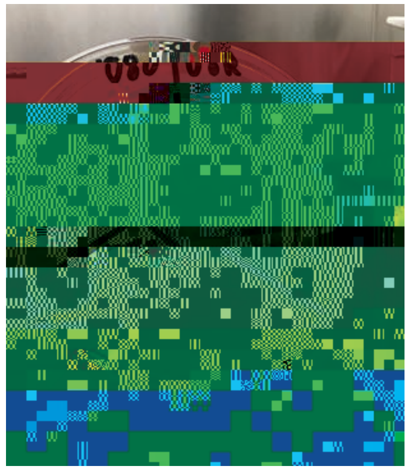
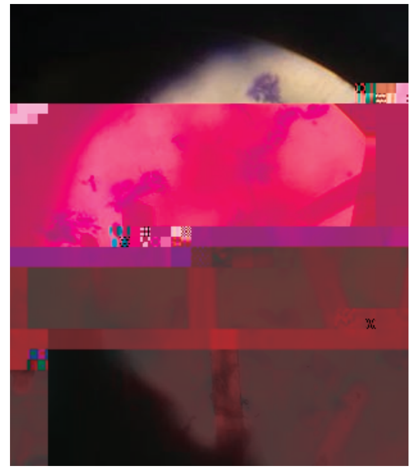


FIGURE **2**

Microscopic Examination



Control (Unused) Casino Gaming Chip Results

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Carbon monoxide (CO) is an odorless, colorless gas released during incomplete combustion of carbon, which is emitted from fuel-burning engines, including those in cars, boats, and generators. Unintentional nonfire-related (UNFR) CO poisonings are among the leading causes of unintentional poisoning deaths in the U.S. (Centers for Disease Conand were also included. Partially de-identified electronic death certificate data, including medical examiner numbers, were obtained from the NYC Department of Health and Mental Hygiene (DOHMH) Bureau of Vital Statistics for the cold-season months (October 1–April 30) during the years 2005–2013.

In NYC, the medical examiner investigates all deaths suspected of being due to an external cause, including CO poisoning. A research agreement with the Office of Chief Medical Examiner (OCME) allowed us to query OCME records for CO cases identified in Bureau of Vital Statistics data. Research assistants abstracted relevant data from medical examiner records into a Microsoft Access database and analyzed the data in SAS version 9.2. We also reviewed OCME documents to ensure the death met the case definition of being nonfire related and unintentional, and for exposure occurring in one of the five NYC boroughs.

We used death certificate data to determine race/ethnicity, sex, age, borough of res-

Source of Carbon Monoxide (CO) and Environmental Risk Factors Among Decedents (*n* = 32), New York City, 2005–2013 (October–April)

The UNFR CO death rate in NYC appears to be lower than national and regional rates. The cold-season death rate in NYC was 0.4 deaths per million. The year-round age-adjusted death rate was 0.49 per million, lower than the year-round age-adjusted Northeast death rate of 0.91 deaths per million and the national rate of 1.46 deaths per million from 1999–2012 (Sircar et al., 2015).

The higher CO poisoning death rates in men that we observed in NYC are consistent with studies in other jurisdictions (Iqbal, Clower et al., 2012). One national study found that nonfatal CO exposures and emergency department visits were more common among women, whereas men were more likely to experience death (Iqbal, Clower, et al., 2012). It is possible that men might be more vulnerable to death because they are more likely to abuse alcohol and substances (Merikangas & McClair, 2012), which could decrease the likelihood that they will recognize early symptoms and remove themselves from the exposure. Men might also have more acute high-level exposure because they could be more likely to work with tools or appliances that emit CO in an occupational setting (CDC, 2007; Iqbal, Clower, et al., 2012). In our study, all work-related exposures (= 7) were among men.

In this study, the risk of fatal UNFR CO poisoning increased with age, also consistent with other studies (CDC, 2007; Sircar et al., 2015). This trend might be because older people are 1) less likely to experience symptoms or 2) unable to recognize early symptoms of CO poisoning, which can be nonspecific (Muo & Gambert, 2015). An increasing prevalence with age of medical comorbidity, especially cardiovascular disease, could make older adults more prone to the effects of CO on the heart. Finally, older adults could be more likely to live in social isolation, resulting in a longer CO exposure and lower likelihood of being found before death.

Coronary artery disease was the clinical condition most associated with death by UNFR CO poisoning. We considered a decedent as having coronary artery disease if it was present on autopsy. Autopsy dissection of coronary arteries showing atherosclerosis, however, might not indicate clinically apparent heart disease during life. Young subjects with no clinical diagnosis of cardiovascular disease might be diagnosed as having atherosclerosis on imaging and autopsy (Tuzcu et al., 2001). Both clinical and subclinical coronary artery disease can increase risk of death from CO poisoning because it makes the victim more susceptible to the effects of hypoxia, as well as to CO toxicity directly affecting the myocardium. In addition, coronary artery disease can predispose exposed people to arrhythmia and other cardiac complications of CO poisoning (Lippi, Rastelli, Meschi, Borghi, & Cervellin, 2012).

Housing stock, transportation, weather, and employment likely all contributed to differences in rates of death between jurisdictions. From 1999–2012, NYC victims of fatal UNFR CO poisoning were somewhat less likely to be exposed at home (44%) than deaths nationally (54%) (Sircar et al., 2015) or in Florida (77%) (Harduar-Morano & Watkins, 2011). In November 2004, NYC passed a law mandating CO detectors in dwellings, which include apartment buildings, single-family homes, and multifamily homes. Our study period occurred after this law was instituted, so it is possible that we were seeing fewer deaths in homes due to CO alarm warnings. A previous study of incidence of CO poisoning in NYC before and after the CO detector law found nonsignificant decreases in hospitalizations and deaths from UNFR CO poisoning after the law; however, the relatively short study period and small number of identified deaths might have limited our ability to detect a significant change (Wheeler-Martin et al., 2015).

In our study, the most common source of CO poisoning was automobile emissions (47%). This result is consistent with national studies that have also found vehicle emissions to be the most common exposure source, most frequently via stationary vehicles (Cobb &cohe oisondsbyjedudperpoison ap03 1 023 rule.weaeT0(e a0homes.)e sources that caused more deaths were, in effect, overcounted.

A strength of this study is the use of medical examiner investigation data to describe the source of CO and the context in which the deceased was exposed, which is information generally not available from death certificates. In addition to CO detector regulations, one of the strategies for prevention of CO exposure is public health messaging to educate the public and at-risk populations about how to protect themselves and avoid exposure. The results of this study can help ensure that public health messaging appropriately emphasizes current risks in NYC. While continued focus on educating the
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JEH

Available to those holding an individual NEHA membership only, the *JEH* Quiz, offered six times per calendar year through the *JournaloEHA*

JEH

1. c	4. b	7. b	10. a
2. d	5. b	8. a	11. a
3. a	6. d	9. c	12. b

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Plastic is widely used in everyday life due to its continuous production in the last 60 years. In the 8-year period from 2008–2016, production of plastic products has sharply increased 37%, from 245 million metric tons in 2008 to 335 million metric tons in 2016 (Lithner, Larsson, & Dave, 2011; Plastics Europe, 2017). One of the most frequent uses of plastics is in packaging, storing, and serving food and beverages. Plastic products, in all stages of their life cycle, occupy almost every aspect of our lives and we tend to neglect their potential harmful impacts to our health and the health of our environment (Lithner, Damberg, Dave, & Larsson, 2009).

The most important organic substances that can be released from plastic consumer products are styrene, 1,3-butadiene, melamine, formaldehyde, acrylamide, di-2-ethylhexyl phthalate, di-2-ethylhexyl adipate, vinyl chloride, and bisphenol A (Durusoy & Karababa, 2011). These substances are endocrine disrupting and have carcinogenic effects (Durusoy & Karababa, 2011). The aforementioned substances can be released into food or beverages depending on the chemical characteristics of the plastic or food/beverage; tempera-

Monteiro, 2012; Genualdi, Nyman, & Begley, 2014; Linssen, Janssens, Reitsma, & Roozen, 1991; Miller, Newhook, & Poole, 1994; Paraskevopoulou, Achilias, & Paraskevopoulou, 2012). Styrene has been reported in yogurt, cream, salad, soft cheese, margarine, hot and cold beverages, fresh and cooked meat, candied fruit, and fast food packed in polystyrene (Miller et al., 1994).

The standard method for detection and quantification of those compounds is gas chromatography with mass spectrometry (GC-MS) (Garrigós, Marín, Cantó, & Sánchez, 2004; Kusch & Knupp, 2002). This analytical method is considered to be the gold standard but it is quite expensive, time-consuming, and requires the use of harmful solvents during sample preparation. Therefore, for this feature, we attempted a new way to detect styrene: spectral fluorescence signature (SFS). SFS is widely used in research on phytoplankton (Babichenko, Leeben, Poryvkina, van der Wagt, & de Vos, 2000; Kaitala, Babichenko, Poryvkina, & Leeben, 1994) and dissolved organic matter (Babichenko, Kaitala, Leeben, Poryvkina, & Seppälä, 1999). Fluorescence spectrometry is a standardized method (ASTM International, 2012) with great potential, as recognized by the International Council for the Exploration of the Sea (Ariese, Beyer, Jonsson, Porte, & Krahn, 2005).

According to the available literature, SFS has not been used for the determination of styrene released from plastic consumer products. In previous studies, SFS was validated for the determination of organic compounds using GC-MS as the gold standard; the matching of the finding was >99% (Ferretto et al., 2014; Poryvkina, & Babichenko, 2010). There is also evidence that SFS is comparable with GC-MS in interlaboratory proficiency testing (i.e., produced satisfactory -scores) (Kammann et al., 2013). As a fast and inexpensive method that does not require the use of harmful solvents, SFS could be of great value in the area of styrene detection and quantification.

With these considerations, we tried to demonstrate the value of SFS in the determination of styrene as a product of polystyrene's release.

We looked at plastic consumer products made of polystyrene (cups for serving hot and cold beverages, containers for the delivery of food, and containers for storing food and drinks). We purchased from a local market Styrofoamsa87Tw (onescTc -0.6Tw [ )70duscT

µg/L. For comparison, the linearity of headspace gas chromatography with flame ionization detection (HS-GC-FID) was 5.0–750.0 µg/L (Hansson & Hakkarainen, 2006) and for online solid-phase extraction liquid chromatography with diode array detector (SPE-LC-DAD) linearity was 10.0–1000.0 µg/L (Saim, Osman, Sabian, Zubir, & Ibrahim, 2012).

During our research, we established that for the SFS method ranged from 0.84–3.7% depending on the measured concentrations. This finding is similar to other methods: for gas chromatography, the had been found to be 3% (Hansson & Hakkarainen, 2006) and in the range of 2.4–9.3% (Lin, Song, Fang, Wu, & Wang, 2017), while liquid chromatography has been found to be 5.3% (Gennari et al., 2012) and in the ranges of 2.1–3.3% (Saim et al., 2012) and 0.1–0.3% (Moradi, Kiarostami, & Amini, 2017).

As for our measured results, the range in cups and food containers for hot water depending on the time of exposure was 1.45–9.95 µg/L and for room temperature water was 0.10–2.78 µg/L. Results obtained in previous studies (Ahmad &

we used pure polystyrene plastics and only distilled water, which has a spectrum that is characterized by a hardly visible fluorescence organic matter band. Also, our results might be limited in that we used samples randomly

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FIGURE **1**

Free Laminated Pool Chemical Safety Poster Available in English and Spanish

and enforcement. To minimize the risk of these injuries, pool chemical safety training (Figure 1) should be included in operator training and provided to any aquatics staff involved in storing or handling pool chemicals. Additionally, preventing unauthorized access to chemical storage spaces, exhausting air from these spaces at rates that help protect occupant health and safety, and providing eyewash stations in these spaces can minimize the risk of pool chemical injuries or at least their severity. To specifically minimize risk of toxic chlorine gas events, the chemical (chlorine and acid) feed should be deactivated if there is no or low water flow in the recirculation system.

These examples of preventive education and engineering measures are recommended in the Model Aquatic Health Code (MAHC, www.cdc.gov/mahc). The MAHC's overarching objective is to prevent illness and injuries associated with public treated recreational water venues (i.e., pools, hot tubs/spas, and water playgrounds), which it does through providing recommendations based on the latest science or best practices. State and local jurisdictions, depending on their individual needs, can voluntarily adopt all or part of the MAHC. Because the MAHC provides prevention recommendations in its chapters on design and construction, operation and maintenance, and policy and management, recommendations to prevent a specific illness or injury can appear in multiple MAHC chapters.

State and local environmental health colleagues have reported that it can be difficult to find all the relevant MAHC code and supporting annex rationale language. In response, the Centers for Disease Control and Prevention is developing Mini-MAHCs. Mini-MAHCs are concise documents that aggregate MAHC code and annex language on a specific public health issue. One Mini-MAHC

necessary in brownfield and land reuse site assessment and redevelopment.

BROWN is a multisector land reuse collaboration that provides free consultation to communities with concerns about contaminated properties. BROWN includes representatives from ATSDR, U.S. EPA, other federal agencies, NEHA, state and local health agencies, environmental consultants, and academia. One key goal of BROWN is to support environmental health education that is geared towards health agencies. For example, BROWN provided input into ATSDR's Environmental Health Resource Self Learning Modules—Epidemiology, Land Reuse Sites, Risk Assessment, Risk Communications, and Toxicology—that are available at www.atsdr.cdc.gov/sites/brownfields/for_health_agencies.html#LearningModules. This collaboration ultimately resulted in a survey developed by NEHA to assess LHD staff skills in environmental health and to gauge the effectiveness and potential impact of the modules. In another collaboration, we created a 3-part short video series, Engaging Health Departments in Brownfields/Land Reuse Redevelopment, that highlights ways that health agencies can promote and build capacity to become involved in land reuse/brownfields work (www.atsdr.cdc.gov/sites/brownfields/videos.html).

In June 2015, ATSDR held an in-person focused discussion with BROWN members to collect input on

The NEHA survey had 109 respondents, of which 93 (85%) indicated that they currently worked in a health department and 85 (91%) responded to survey questions pertaining to their health department (Table 2). The majority of respondents (68%) indicated that they worked in relatively small LHDs (1–24 employees). Approximately 53% of the survey participants indicated servicing a rural area, 20% a suburban area, and 19% a mixture of rural, urban, suburban, or territorial areas.

The level of education or the type of activities requested did not differ among different service areas (see supplemental tables at www.neha.org/jeh/supplemental). The level of education, however, varied with how often services were requested of LHDs in risk communication, risk assessment, toxicology, epidemiology, and land reuse/brownfields (Figure 1). Of the respondents who performed tasks within the five areas, a range of 5–75% of LHD employees had no formal training. Only 4 of 85 respondents performed toxicology tasks, of which 75% had no formal training. Among LHD respondents who indicated working on land reuse/brownfields issues, almost 75% indicated having either no formal education (e.g., college-level classes) or only continuing education courses related to land reuse/brownfields.

On the last question of the survey, 29 respondents indicated interest in testing the draft ATSDR Environmental Health Resource Self Learning Modules. NEHA randomly contacted a subset of nine individuals and three provided feedback. Their feedback indicated that the learning modules ranged from somewhat to very useful and would be useful for increasing their capacity in environmental health and land reuse.

ATSDR updated the Environmental Health Resource Self Learning Modules to reflect the changes suggested by BROWN members. The survey conducted by NEHA provided valuable insight as to the capacity and education attained among those working on important community environmental health issues. The survey results indicated mixed levels of training completed by LHD staff in five different areas of environmental health

National Environmental Health Association Local Health Department Survey Participant Characteristics (*n* = 85)

Characteristic	# (%)

(Figure 1). Feedback on the use of the learning modules, while limited to only three LHD survey respondents, was positive and indicated that the modules were useful for providing knowledge about an unfamiliar topic and giving LHD personnel confidence to increase their skills in specific environmental health topics pertaining to land reuse.

As awareness of brownfields and land reuse sites increases, opportunities to engage LHDs increases. LHD staff, with their proximity to communities, can ensure the safe reuse of land and assessment of potential exposures to contaminants associated with brownfields and land reuse sites. Through BROWN, ATSDR, U.S. EPA, NEHA, and other partners intend to collaborate with other stakeholders to continue to help build capacity of LHDs to engage in environmental health and land reuse work.

One outcome is a newly developed ATSDR–NEHA Environmental Health and Land Reuse (EHLR) Certificate Program that will be completed in late spring 2019 and will subsequently be available as free training for environmental professionals, such as those in LHDs, to further increase their understanding of and skills in environmental health and land reuse. Participants who successfully complete the training will be eligible for continuing education credits from ATSDR and a Certificate of Completion in EHLR issued by NEHA. Ultimately, we hope all the tools and resources geared towards educating LHDs in environmental health and land reuse lead to increased abilities to perform a range of environmental health services and improved overall public health in local communities.

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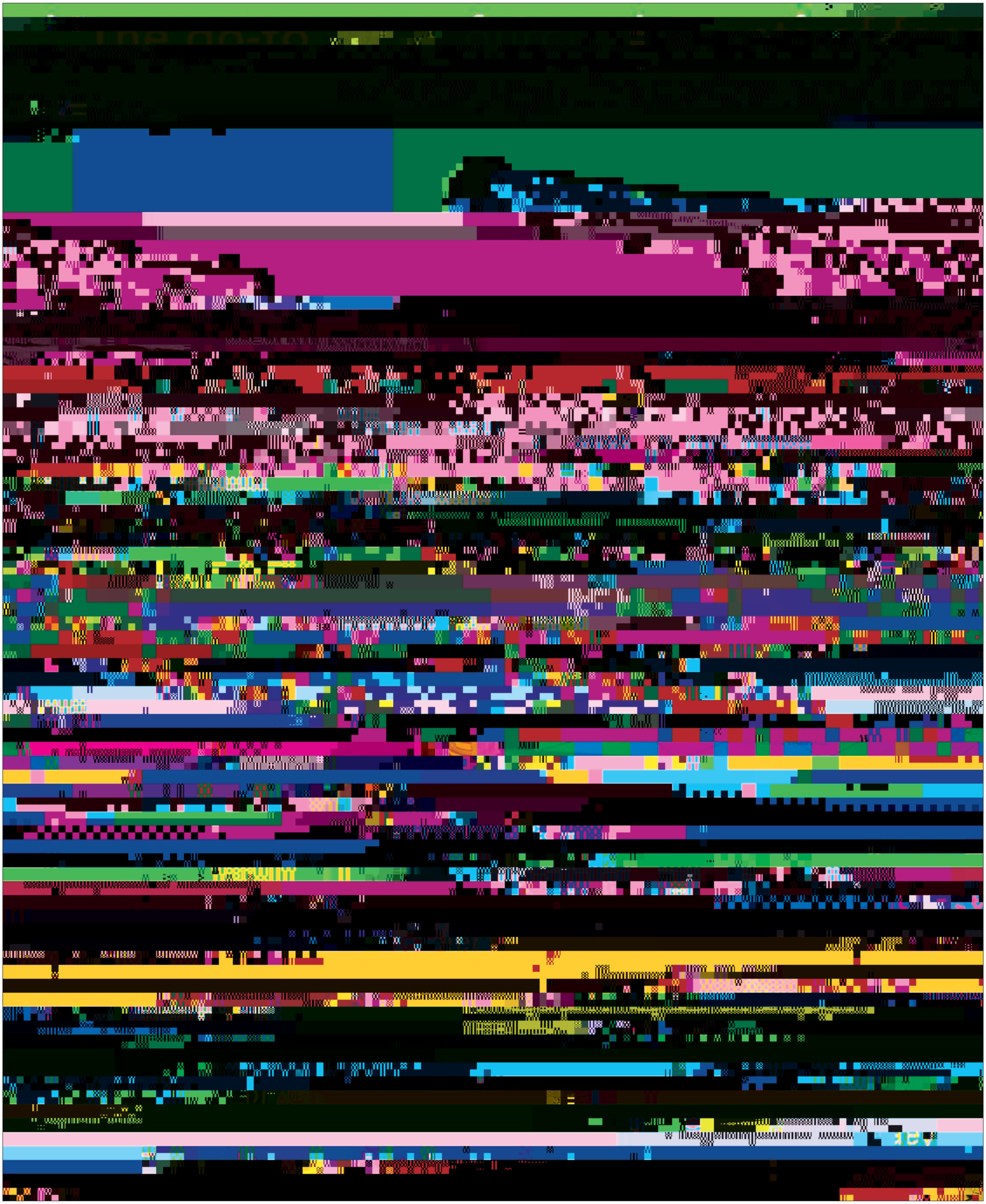

SPECIAL

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directors in large urban centers and influential jurisdictions. These respected professionals are NEHA members. I contend there are three attributes that make us natural leaders.

First, many of us have cultivated political savvy as a function of our jobs. We weave, bob, and broker conversations among the regulated community and elected officials. We understand the concerns of families and the public at large.

Second, we literally speak the language of our local constituents. How else could we effectively communicate expectations around compliance and best practice? In fact, I float the proposition that Darwinian forces, once applied, result in environmental health directors that excel in communication. We know how to work with our constituents and understand what motivates them.

Third, we spend most of our time in our business and regulated communities, not in an office. Most of us are detailed oriented. We generally have strong science educations. We know where the environmental risk factors exist in our regions. Who else would you want in the room if resource and personnel decisions need to be made to protect and promote the public's health? I'd want an informed, educated, and experienced leader.

[illegible]

Ladies and gentlemen, I hear this sentiment frequently, particularly in federal government circles. For example, environmental health is not specifically mentioned in the existing version of the Pandemic and All-Hazards Preparedness Act. Currently there is a notable absence of a Public Health Emergency Preparedness environmental health capability. It would seem at first blush from the national perspective that there is no role for us. Of course, this is patently untrue at the local level.

Who makes decisions about reoccupancy of smoke-damaged homes adjacent to wildfires? Who assists 20% of the public who use decentralized water sources after localized floods? When is the day care facility safe

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HealthSpace CS Pro helps