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Thirdhand Exposure to Methamphetamine Syndrome

Symptoms Resulting From Environmental Exposure to Methamphetamine Contamination

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ABOUT THE COVER

Thirdhand exposure to methamphetamine occurs through contact with environments that have become contaminated during the manufacture or use of the substance. This exposure is a serious emerging public health concern and can cause adverse health effects in unwitting residents, particularly children. This month's cover article, "Thirdhand Exposure to Methamphetamine Syndrome: Symptoms Resulting From Environmental Exposure to Methamphetamine Contamination Arising From Manufacture or Use," explores the symptoms and current situation related to thirdhand exposure to methamphetamine, proposes a term to be used to describe the syndrome to facilitate the coordination of research, and provides recommendations for environmental health professionals.

See page 20.

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PRESIDENT'S MESSAGE

Tom Butts, MSc, REHS

Environmental Health—What Can't We Do?

Environmental health/environmental public health refers to the branch of public health that focuses on understanding how environmental factors can affect human health and well-being. It involves assessing, mitigating, controlling, and preventing environmental hazards that can have adverse effects on individuals or communities.

Environmental health considers factors, including air quality, water quality, food safety, sanitation, waste management, hazardous substances, occupational health, and the overall built and natural environments we all work and live in. It aims to identify and mitigate potential health risks associated with these factors.

Practitioners can conduct research, monitor and assess environmental conditions, develop and implement policies and regulations, provide education and outreach, and collaborate with other sectors to address environmental health issues. The ultimate goal is to protect and improve public health by minimizing or eliminating environmental risks and promoting environmental sustainability.

The specific roles within the environmental public health workforce can include environmental health officers, public health inspectors, epidemiologists, toxicologists, occupational health specialists, environmental scientists, environmental engineers, sanitarians, and policy analysts, among others. Each role contributes to different aspects of environmental health, but all are important to recognize.

As I think about the importance of the work done on a daily basis, I often think about how closely environmental health is aligned with Maslow's hierarchy of needs. Maslow's hierarchy of needs is a psychological theory that suggests humans have a set of hierarchical needs that must be met to reach their full potential and achieve self-actualization.

> *The environmental health practice continues to evolve as challenges and opportunities emerge in the ever-changing landscape.*

At the base of Maslow's hierarchy are physiological needs, which include basic requirements for survival such as food, water, shelter, and sleep. Environmental health plays a critical role in ensuring access to clean air, safe drinking water, safe food, adequate sanitation, and proper waste management. By addressing these foundational issues, environmental health directly contributes to meeting the physiological needs of individuals.

Moving up the hierarchy, the next level consists of safety needs, including personal and environmental safety, protection from hazards, and access to healthcare services. Environmental health professionals work every day to identify and mitigate environmental risks such as exposure to pollutants, hazardous substances, or unsafe working conditions. By promoting safe and healthy environments, we contribute to fulfilling the safety needs of individuals.

The third level in the hierarchy is the need for love and belonging, which encompasses social connections, relationships, and a sense of community. Environmental health is often called on by community members when no one else has responded and can foster community engagement, collaboration, and awareness. We create opportunities for people to come together and address shared environmental concerns. By promoting a sense of belonging and cooperation, environmental health efforts contribute to fulfilling social needs.

The fourth level of Maslow's hierarchy is the need for esteem, which involves feelings of achievement, recognition, and self-worth. Environmental health work can contribute to enhancing self-esteem by empowering individuals to take control of their environment, make positive changes, and participate in decision-making processes related to their communities.

At the top of the hierarchy is self-actualization, which refers to achieving one's full potential and personal growth. While environmental health might not directly address self-actualization, it can support creating the necessary conditions for individuals to focus on higher-level needs by ensuring a foundation of physiological well-being, safety, social connections, and self-esteem.

As I reflect on the important role the profession has in our communities, it is also imperative to recognize the continual changes in environmental public health practice, often dictated by national or international events. It

is apparent to me that many of us have worked through a number of both unexpected and predictable changes. These instances have likely created some long days and sleepless nights as we worked to address these challenges while we struggled to maintain the important programs and activities that protect community members and must not be cast aside. Our plates runneth over.

Increased Awareness and Concern: Over the past three decades, there has been a notable increase in public awareness and concern about environmental issues such as air and water pollution, new diseases and vectors, climate change, and many more. The accessibility of information (validated or not) often brings new issues to community activists and the media that in turn must be addressed. These changes have led to a greater demand for action from governments, businesses, and individuals.

Advancements in Technology and Data Analysis: Environmental health practitioners now have access to advanced technologies and tools for data collection, monitoring, and analysis (if we can afford them or if our agency leaders empower us to access them). GIS, remote sensing, and big data analytics have revolutionized the way food safety and environmental data are gathered and used for decision making. The affordability and access to various air and water quality measuring devices make citizen science efforts more and more common. Artificial intelligence (AI) is poised to have a big impact on environmental health practices, too.

Focus on Climate Change: Climate change has emerged as one of the most critical environmental challenges of our time. Environmental health professionals are increasingly focusing on understanding the health impacts of climate change, such as extreme weather events, changing disease patterns (e.g., locally transmitted malaria in Florida), and the health consequences of rising temperatures. Environmental health staff are often part of community teams that develop climate action and mitigation plans, as well as have a role in the planning of cooling centers.

Health Impact Assessments: Health impact assessments (HIAs) have become more prevalent in environmental health practice. HIAs evaluate the potential health effects of proposed policies, projects, or developments, helping decision makers to make informed choices that consider public health implications. HIAs can be powerful tools to address social determinants of health.

One Health Approach: The concept of One Health has gained traction, recognizing the interconnection between human health, animal health, and the environment. Environmental health practitioners are collaborating with professionals in other disciplines, such as veterinarians and ecologists, to address health challenges holistically.

Environmental Justice: There is again growing recognition of environmental injustices, where vulnerable and marginalized communities bear a disproportionate burden of environmental hazards. Environmental health practitioners are increasingly advocating for equity and justice in environmental decision making and policy implementation.

Regulatory Changes: Environmental regulations have evolved over the last 30 years to address what science has identified as risks to our health. Stricter and new environmental standards and regulations have been implemented to protect public health. The focus on per- and polyfluoroalkyl substances (PFAS) is the most recent example that affects drinking water and so much more.

Global Issues: Environmental health is increasingly recognized as a global issue that requires international collaboration. The global food supply system is a great example.

Response and Recovery: Environmental health professionals were called on to assume many new roles during the COVID-19 response. Those roles ranged from enforcement to technical assistance as we learned to adapt to the best science available. These roles in recovery from natural disasters are not new, but as disasters are larger and more frequent there is also a larger demand for time and staff.

Environmental public health professionals must continually build their knowledge and be agile in responding to unique circumstances and changing priorities. The environmental health practice continues to evolve as challenges and opportunities emerge in the ever-changing landscape.

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Persistence and Transfer of Enveloped Phi 6 Bacteriophage on Hotel Guest Room Surfaces

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Abstract **The hotel guest room environment can be contaminated through touch or aerosols and become a source of viral transmission. Understanding the extent of respiratory virus survival and persistence on hotel guest surfaces can help the lodging industry develop an effective cleaning and disinfecting strategy and focus on hot spots. This study investigated the survival and persistence of enveloped phi 6 bacteriophages (a surrogate of SARS-CoV-2) on hotel guest room surface coupons for 30 days at 23 ± 2 °C and determined the transfer rate between fomites and hands.**

This study showed that phi 6 persisted for up to 2 days on the carpet, hotel room curtain, and leather coupon samples. Phi 6 persisted for up to 3 days on hotel room beds, wooden desks, door handles, and hotel amenities and up to 4 days on light switches, remote controls, and bathroom faucets. When a high level of phi 6 (10^7 PFU/ml) was used, the transfer rate from hands to surfaces ranged from 23% to 58% and the transfer rate from fomites to hands ranged from 50% to 74%. With a low level of phi 6 (10^3 PFU/ml), the transfer rate from hands to surfaces ranged from 14% to 38% and the transfer rate from fomites to hands ranged from 20% to 45%. The results revealed that phi 6 could be transmitted via hotel room surfaces. Our study results can be used as a tool to design robust and effective training strategies for the lodging industry.

Introduction

The coronavirus (COVID-19) disease emerged in Wuhan, China, in 2019 and has spread worldwide to reach all countries (Shereen et al., 2020; Suman et al., 2020). The spread of the COVID-19 pandemic has dramatically affected global economic and social life. The hospitality industry, in particular the hotel industry, has been the hardest hit by this pandemic due to government lockdowns and social distancing requirements (American Hotel & Lodging Association [AHLA], 2020a; Ocheni et al., 2020). Revenue in the U.S. hotel industry in 2020 fell by nearly 50%, largely due to the low occupancy nationally (AHLA, 2021).

COVID-19 is a severe respiratory infection caused by the SARS-CoV-2 virus (World Health Organization, 2020); SARS-CoV-2 is transmitted by an infected person breathing out droplets or aerosols that contain the virus that land on the eyes, nose, or mouth of other people (Centers for Disease Control and Prevention [CDC], 2022). Indirect transmission via contaminated surfaces, however, can also occur and could become the source of infection (Castaño et al., 2021). Studies have demonstrated that SARS-CoV-2 can be transmitted via contaminated surfaces and cause infection (Arav et al., 2021; Santarpia et al., 2020). In their review, Kampf et al. (2020) conclude that respiratory viruses—such as severe acute respiratory syndrome (SARS) coronavirus, Middle East respiratory syndrome (MERS), or endemic human coronaviruses (HCoV)—have the ability to persist and stay viable on inanimate surfaces (i.e., metal, glass, plastic) for days, indicating that surfaces could be a potential source of infection (Duan et al., 2003; Rabenau et al., 2005).

In the context of the lodging industry, hotel guest room surfaces usually are subject to frequent human contact and touching (Park et al., 2019). Therefore, hotel rooms should be considered at high risk of being contaminated by touch or aerosols and becoming a source of transmission of viruses, such as SARS-CoV-2 (Park et al., 2019). Previous studies have shown that hotel room cleanliness is heavily based on visual observations by cleaning staff and the bioburden on surfaces is not taken into consideration (Almanza et al., 2015a, 2015b). These studies highlighted a lack of testing standards currently for hotel room sanitation. While visual cleanliness is important, it does not ensure protection of infection from pathogens.

Hotels and cruise ships have been associated with multiple viral outbreaks. During the SARS outbreak of 2003, the original virus source in Hong Kong was traced to an infected individual who was staying at a local hotel. The virus infected six additional travelers at the hotel before it spread further to other parts of Asia (Chien & Law, 2003). In November 2020, 33 cases of COVID-19 occurred at a quarantine hotel in Australia caused by an

infected traveler from the UK (Leong et al., 2021). In another example, the Diamond Princess cruise ship outbreak resulted in 696 COVID-19 cases in February 2020 (Expert Taskforce for the COVID-19 Cruise Ship Outbreak, 2020). Since 2000, there have been several incidents of acute respiratory illness outbreaks caused by the influenza virus on cruise ships (Brotherton et al., 2003; CDC, 2001; Fernandes et al., 2014).

Cleaning and efficient housekeeping have become even more essential for the hotel industry to provide further assurance to guests (Pillai et al., 2021). In response to the pandemic, many major hotel chains implemented new safety and cleaning strategies such as increased use of technology (e.g., remote check-in, contactless ordering in restaurants), noncontact sanitizers, and partnerships with industry and academic experts (Four Seasons, 2020; Hilton, 2020; Marriott International, Inc., 2022). Additionally, Zemke et al. (2015) showed that guests are willing to pay more if the hotel has disinfecting programs and shows that the guest rooms receive sufficient cleaning.

For the purposes of our study, phi 6 bacteriophages were used as a surrogate for the SARS-CoV-2 virus. Phi 6 is an enveloped virus that poses similar characteristics to respiratory viruses (Aquino de Carvalho et al., 2017; Turgeon et al., 2014) and has been validated as a suitable surrogate for coronaviruses for environmental investigation (Bailey et al., 2022; Franke et al., 2021; Serrano-Aroca, 2022). In addition, as a Biosafety Level 3 laboratory is required for use of the SARS-CoV-2 virus (Turgeon et al., 2014), the use of phi 6 allows for replication studies to be conducted without these extra protections.

The objectives of our study were to understand the extent of respiratory virus survival and persistence on hotel guest surfaces and evaluate the transfer rate between hands and high-touch surfaces to help hotel management develop better cleaning and disinfecting strategies of contamination hot spots.

Methods

Reagents and Coupons

All media and reagents were purchased from VWR. The bed, carpet, and hotel amenities were provided by a national hotel chain. Light switches, door handles, TV remote controls, room curtains, leather, bathroom faucets, and stainless-steel coupons were purchased from local retail stores. Samples were chosen based on use in previous hotel microbiological studies (Park et al., 2019; Zemke et al., 2015).

Bacteriophage and Host

Pseudomonas syringae (host) and phi 6 were provided by the Centers for Disease Control and Prevention. The host was cultivated on tryptic soy agar (TSA) and grown in tryptic soy broth (TSB). To prepare the phi 6 stock solutions, propagated phi 6 was suspended in TSB at concentrations of approximately 8 to 10 log PFU/ml. We prepared and stored working stocks of phi 6 at 4 °C, streaked *P. syringae* on the TSA plate using a plastic inoculation loop from a previously prepared TSA slant, and the plates were incubated for 18 hr at 22 °C. After overnight incubation, a single colony of *P. syringae* was taken and inoculated in a 250-ml flask containing 50 ml of TSB using a plastic inoculated needle; the flask was then placed in a shaking incubator for 18 hr at 22 °C.

After incubation, the density of the culture was determined using a spectrophotometer (Spectronic 20D, Thermo Fisher Scientific). The density of the culture was set to optical density (OD550) wavelength to achieve absorbance between 0.5 and 0.8 on the spectrophotometer. After preparing a host, 1 ml of room temperature (23 ± 2 °C) TSB was added to the tube containing the lyophilized phi 6 and vortexed for 1 min, followed by the addition of 500 µl of the rehydrated phi 6 to 50 ml of TSB in a 250-ml flask, followed by the addition of 100 µl of overnight growth of *P. syringae* (host) to the flask containing the virus. The flask containing TSB, the virus, and *P. syringae* was placed in a shaking incubator for 18 hr at 22 °C.

Purification of Phi 6 Stock

The phi 6 was purified using a 0.22 µm PVDF filter that was attached to a sterile needle-less Millipore SLGV033RS 60 cc syringe. After pulling the plunger out from the syringe, 15 cc of the overnight culture was pipetted into the syringe barrel. The plunger was replaced, the syringe filtered out any bacterial debris, and the phi 6 was dispensed into a sterile polypropylene tube (i.e., centrifuge tube). All procedures were performed inside a biosafety cabinet.

Plaque Assay

Plaque assays were performed to identify the concentration of phi 6 for filtrate phi 6 bacteriophages. Next, 10-fold serial dilutions of the phi 6 filtrate were made in 0.02% phosphate buffered saline (PBS) and Tween (PBST, 100 ml of PBS + 0.02% Tween 20) buffer. The remaining filtrate was stored in a refrigerator at 4 °C for later use after wrapping tubes with aluminum foil to protect the phi 6 from light. Next, 1 ml of the diluted phi 6 was mixed with 100 µl of overnight cultures of *P. syringae*. The mixture was added to a tube containing 3 ml of prewarmed (45–50 °C) TSB soft agar. The soft agar with host and phi 6 was mixed quickly, poured onto TSA plates, and tilted by hand to evenly distribute the soft agar on top. The plates were left to dry for 30 min, inverted, and incubated for 24 hr at 22 °C. After incubation, the plaque-forming units were quantified.

Persistence Experiment

Before the start of the experiment, all items were cut into either square 5 x 5 cm or 10 x 10 cm coupons, depending on the item. Coupons were sterilized using either an autoclave for 15 min at 121 °C or by using 70% ethanol. The inoculum was prepared by adding 5 ml of phi 6 stock to 45 ml of 0.02% PBST buffer (10^8 PFU/ml). To inoculate, each coupon surface was spot-inoculated with 0.2 ml of inoculum, and L-shaped spreaders were used to distribute the phage on the surfaces evenly. The coupons were air-dried for 1 hr at room temperature (23 ± 2 °C). Alongside the drying process time, TSA soft agar tubes were prepared for overlay by melting prepared TSA soft agar in a 48–50 °C water bath.

After drying time, two samples from each surface were taken and placed in a stomacher bag containing a 45 ml or 90 ml of virus buffer (0.02% PBST) and homogenized for 2 min. Next, 10-fold dilutions were made and 1 ml from each dilution and 100 µl of the overnight host were added to one melted and tempered soft (3 ml) TSA agar overlay tube and poured onto a TSA plate. Each TSA plate was tilted to ensure that the overlay mixture completely coated the plate. The plates were allowed to solidify inside the biosafety cabinet for 30 min before being inverted and placed for 18–24 hr at 22 °C in an incubator. The sterile phage buffer (no phi 6) plates were prepared and used as negative control plates to test for potential contamination.

TABLE **1**

Survival and Persistence of Phi 6 on Hotel Guest Room Surfaces

Day	Mean and Standard Deviation of Log PFU/cm² for Each Surface [a]									
	Bed	Carpet	Desk	Light Switch	Door Handle	Remote Control	Room Curtain	Hotel Amenities	Leather	Bathroom Faucet
1	3.5 ± 0.2	3.0 ± 0.4	3.3 ± 0.6	3.2 ± 0.2	3.8 ± 0.2	3.5 ± 0.3	2.5 ± 0.4	3.1 ± 0.9	2.8 ± 0.5	3.8 ± 0.3
2	2.2 ± 0.3	1.5 ± 0.1	2.0 ± 0.4	1.9 ± 0.4	2.2 ± 0.3	2.0 ± 0.3	1.2 ± 0.2	1.9 ± 0.4	1.3 ± 0.1	2.5 ± 0.2
3	1.1 ± 0.4	0.5 ± 0.3	1.3 ± 0.1	1.3 ± 0.3	1.4 ± 0.1	1.4 ± 0.3	ND ± 0	1.0 ± 0.3	0.4 ± 0.2	1.3 ± 0.1
4	ND ± 0	ND ± 0	0.7 ± 0	1.0 ± 0.1	0.7 ± 0.2	0.9 ± 0.3	ND ± 0	0.5 ± 0.2	ND ± 0	0.9 ± 0.4
7	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0.1	ND ± 0	ND ± 0	ND ± 0	ND ± 0	0.4 ± 0.2
10	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
13	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
16	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
19	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
22	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
25	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
28	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0
30	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0	ND ± 0

[a] Mean and standard deviation of phi 6 survival on each hotel guest room surface over 30 days ($N = 6$).

Note. The greatest reduction of phi 6 occurred within the first 2 days postinoculation. ND = none detected.

After incubation, plates were counted and plaques were recorded as PFU/cm². The above sample plating procedures were carried out on days 1, 2, 3, 4, 7, 10, 13, 16, 19, 22, 25, 28, and 30 for each of the three biological replicates and under similar experimental conditions.

Simulation Study

A simulation experiment was carried out to determine the ability of phi 6 to transfer from contaminated hands to hotel room surfaces and identify potential cross-contamination from contaminated hotel room surfaces (fomites) to hands. Two different scenarios were done using high and low phi 6 concentrations (high level = approximately 10^7 PFU/ml; low level = approximately 10^3 PFU/ml) in two experimental settings, three biological replicates, and with duplicate samples for each replicate.

Scenario 1: Cross-Contamination From Inoculated Hands With High or Low Level Phi 6 to Hotel Room Surfaces

In the first scenario, hands were inoculated with 0.2 ml of the phi 6 suspension (10^7 PFU/ml or 10^3 PFU/ml) and held at room temperature (23 ± 2 °C) for 30 min to dry to facilitate attachment. The investigator used the contaminated hand to touch for 20 s each coupon surface: bed, carpet, hotel amenities, light switch, door handle, TV remote control, room curtain, leather, bathroom faucet, and stainless-steel coupons. Next, each coupon was placed in a stomacher bag and mixed for 2 min. Each item then underwent microbiological analysis.

Scenario 2: Cross-Contamination From Inoculated Hotel Room Surfaces With High or Low Level Phi 6 to Hands

For the second scenario, each hotel room surface was inoculated with 0.2 ml of phi 6 suspension (10^7 PFU/ml or 10^3 PFU/ml). The items were left to dry for 1 hr. During the drying time, hands were washed for 30 s using soap and warm water (40 °C). The washed hands were dried using paper towels, sprayed with 70% ethanol, and allowed to air dry. Next, the index finger (primary transfer) of each hand touched the contaminated hotel room surfaces for 20 s.

Samples from the hands were collected using the glove-juice method (Larson et al., 1980; Sirsat et al., 2013) with brief modifications as detailed. The index finger from each hand touched the contaminated surfaces for 20 s, and then the hand was inserted into a sterile surgical glove containing 1 ml of sterile 0.02% PBST virus buffer in the index finger section. The hand with a glove on was vortexed for 60 s. The sample was then transferred from the glove index finger region to a sterile 10-ml conical tube using a sterile pipette. The sample underwent further dilution and viability plate count analyses.

For both scenarios, the viability assay was performed by adding 1 ml from each collected sample (either after contaminated hands touched clean hotel room surfaces or clean hands touched contaminated hotel room surfaces), and a 100 µl of overnight host was added to a tube containing 3 ml of soft TSA, shaken by hand, and quickly poured onto TSA plates. The plates were allowed to solidify and then incubated for 24 hr at 22 °C. After incubation, the plaques were counted and recorded as PFU/cm².

Statistical Analyses

The plaque-forming units from all experiments (persistence and simulation) were converted to

TABLE **2**

Transfer Rate of Phi 6 From Hands to Hotel Guest Room Surfaces

Surface	Log and Transfer Rate With High Level Inoculation (10^7 PFU/cm^2)		Log and Transfer Rate With Low Level Inoculation (10^3 PFU/cm^2)	
	Log PFU/cm^2 [a]	Transfer Rate [b] (%)	Log PFU/cm^2	Transfer Rate (%)
Hands to				
Bed	1.9 ± 0.2	44	0.5 ± 0.4	24
Desk	2.5 ± 0.3	58	0.8 ± 0.3	38
Light switch	1.5 ± 0.1	35	0.7 ± 0.3	33
Door handle	2.2 ± 0.4	51	0.6 ± 0.3	29
Remote control	1.9 ± 0.3	40	0.3 ± 0.1	14
Room curtain	1.3 ± 0.2	30	0.3 ± 0.1	14
Hotel amenities	1.5 ± 0.3	35	0.4 ± 0.2	19
Leather	1.0 ± 0.2	23	0.3 ± 0	14
Bathroom faucet	2.4 ± 0.1	56	0.6 ± 0.3	29

[a] Mean and standard deviation of phi 6 from inoculated hands (10^7 or 10^3 PFU/cm^2) to hotel guest room surfaces after hands touched each surface for 20 s ($N = 6$).

[b] The transfer rate of mean and standard deviation of phi 6 from inoculated hands (10^7 or 10^3 PFU/cm^2) to hotel guest room surfaces after hands touched each surface for 20 s ($N = 6$).

log 10; the survival rate curve was constructed using Microsoft Excel. For the cross-contamination analysis, means and standard deviations of log PFU/cm^2 were calculated. We calculated the transfer rate (%) following the formula obtained by Lopez et al. (2013):

Percent transfer rates = (log PFU/cm^2 of phi 6 on recipient surface / log PFU/cm^2 of phi 6 on the original surface) × 100

Results and Discussion

Persistence of Phi 6 From Contaminated Hotel Room Surfaces Over 30 Days

Table 1 shows the recovery of phi 6 on hotel room surfaces. The results indicate that phi 6 persisted for as long as 2 days on carpets, curtains, and leather coupon samples. We also found that phi 6 can persist for as long as 3 days on coupons of beds, wooden desks, door handles, and hotel amenities—and for as long as 4 days on light switches, remote controls, and bathroom faucets. Even though phi 6 appeared on some surfaces beyond the times previously mentioned, the average of the six samples collected from three replicates was below the detection limit of 0.9 log PFU/cm^2. The bathroom faucet had the last observed presence of phi 6 on day 7.

Hotels are places where many people gather in close environmental conditions and have direct contact with surfaces. Therefore, any hygienic issues or poor environmental conditions in hotel areas and guest rooms make hotels a potential source of virus transmission (Park et al., 2019). Sifuentes et al. (2014) have shown that virus surrogates can transmit to other hotel rooms and parts of the hotel from contaminated surfaces by means of guests and housekeepers.

The results of our study reveal that phi 6 contamination can be transmitted via fomites to hands, increasing the likelihood of viral infection. The variability observed for the survival of phi 6 among different hotel room surfaces could be due to the type of each surface (e.g., porous versus nonporous). Viruses and their surrogates persist longer on nonporous surfaces compared with porous surfaces (Kasloff et al., 2021; Lopez et al., 2013; Whitworth et al., 2020). Our study is consistent with these previous studies, demonstrating that phi 6 persisted longer on nonporous materials (3–4 days) compared with porous materials (2 days). One exception in our observations was that phi 6 survived 3 days on hotel room beds, which would be a porous material. The prolonged survival on hotel room beds could have large-scale implications for public health.

The results of our study provide insight into the potential risks of high-touch surfaces for hotel guest rooms. Presently, it is of ultimate importance that the hotel industry prioritizes its cleaning and sanitizing programs to prevent virus transmission and to provide further assurance to customers. Our results demonstrate that future training and cleaning programs should include an increased focus on nonporous surfaces and bedding.

Simulation of Cross-Contamination From Hands to Hotel Room Surfaces

Hands were artificially contaminated with high and low concentrations of phi 6 (10^7 PFU/cm^2 or 10^3 PFU/cm^2, respectively) and transfer rates were recorded. These data are presented in Table 2. In both experiments, leather had the lowest transfer rate of phi 6 at high and low concentrations (23% and 14%, respectively); the wooden desk had the highest transfer rate of phi 6 at high and low concentrations (58% and 38%, respectively).

At the high concentration, the desk (58%), door handles (51%), and bathroom faucets (56%) had the highest transfer rate and had values above 50%. All surfaces were found to be above the detection limit of 0.9 log PFU/cm^2.

At the low concentration, the lowest transfer rate was found for remote controls, curtains, and leather, all at 14%. All surfaces fell below the detection limit of 0.9 log PFU/cm^2. Although phi 6 was detected in some samples, the final average of the six samples tested on all surfaces was below the detection limit, which indicates that viral transmission from hands to surfaces is not likely when hands become contaminated with a low level of viruses.

The results of our experiment at the high concentration inoculation are consistent with previous research that has demonstrated that hands play an important role in the transmission of various contaminants, including viruses (Ansari et al., 1991; Scott, 2013).

Simulation of Cross-Contamination From Hotel Room Surfaces to Hands

The phi 6 transfer rates from artificially contaminated hotel room surfaces to hands at

high (10^7 PFU/cm^2) and low (10^3 PFU/cm^2) concentrations are shown in Table 3. The transfer rates from surfaces to hands were found to be higher when compared with hands to surface. The only exceptions to this finding were at the low concentration, where hands to desk (37% versus 38%), door handle (28% versus 29%), and faucet (both 29%) were slightly higher or equal.

At the high concentration, all surfaces were found to have transfer rates above 50% and above the detection limit of 0.9 log PFU/cm^2. Bathroom faucets had the highest transfer rate at 74%. At the low concentration, light switches had the highest transfer rate at 45% and were the only surface above the detection limit. Curtains had the lowest transfer rate at 20%.

Previous research has indicated that cleaning is an important factor for hotel selection by consumers and that specific customer segments are willing to pay more for enhanced cleaning methods (Zemke et al., 2015). Thus, increased vigilance in cleaning procedures would be beneficial for public health as well as for hotel business.

TABLE **3**

Transfer Rate of Phi 6 From Hotel Guest Room Surfaces to Hands

Surface	Log and Transfer Rate With High Level Inoculation (10^7 PFU/cm^2)		Log and Transfer Rate With Low Level Inoculation (10^3 PFU/cm^2)	
	Log PFU/cm^2 [a]	Transfer Rate [b] (%)	Log PFU/cm^2	Transfer Rate (%)
Bed to hands	2.0 ± 0.2	50	0.4 ± 0.3	25
Desk to hands	1.6 ± 0.1	63	0.7 ± 0.2	37
Light switch to hands	2.1 ± 0.2	57	0.9 ± 0.2	45
Door handle to hands	1.9 ± 0.3	62	0.5 ± 0.3	28
Remote control to hands	1.6 ± 0.4	53	0.6 ± 0.2	32
Room curtain to hands	1.5 ± 0.3	54	0.3 ± 0	20
Hotel amenities to hands	1.7 ± 0.1	59	0.4 ± 0.1	23
Leather to hands	1.4 ± 0.1	50	0.3 ± 0.1	20
Bathroom faucet to hands	2.3 ± 0.2	74	0.6 ± 0.3	29

[a] Mean and standard deviation of phi 6 from each inoculated hotel guest room surface (10^7 or 10^3 PFU/cm^2) to hands after touching each inoculated surface for 20 s ($N = 6$).

[b] The transfer rate of mean and standard deviation of phi 6 from each inoculated hotel guest room surface (10^7 or 10^3 PFU/cm^2) to hands after touching each inoculated surface for 20 s ($N = 6$).

Conclusion

According to our study results, phi 6 bacteriophages—a surrogate of the SARS-CoV-2 virus—can survive for up to 4 days on light switches, remote controls, and bathroom faucets; up to 3 days on hotel room beds, wooden desks, door handles, and hotel amenities; and up to 2 days on the carpet, hotel room curtains, and leather coupon samples. Our findings suggest that high-touch areas in hotel guest rooms could be a potential source of virus transmission, and cross-contamination from these surfaces to hands and vice versa is possible and perhaps even likely.

Therefore, based on our data, it is recommended that hotel businesses establish standard operating procedures (SOPs) to ensure that these potential hot spots are effectively cleaned to minimize the risk of potential virus transmission. Although CDC (2021) and AHLA (2020b) have provided enhanced cleaning and disinfecting guidelines to aid the hotel industry in specific protocols for minimizing risk, SOPs are still needed.

The results from our study might not represent a real-world hotel room environment, as our experiments were conducted under laboratory conditions and the surfaces were inoculated with a high concentration of phi 6 to simulate a worst-case scenario. Thus, more research is needed to investigate potential viral transmission via hotel room surfaces to confirm our findings.

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INTERNATIONAL PERSPECTIVES/GUEST COMMENTARY

Managing Mosquito-Borne Diseases as an Emergency for Mosquito Control: The South Korean Experience

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Abstract **Although the threat of mosquito-borne diseases has increased, South Korea has not regarded this issue as an emergency for mosquito control. This article aims to examine how to improve the situation in South Korea with the goal of reducing, if not eliminating, adverse impacts. Currently, South Korea has implemented centralized chemical responses to mosquito-borne diseases. This response, however, is insufficient and as such, the implementation of integrated emergency management is needed. Finally, neighboring nations could use this case as a criterion for evaluating their own integrated systems while expanding multiple networks with other nations.**

Introduction

Vectors by definition carry diseases and play an important role in transmitting pathogens from sources to hosts. Pests are considered a nuisance and sometimes, but not always, carry diseases. Mosquitoes can be either vectors or pests that harbor in standing water, displaced wildlife, and debris, as well as result from poor sanitary conditions and environmental changes (Centers for Disease Control and Prevention, 2023). Mosquito vectors have become a global public health issue by increasing mortality and zoonosis after the occurrence of natural hazards such as typhoons and floods (Staples et al., 2023).

The principles of integrated vector management or integrated pest management are widely used to deal with mosquito-borne diseases (National Environmental Health Association [NEHA], 2021; World Health Organization [WHO], 2023). These principles coordinate various types of information, environmental information, and control methods to reduce potential threats to humans. They also require limiting and regulating water, food, and harborage sites.

The use of integrated emergency management in this article focuses on the concept of mosquito-borne disease emergencies, which has been used worldwide in the 21st century via utilizing cutting-edge information, communication technology, and modes of transportation (Yildirim, 2023). This approach emphasizes the significance of networking among various stakeholders through major institutions and their associated functions. By relying on proven effective methods (e.g., improvement of surveillance, response capacity, integrated actions and coordination), these stakeholders can save human lives by controlling mosquito-borne diseases.

In terms of public health communication, integrated emergency management plays an important role in helping individuals make better decisions on health issues, thus, making individuals healthier (Dubé et al., 2022; Yelton et al., 2023). Public health communication includes many subfactors such as understanding health concepts, developing health information, utilizing research and development, and improving cultural competency. Getting involved in these activities and interventions via integrated emergency management can engage the general public through public health communication, thus, influencing and changing their traditional behavior toward mosquito-borne diseases.

South Korea (hereafter referred to as Korea) often faces mosquito-borne diseases during summer months. The three major genera in the region include *Aedes* spp., *Culex* spp., and *Anopheles* spp. (Seo et al., 2021). Mosquito-borne diseases include malaria, Japanese encephalitis, filariasis, dengue, West Nile virus, and Zika virus (NEHA, 2021). During globalization, foreign mosquito-borne diseases have also been imported to Korea via travelers or workers entering the country. From the viewpoint of geographic area, this article includes almost all areas of Korea, in consideration of the large psychological impact of mosquito-borne emergencies on the public within a relatively small territory.

Korea has not fully addressed the issue of mosquito-borne diseases within the framework of integrated emergency management. Instead, the nation has stuck to its current centralized chemical response. If left unaddressed, this situation might cause a catastrophe for the nation, which comprises approximately 50 million people (Byrne & Corrado, 2021). Simultaneously, the situation in Korean might have implications for

neighboring nations. As such, this article aims to comment on how Korea should improve its approach to the issue of mosquito-borne diseases as an emergency for mosquito control.

Centralized Chemical Response

Korea Disease Control and Prevention Agency

As an independent governmental institution, the Korea Disease Control and Prevention Agency (KDCA) plays a key role in dealing with mosquito-borne diseases in Korea. KDCA has provided national guidelines on the management of mosquito-borne diseases at the central government level. The efforts of KDCA (n.d.) have contributed to the development of a centralized response system. Although the agency believes that mosquito-borne diseases are directly related to human health, the urgent need for mosquito control has not been sufficiently advocated for and addressed in Korea.

Moreover, the Ministry of Food and Drug Safety (MFDS, n.d.) has provided a list of appropriate mosquito repellents as part of its involvement in controlling mosquito-borne diseases. According to MFDS, though, mosquito repellents are detrimental to food and drug safety because they contain toxic materials. Various local governments have attempted to manage mosquito-borne diseases within their administrative regions through the use of control measures such as electric insect traps and solar-powered mosquito traps. As an example, with the support of volunteers, the cities of Ulsan and Guri successfully reduced the number of mosquitoes in their areas through the use of these types of control measures.

Chemical Control

Chemical control refers to the use of chemicals to control mosquitoes. Chemical controls frequently are implemented in Korea when disease transmission from mosquitoes or public health concerns about these potential vectors are imminent. Thus, in Korea, the government has strongly encouraged people to use pesticides and insecticides to control mosquitoes and prevent mosquito-borne diseases.

In the use of such chemicals, precautionary directions or warning labels are indicated on their containers due to their toxic components. Unfortunately, some of these chemicals can cause harm or unnecessarily exterminate pollinators such as honeybees and other animals that are important food sources, such as fish and birds.

Furthermore, these types of chemicals have been used as adulticides or larvicides to target various mosquitoes (Meier et al., 2022). Adulticides include pesticides, spraying equipment, and other applications to control adult mosquitoes. Larvicides control mosquito breeding or larvae and include diverse chemicals, insecticides, oils, and films. Application of larvicides is limited, however, because of the size of affected areas, lack of workforce, and inaccessibility, among other reasons.

Institutional Aspects of Integrated Emergency Management

Government

In Korea, the Ministry of the Interior and Safety (MOIS, n.d.) is a single emergency management agency that deals with all types of hazards. MOIS has yet to investigate or act on mosquito-borne disease emergencies. Furthermore, MOIS has not systematically collaborated with KDCA on this public health issue. KDCA should address this issue with support from MOIS. KDCA should also expand its activities related to this issue and have MOIS facilitate the surveillance of mosquitoes or related diseases. Overall, not only MFDS but also local governments need to cooperate with one another to address this public health issue.

Researchers

Public researchers included individuals working for KDCA and MFDS. In terms of emergency management, researchers working for both the Korea Fire Institute and National Disaster Management Research Institute under MOIS need to expand their studies on mosquito-borne diseases and their treatments in emergency situations for mosquito control. At the same time, private researchers should investigate the same topic more comprehensively, as they might be less restrained by bureaucratic regulations (Armed Forces Pest Management Board, 2015). With the cooperation of public researchers, private researchers can continue to research mosquito-borne diseases and methods to protect the population from mosquitos and the diseases they carry.

Local Communities

Local communities include the food industry, mass media, and residents. The local food industry needs to implement efficient disposal of food waste and wastewater. The mass media has the ability to deliver information on mosquito-borne diseases to the public before, during, and after the occurrence of natural disasters. Additionally, the mass media must alert the public about emergencies in a timely manner. And residents, while continuing to separate reusable solid waste and debris during waste management, should monitor the emergence of abnormally high numbers of mosquitoes in their households and around where they live. Furthermore, residents should report on the situation to local public health centers.

Functional Aspects of Integrated Emergency Management

Chemical Management

The heavy reliance by Korea on chemical control indicates that the nation has dealt primarily only with the emergency response phase—or at most, the emergency recovery phase—by using pesticides and insecticides. To this end, the nation must address all four phases of the mosquito emergency management cycle: 1) prevention/mitigation, 2) preparedness, 3) response, and 4) recovery. Before an outbreak of infectious diseases, the nation must further address measures related to chemicals that control mosquitoes such as legalization, inspection, forecasting, emergency operation plans, and training and exercises.

Biological Management

Biological predators of mosquitoes include flying insects, bats, birds, turtles, frogs, fish, parasites, and pathogens. Multiple biological predators play a role in preying on mosquitoes, including mosquito larvae, mosquito pupae, and adult mosquitoes (Yi et al., 2014). To avoid disrupting the order of the ecological system, Korea needs to develop basic emergency operation plans and integrate them to maximize the spread of predators into the environment. Simultaneously, the nation must determine what needs to be improved in this type of biological manage-

ment and include details in their emergency operation plans.

Environmental Management

In a natural environment, water is collected in new or unanticipated places during hot summers, and this standing water can breed mosquitoes or cause related disease emergencies. These locations include roadside ditches, backyards, damaged structures, decorative ponds, discarded tires, fallen trees, and waste disposal sites. As standing water is a major source of breeding mosquitoes, it should be completely drained, or drained as much as possible. In this context, Korea needs to more extensively or regularly clean not only standing water but also debris and then maintain the area as needed.

Implications to Neighboring Nations

Due to climate change, including warmer temperatures and heavier precipitation, the incidence of mosquito-borne diseases has significantly increased. Additionally, due to frequent travel, mosquito-borne viruses such as the Zika virus have spread more widely over many regions (Fernandes et al., 2018). In other words, the international community increasingly is affected by mosquito-borne diseases. Therefore, the topic of mosquito-borne diseases or related emergencies is not a regional public health issue but rather a global one.

It is not easy for the field of national emergency management to fully practice integrated emergency management, as it requires a diverse array of personnel and resources plus time and effort (WHO, 2014). Thus, the extent of integrated emergency management depends on national circumstances. Furthermore, by referencing the situation in Korea, neighboring nations must realize that integrated emergency management with public health communication is a basic requirement for addressing mosquito-borne diseases.

More specifically, when neighboring nations face difficulties dealing with mosquito-borne diseases, they must initiate the evaluation and eventual implementation of appropriate integrated emergency management both institutionally and functionally. The institutional aspect includes three subfactors: governments, researchers, and local communities. Similarly, the functional aspect includes three subfactors: chemical, biological, and environmental management. Any missing or problematic subfactors must be resolved for mosquito-borne diseases to be appropriately addressed.

Moreover, neighboring nations need to further expand their international networks to address transnational mosquito-borne disease emergencies. Exchanging appropriate information and knowledge in a timely manner might fully address public health concerns and zoonosis in the region. Based on these networks, related integrated emergency management can be sustained institutionally and functionally, and with a long-term perspective (Bourtzis et al., 2016).

Conclusion

This article highlights the importance of integrated emergency management of mosquito-borne diseases by examination of the current situation in Korea. As a key theme, Korea should change its centralized chemical response to an integrated emergency management response. Similarly, the nation should consider mosquito-borne diseases as an emergency for mosquito control rather than an annual activity or a normal occurrence. This approach could lead to a faster way to improve public health in Korea. Neighboring nations may use lessons from Korea as an opportunity to evaluate their own situation, including their current emergency management system and handling of mosquito-borne diseases.

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INTERNATIONAL PERSPECTIVES/GUEST COMMENTARY

Thirdhand Exposure to Methamphetamine Syndrome: Symptoms Resulting From Environmental Exposure to Methamphetamine Contamination Arising From Manufacture or Use

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Abstract **Thirdhand exposure to methamphetamine occurs through contact with environments that have become contaminated during the manufacture or use of the substance. This exposure is a serious emerging public health concern. Exposure can cause adverse health effects in unwitting residents, particularly children. As an increasing number of reports appear in the scientific literature, we propose "thirdhand exposure to methamphetamine syndrome" as a collective term to describe the various nonspecific symptoms that are related to methamphetamine exposure. This proposed term could provide a searchable keyword to facilitate the coordination of research to better understand the health-related consequences of exposure to methamphetamine that result from its manufacture and use.**

Introduction

Methamphetamine usage has been described as a global epidemic (Chomchai & Chomchai, 2015; European Monitoring Centre for Drugs and Drug Addiction & Europol, 2022; Hansell, 2006; Jones & Comparin, 2020; Pisarski, 2021). Worldwide, methamphetamine is the second most used illicit drug and the most commonly manufactured amphetamine-type stimulant (Bijlsma et al., 2021; European Monitoring Centre for Drugs and Drug Addiction & Europol, 2022; Jones & Comparin, 2020; Perez et al., 2022; Stoneberg et al., 2018). Recent reports indicate an increase in both use and the incidence of methamphetamine overdose (Han et al., 2021; Young et al., 2019).

Many countries conduct on an annual basis national drug surveys that consider a range of factors, including sociological demographics, substance abuse, and stage of addiction (European Monitoring Centre for Drugs and Drug Addiction & Europol, 2022; Substance Abuse and Mental Health Services Administration, 2020; Sutherland et al., 2022). As a result, the dose response and impact of methamphetamine on firsthand drug users have been extensively researched. There are also newspaper articles that highlight drug-related violence, drug trafficking, and drug busts by police (Rawstorne et al., 2020). Secondhand exposure is also reasonably well defined as it relates to the cohort of people, especially children, who are present during the manufacture or use of drugs (Holitzki et al., 2017; Meays et al., 2019). This exposure often includes family members and children who reside at the same property.

Both the manufacture and the personal use (e.g., smoking) of amphetamine-type stimulants (e.g., amphetamine, methamphetamine, 3, 4-methylenedioxymethamphetamine [MDMA]) can result in environmental contamination. Even though amphetamine is structurally similar, methamphetamine has a greater effect on dopamine levels and the corresponding transporter proteins (Chiu & Schenk, 2012). Methamphetamine is the amphetamine-type stimulant most commonly smoked; MDMA is usually taken in tablet form or snorted intranasally. Thus, methamphetamine is the main amphetamine-type stimulant of concern for thirdhand exposure (Meyer, 2013).

Methamphetamine use can take place in a range of locations, including household properties, hotels, public bathrooms, and vehicles (Cherney et al., 2006; Green & Moore, 2013; Hannan, 2005). This use in a range of locations leads to porous materials, such as carpets and soft furnishings (including bedding), absorbing methamphetamine residues (Morrison et al., 2015; Wright et al., 2019). Furniture, benchtops, interior walls, and other impermeable surfaces can also have residual deposits that can be mobilized through air movement or foot traffic (Bitter, 2017; Martyny et al., 2007; Wright et al., 2019). Furthermore,

TABLE **1**

Summary of Symptoms Experienced by Residents After Thirdhand Exposure to a Methamphetamine-Contaminated Property and by Residents Living in a Former Clandestine Laboratory

Symptom	Individuals Reporting Symptoms (% of Total Individuals)		
	Children and Adolescents (*n* = 29) (<21 years) # (%)	Adults (*n* = 34) (>21 years) # (%)	Adults (*n* = 27) (Residing in a Former Clandestine Laboratory) # (%)
Behavioral and cognitive issues	23 (79)	22 (65)	2 (8) *
Sleeping difficulty	21 (72)	23 (68)	–
Respiratory issues	18 (62)	18 (53)	11 (39)
Skin problems	16 (55)	19 (56)	–
Eye problems	16 (55)	20 (59)	2 (7)
Nausea or vomiting	16 (55)	20 (59)	5 (19)

* Dizziness was the reported symptom but could also be categorized as a cognitive issue.
Source: Thrasher et al., 2009; Wright et al., 2020.

research has demonstrated that newly introduced furniture can also absorb existing methamphetamine contamination from within a property (Wright et al., 2019). Thus, residents might move into a property and be unwittingly exposed to methamphetamine residues that have resulted from prior manufacture or smoking; this transfer is considered thirdhand exposure. Thirdhand exposure can cause significant—but poorly defined—adverse health effects (Wright et al., 2020).

There is limited research on the extent of these health impacts; however, the research available currently has identified a range of symptoms associated with exposure. We consider that there needs to be a collective term to describe the symptoms of thirdhand exposure to methamphetamine. We propose "thirdhand exposure to methamphetamine (THEM) syndrome" as a collective term to describe the various nonspecific symptoms that are related to methamphetamine exposure. This term will enable better tracking and collation of future research, which will inform best practices in regulation and in understanding these adverse health effects.

Thirdhand Exposure Symptoms

Wright et al. (2020) analyzed 63 individuals who had previously resided in a methamphetamine-contaminated property. The symptoms and housing situations were documented and characterized for the 25 case studies. The individuals consented to hair analysis and permitted the property to be tested for methamphetamine. None of the participants were using or manufacturing methamphetamine themselves. The adverse health effects varied from short-term to chronic symptoms, and the time spent and/or lived at the property ranged from a few days to 10 years (Wright et al., 2020). Participants self-reported symptoms that were verified by health professionals, such as the family general practitioner or school nurse (Wright et al., 2020). For individuals <21 years and for adults, behavioral and cognitive issues (79% and 65%, respectively) and sleeping difficulties (72% and 68%, respectively) were the most prevalent adverse health effects recorded (Table 1).

Thrasher et al. (2009) published the adverse health effects experienced by people exposed to methamphetamine laboratories (i.e., where the cooking process of making methamphetamine had taken place), which included residents living in former clandestine laboratories. The six most reported symptoms from adult residents in this study were headaches, respiratory issues, nausea, cough, eye problems, and dizziness.

Given that research is limited, for the purpose of characterizing symptoms associated with thirdhand exposure, both the manufacture and smoking of methamphetamine have been included in Table 1. We recognize there could be other symptoms not mentioned; therefore, this list should not be considered comprehensive (Flannery et al., 2006; Matteucci et al., 2007; Smith et al., 2015).

Dose-Response Relationship

The term dose-response refers to a concentration or dose of a toxin that will cause an effect of a particular measurable response (endpoint) in the subject of a particular measurable response (endpoint). Dose-response curves generally assume a sigmoidal shape with increasing doses resulting in increasing effects (Vallero, 2010). There are difficulties in applying this model to methamphetamines. The first issue is the lack of data about exposure and effect (or symptoms), and the second issue is the nonspecific nature of the symptoms. Both of these impediments will be addressed to a degree by naming the syndrome and facilitating information collation.

When establishing guidelines to protect public health, observational research studies are used to identify the no-observed-adverse-effect level (NOAEL) and/or the lowest-observed-adverse-effect limit (LOAEL). While it is important to include both quantitative and qualitative results, it can be challenging to determine an exact threshold due to variation among individuals (Eaton & Gilbert, 2008; Ochoa, 2018). The vulnerability of the population that might be exposed is considered in the use of uncertainty factors, which are applied to the threshold (NOAEL or LOAEL). Establishing an LOAEL from observational studies has been identified by a number of researchers; however, the published research available is limited (Fahmi et al., 2010; Mayer & Miskelly, 2022; Thrasher et al., 2009; Wright et al., 2020).

Hair samples have long been used as evidence in courts of law for cases involving illicit substances; this technique provides valuable information about the time frame and levels of methamphetamine a person has been exposed to (Kintz, 2017). Recent research has shown that environmental contamination from illicit drugs can be established through hair analysis (Kintz et al., 2020, 2021). In general, increasing concentrations have been found in hair

with increasing levels of exposure in individuals (Han et al., 2010, 2011; Polettini et al., 2012; Wright et al., 2020). Higher concentrations of methamphetamine were found in segmented hair sections compared with concentrations found using an external hair wash solution, indicating the difference between drugs settled on the outside of hair and drugs incorporated into the hair matrix by means of ingestion (Kintz, 2017; Kintz et al., 2020). In addition, variation in concentrations from the root to the tip of the hairs demonstrated that the hair matrix captured the drug as the hair matrix grew, and that the contamination varied over a period of time (Kintz et al., 2021).

Syndromes and Acronyms

Establishment of a defined term to describe the health consequences of thirdhand exposure to methamphetamine is needed to raise awareness, facilitate data collection, improve diagnoses, and encourage future research into potential long-term health consequences. Calvo et al. (2003) defined a syndrome as a group of known symptoms that can be attributed to a specific illness, even when the complete associations for that ailment might not be fully established. Other syndromes have been defined and given an acronym for future identification in research. For example, chronic fatigue syndrome (CFS; Brurberg et al., 2014), irritable bowel syndrome (IBS; Chey et al., 2015), and sick building syndrome (SBS; Redlich et al., 1997) are a few syndrome classifications with a number of nonspecific symptoms.

SBS has a number of similarities to thirdhand exposure to methamphetamine, and thus we described it in some detail. In the 1980s, the World Health Organization characterized SBS as a combination of symptoms that are expressed through multiple organ systems when people are exposed to an enclosed built structure, such as an office building, hospital, or school (Redlich et al., 1997; Runeson-Broberg, 2020). Similar to exposure to methamphetamine, the symptoms are nonspecific. Individuals reported headaches, lethargy, itchy and watery eyes, nasal congestion, and skin irritation—symptoms that are commonly associated with other illnesses (Burge, 2004). Several factors have been documented that increase the prevalence of SBS within a cohort including allergies, sex, temperature, ventilation, outdoor air pollution, and volatile organic compounds (Mentese et al., 2020; Runeson-Broberg, 2020; Saijo, 2020). Overall, SBS highlights the range of indoor air quality conditions and how symptoms can vary in individuals.

As such, like SBS, it is reasonable to presume there are some members of the public who have not reported adverse health issues or who have reported them but have attributed them to another illness (Runeson-Broberg, 2020). Exposure levels are dependent on the individual's risk factors, activities, and exposure times (Kintz et al., 1995; Tsanaclis & Wicks, 2008; Wright et al., 2020). In conjunction with self-reported symptoms, however, exposure to amphetamine-type stimulant contamination can be verified by quantitative sampling of blood, urine, hair, and the person's environment (Kintz et al., 1995; Tsanaclis & Wicks, 2008). We propose THEM syndrome as a name for the range of adverse health effects experienced by individuals due to contamination from amphetamine-type stimulants, specifically methamphetamine.

Current Situation

Research has established that there has been an increase in autopsies of infants and children with methamphetamine present in their systems (Kenneally & Byard, 2020; Tse et al., 2020). There were seven case studies identified by forensic scientists in South Australia and eight from New Zealand (Kenneally & Byard, 2020; Tse et al., 2020). Of these 15 cases, 6 out of 7 (86%) from South Australia and 8 out of 8 (100%) from New Zealand were for infants under the age of 12 months. Using blood analysis, both studies determined that there was no deliberate ingestion and there was a known cause of death for all except two of the cases from South Australia.

Thus, these infants were exposed passively either in utero, from breastmilk or formula, or via environmental exposure (Kenneally & Byard, 2020; Tse et al., 2020). There have been several other studies that investigated methamphetamine exposure in children (Castaneto et al., 2013; Flannery et al., 2006; Kintz et al., 1995; Tsanaclis & Wicks, 2008; Wright et al., 2020); however, future research is needed to determine the health burden of thirdhand exposure.

This situation regarding thirdhand exposure is exacerbated by a housing shortage in many countries worldwide (Brill & Raco, 2021; Lima, 2021; Massimo, 2021; Richardson, 2022). As a result, sometimes housing is rented or sold without sufficient inspection (Ullah & Sepasgozar, 2020). Additionally, due to privacy laws, a detailed account about a property's illicit drug history is not available even after law enforcement was involved. In Australia, it is estimated that only 1 in 10 clandestine laboratories are discovered, meaning many go undetected (Degenhardt et al., 2017) and rarely, if ever, is a house investigated due to methamphetamine use alone. In summary, the turbulent housing market might potentially result in an increase in THEM syndrome.

Furthermore, with the increase in roadside random drug testing and workplace testing for illicit drugs (Bade et al., 2018; Love et al., 2022; Mills et al., 2021; Smith et al., 2021), there are other unintended consequences of THEM syndrome. Residents who are exposed to methamphetamine contamination potentially could run the risk of testing positive in a workplace drug test (Buzby et al., 2021; Kapur & Aleksa, 2020; Tremonti & Haber, 2021), which would have numerous social and physiological consequences. This issue is further complicated by the potential for THEM syndrome to occur because of where an individual works; examples include police officers or social workers who unknowingly enter contaminated properties (Hannan, 2005; Norman et al., 2021; Witter et al., 2007).

Recommendations for the Environmental Health Profession

The environmental health profession is profoundly local (Rodrigues et al., 2021). Environmental health professionals work on the front line to protect public health and can be the first point of contact for individuals who are concerned about methamphetamine-contaminated properties (Kuhn, Walker, Wright, et al., 2021). The environmental health profession is best positioned to take on the challenge of regulating this public health threat. Currently, however, there are many businesses working in this space. In Australia, it has been found that there is a concerning lack of industry regulation and additionally, some businesses have been found to have conflicts of interest (Kuhn, Walker, Whiley, et al., 2021). For example, some companies have been conducting the initial testing for a property, the decontamination process, and then also the validation testing to confirm

that their decontamination process worked (Kuhn, Walker, Whiley, et al., 2021). The environmental health profession should advocate for these processes to be conducted by independent businesses to ensure no conflict of interest and resulting bias.

The methods being used for testing by industry members are also problematic. Often there are no standardized methodologies and the presumptive test kits or lateral flow assays commonly used have lower limits of detection than reported by manufacturers (Kuhn et al., 2023). This lack of standardization can unnecessarily increase stress and anxiety for homeowners or residents. Presumptive test kits should be used as a screening tool, not as the basis of a remediation plan or decontamination validation. Environmental health professionals should be aware of this limitation and advise that quantitative testing should be conducted for any positive results from presumptive testing.

There are also several uncertainties that must be considered when assessing the public health risks associated with managing methamphetamine contamination. Future research is needed to inform best practices. For example, exposure time is one of the essential factors that can affect the health outcome of the individual; thus, contamination within residential properties is a main concern. People, especially young children, spend a significant portion of their time every day in the home (Wright et al., 2020). Residues in public places, such as shops or public restrooms, are less of a concern due to the relatively short exposure time in that space. A syndrome name will both facilitate the collation of information and raise awareness of thirdhand methamphetamine exposure, which will support the efforts of the environmental health profession to regulate this public health threat and protect public health.

Conclusion

There are many gaps in knowledge currently regarding environmental contamination with methamphetamine from use and manufacture, as well as unknowns of adverse health effects associated with methamphetamines. Future research is needed to further characterize the symptoms and potential long-term consequences of thirdhand methamphetamine exposure to human health. Our proposed syndrome definition and acronym of THEM syndrome will focus future research; provide a searchable keyword; and enable relevant studies to be more easily identified and tracked by medical professionals, researchers, and government officials.

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JEH QUIZ

FEATURED ARTICLE QUIZ #2

Thirdhand Exposure to Methamphetamine Syndrome: Symptoms Resulting From Environmental Exposure to Methamphetamine Contamination Arising From Manufacture or Use

Available to those with an active National Environmental Health Association (NEHA) membership, the *JEH* Quiz is offered six times per calendar year and is an easily accessible way to earn continuing education (CE) contact hours toward maintaining a NEHA credential. Each quiz is worth 1.0 CE.

Completing quizzes is now based on the honor system and should be self-reported by the credential holder. Quizzes published only during your current credential cycle are eligible for CE credit. Please keep a copy of each completed quiz for your records. CE credit will post to your account within 3 business days.

Paper or electronic quiz submissions will no longer be collected by NEHA staff.

INSTRUCTIONS TO SELF-REPORT A *JEH* QUIZ FOR CE CREDIT

1. Read the featured article and select the correct answer to each *JEH* Quiz question.
2. Log in to your MyNEHA account at https://neha.users.membersuite.com/home.
3. Click on Credentials located at the top of the page.
4. Select Report CEs from the drop-down menu.
5. Enter the date you finished the quiz in the Date Attended field.
6. Enter 1.0 in the Length of Course in Hours field.
7. In the Description field, enter the activity as "*JEH* Quiz #, Month Year" (e.g., *JEH* Quiz 2, October 2023).
8. Click the Create button.

➔ Quiz effective date: October 1, 2023 | Quiz deadline: January 1, 2024

1. Worldwide, methamphetamine is the __ most used illicit drug.
   a. first
   b. second
   c. third
   d. fourth
2. Worldwide, methamphetamine is the most commonly manufactured amphetamine-type stimulant.
   a. True.
   b. False.
3. Thirdhand exposure to methamphetamine occurs through
   a. exposure during the manufacture or use of the substance.
   b. personal use of the substance.
   c. contact with environments that have become contaminated during the manufacture or use of the substance
4. The __ of amphetamine-type stimulants can result in environmental contamination.
   a. manufacture
   b. personal use
   c. a and b
   d. none of the above.
5. One study found that __ of adults who resided in a methamphetamine-contaminated property self-reported behavioral and cognitive issues as a prevalent adverse health effect.
   a. 65%
   b. 68%
   c. 72%
   d. 79%
6. The same study found that __ of individuals <21 years who resided in a methamphetamine-contaminated property self-reported sleeping difficulties as a prevalent adverse health effect.
   a. 65%
   b. 68%
   c. 72%
   d. 79%
7. In another study, the most reported symptoms from adults residing in a former clandestine methamphetamine laboratory included
   a. headaches and dizziness.
   b. respiratory issues and cough.
   c. nausea and eye problems.
   d. all of the above.
   e. none of the above.
8. In Australia, it is estimated that __ in 10 clandestine laboratories are discovered.
   a. 1
   b. 2
   c. 3
   d. 4
9. The term dose-response refers to a concentration or dose of a toxin that will cause an effect of a particular measurable response (endpoint) in the subject of a particular measurable response (endpoint).
   a. True.
   b. False.
10. There are difficulties in applying the dose-response model to methamphetamine due to the
    a. lack of data about exposure and effect.
    b. nonspecific nature of the symptoms.
    c. a and b.
    d. none of the above.
11. Establishment of a defined term to describe the health consequences of thirdhand exposure to methamphetamine is needed to
    a. facilitate data collection and encourage future research.
    b. raise awareness.
    c. improve diagnoses.
    d. all of the above.
12. A syndrome is a group of known symptoms that can be attributed to a specific illness, even when the complete associations for that ailment might not be fully established.
    a. True.
    b. False.

JEH Quiz #6 Answers

May 2023

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

FEATURE STORY

Empowering Future Environmental Public Health Professionals: A Deep Dive Into the Expanded National Environmental Public Health Internship Program

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The environmental public health workforce plays a crucial role in safeguarding the well-being of communities. These dedicated professionals lead efforts to assess and manage risks, ensure safe water and sanitation, support the prevention and control of communicable diseases, ensure food safety, conduct vector control, and contribute to emergency preparedness and response efforts (Gerding et al., 2019). In recent years, however, the environmental public health workforce has faced an alarming decline in both numbers and resources (National Association of County and City Health Officials, 2019). This decline has serious implications for the quality and coverage of environmental public health services. Responding to a growing number of emergencies and managing routine public health functions will be gravely challenging without an adequate workforce.

One way to address this challenge is to develop and support an internship program that serves as a pipeline from environmental health education to practice (Bouye et al., 2016). Internship programs play a crucial role in supporting the transition from the classroom to professional careers in environmental public health. Internships provide students with valuable practical experience and the opportunity to apply theoretical knowledge in real-world settings. These programs offer opportunities to develop essential skills, expand professional networks, and gain exposure to different areas of public health, which ultimately enhance the readiness of students to enter the workforce (Ryan & Hall, 2022). Through internships, aspiring environmental public health professionals can close the divide between education and practice.

The National Environmental Health Association (NEHA) has partnered with the National Center for Environmental Health within the Centers for Disease Control and Prevention (CDC) to offer the National Environmental Public Health Internship Program (NEPHIP) to support the pipeline by offering environmental health students the opportunity to partake in a hands-on environmental public health internship experience. This CDC-funded workforce initiative helps environmental public health students gain valuable work experience, develop meaningful professional relationships, and introduce students to the diverse and rewarding career opportunities that exist in state, tribal, local, and territorial (STLT) governmental public health agencies following graduation.

Through NEPHIP, we collaborate with environmental public health academic programs that are accredited through the National Environmental Health Science and Protection Accreditation Council (EHAC) to place students with qualified public health agencies for a 400-hr paid internship that offers hands-on environmental public health experience at STLT public health agencies. The internship program also enables students to gain credit hours for coursework, partake in an independent project for their portfolio, network with environmental public health professionals for career guidance and opportunities, and find a passion for a specific direction in environmental health. NEPHIP benefits both students and public health agencies. For students, it provides hands-on experience, exposure to real-world challenges, and the opportunity to apply their knowledge in a professional setting, which enhances their skills and employability. For public health agencies, the program offers access to fresh perspectives, a pool of talented individuals, and the chance to cultivate a pipeline of skilled professionals who can contribute to the mission of their agency and address public health needs effectively.

Widening the Horizons

In 2022, we introduced an expanded and revised version of NEPHIP, aiming to provide additional benefits and opportunities for professional and career development. The enhanced program now offers interns the flexibility to choose from multiple internship cohorts throughout the year, including summer, fall, or spring, in contrast to exclusively offering summer internships. Additionally, the number of student interns selected from EHAC-accredited institutions per academic year has also increased, providing support for up to 50 individuals.

> **"Like striped caterpillars that metamorphize into beautiful monarch butterflies, the National Environmental Public Health Internship Program is crafted to accelerate the development of environmental public health students from learners into thriving, effective professionals."**
>
> *– David Dyjack, DrPH, CIH, Executive Director, National Environmental Health Association*

The expansion of NEPHIP encourages interns to consider projects focused on imperative issues such as climate change, health equity, sustainability, and environmental justice. The program was revised to increase diversity among interns and participating host sites and environmental health programs within STLT public health agencies. NEPHIP now offers valuable professional career mentorship sessions, where student interns can engage with other environmental health professionals working in STLT public health agencies outside of their internship host site. In addition, the interns now have the opportunity to attend a Virtual Career Fair.

The augmented program has strategically incorporated our Annual Educational Conference (AEC) & Exhibition into the revised model for NEPHIP. Interns are now offered free virtual registration to the AEC, a complimentary professional development preconference workshop, and select interns are offered travel scholarships to attend the AEC in person. Furthermore, interns are given a 1-year NEHA student membership that provides them with access to valuable resources, a 1-year subscription to the *Journal of Environmental Health*, and networking opportunities.

The revised program offers enhanced coordination and evaluation support to strengthen experiential learning outcomes. Furthermore, participating host programs are offered financial support packages to cover expenses associated with hosting an intern. Overall, these revisions were made to further bolster NEPHIP and bridge the gap between education and practice, contributing to a seamless transition and empowering aspiring environmental public health professionals to make meaningful contributions to the field. As Dr. David Dyjack, NEHA executive director, put it: "Like striped caterpillars that metamorphize into beautiful monarch butterflies, NEPHIP is crafted to accelerate the development of environmental public health students from learners into thriving, effective professionals."

Embracing Imperative Issues as Project Topics

NEPHIP interns are encouraged to explore climate change, health equity, sustainability, and environmental justice within their independent projects. These topics encapsulate the defining issues of our global landscape.

"Training and supporting our environmental public health pipeline for climate change, environmental justice, health disparities, and sustainability is critical to our nation's health and safety."

– Jesse Bliss, MPH, PhD, Director, Program and Partnership Development, National Environmental Health Association

Climate change—with its escalating impacts on ecological systems, natural resources, and human health—demands urgent attention (Weiskopf et al., 2020). Dr. Jesse Bliss, director of Program and Partnership Development at NEHA, underlines the significance of these focus areas by stating, "Training and supporting our environmental public health pipeline for climate change, environmental justice, health disparities, and sustainability is critical to our nation's health and safety."

By integrating these vital concerns into NEPHIP internships, aspiring environmental public health professionals gain invaluable exposure to the multifaceted challenges presented by climate change and become equipped with the necessary knowledge and skills to effectively address its ramifications. Furthermore, the emphasis on health equity is pivotal in mitigating the disparities exacerbated by climate change. Historically, marginalized communities often bear the brunt of environmental hazards and are disproportionately affected by the adverse consequences of climate change (Boyd et al., 2021). A report from the U.S. Environmental Protection Agency (U.S. EPA, 2021) elucidates the ramifications of climate change on socially vulnerable populations within the U.S., people of color and Indigenous communities exhibit a greater propensity to bear the burden of adverse climate effects. These effects include the exacerbation of air quality degradation, the deleterious consequences of extreme temperature on well-being and productivity, and the detrimental effects of coastal and inland flooding on health and property (U.S. EPA, 2021). Incorporating health equity as a focal point within NEPHIP internships fosters an understanding of these disparities and enables interns to devise strategies that promote equitable access to environmental resources, healthcare services, and resilience-building initiatives. By doing so, interns contribute to dismantling the systemic inequities that worsen the impacts of climate change on vulnerable populations.

Sustainability, as a guiding principle, reinforces the imperative of responsible resource management and the development of resilient systems that can adapt to changing environmental conditions (Roostaie et al., 2019). Encouraging interns to engage with sustainability-related projects instills an ethos of ecological stewardship and innovation, ensuring the long-term viability of public health interventions in the face of a rapidly evolving climate.

Lastly, integrating environmental justice into NEPHIP internships acknowledges the intersectionality between environmental concerns, social justice, and public health outcomes. By examining the disproportionate burdens borne by underserved communities and empowering interns to address these injustices, the internship program cultivates a generation of public health leaders committed to confronting the root causes of environmental inequities and advocating for policies and interventions that prioritize justice and inclusivity.

Focusing on Diversity

One of the key improvements in the program is the strengthened promotion and recruitment efforts, with a specific focus on increasing diversity and inclusion among interns. Environmental public health issues affect diverse communities differently. By ensuring a diverse workforce, we can better understand and address the unique challenges faced by various racial, ethnic, and socioeconomic groups (Harper, 2007). This focus promotes a more equitable distribution of resources, interventions, and policies that can effectively mitigate health disparities and promote environmental justice. We have demonstrated a strong commitment to prioritizing diversity among NEPHIP interns by actively seeking candidates from diverse geographic, racial, and ethnic backgrounds.

Under the expansion, NEPHIP now integrates revised diversity metrics into the appli-

cation process such as primary language, English proficiency as a second language, gender identity, and disability. Furthermore, a statement of explanation was added to the demographics section to emphasize the vital importance of collecting this information, recognizing its potential to foster a more representative and equitable program. We are currently developing a dedicated diversity section on our NEPHIP webpage that will serve as an informative platform, elucidating the significance of diversity and inclusion to our organization.

Under the revised version of NEPHIP, we have engaged the Association of Environmental Health Academic Programs (AEHAP) and EHAC to implement targeted strategies through direct outreach and promotion of the internship program to institutions accredited by EHAC that serve racial-ethnic minorities. This proactive approach ensures that students from underrepresented communities have increased awareness and access to the internship program.

By focusing on promoting the program to diverse institutions, we aim to attract a broader range of talented individuals who bring unique perspectives and experiences to the environmental public health field. This commitment to diversity not only fosters a more inclusive and equitable internship program but also contributes to the development of a diverse workforce that can effectively address the complex environmental health challenges faced by communities across the nation.

We have also taken proactive steps to support and engage EHAC in expanding the number of EHAC-accredited programs and promoting diversity within the field. Recognizing the importance of increasing the representation of institutions that serve racial-ethnic minorities, we collaborated with EHAC to provide guidance, resources, and technical assistance to these institutions to consider pursuing EHAC accreditation. By assisting EHAC in building its capacity and outreach efforts, we aim to foster a more inclusive and diverse landscape of accredited environmental health programs. This strategic partnership between NEHA and EHAC strengthens the accreditation process while promoting greater diversity and inclusion within environmental health education.

As Leslie Mitchell, EHAC executive director, notes, "The increased number of internship placements available for students in programs accredited by EHAC provides ever greater opportunities for students to complete internship requirements for undergraduates and more opportunities for graduate students to gain practical experience. Many times, these internships are direct pipelines to employment with local public health departments. Recent marketing and program recruitment support that is focused on Historically Black Colleges and Universities (HBCUs) has been impactful, allowing EHAC to conduct effective on-site program recruitment visits."

"The increased number of internship placements available for students in programs accredited by the National Environmental Health Science and Protection Accreditation Council provides ever greater opportunities for students to complete the internship requirements for undergraduates and more opportunities for graduate students to gain practical experience."

– Leslie Mitchell, Executive Director, National Environmental Health Science and Protection Accreditation Council

Offering Mentorship and Career Guidance

Under the expanded NEPHIP model, we launched the NEPHIP Career Mentorship Program. The mentorship program offers NEPHIP interns unparalleled opportunities for career development and guidance by connecting interns with experienced environmental health professionals employed in STLT public health agencies. The cornerstone of this mentorship program is the participation of professionals who have successfully completed our highly regarded Environmental Health Leadership Academy (EHLA). With its rigorous 12-month training program, EHLA equips graduates with a comprehensive skill set that encompasses management strategies, environmental health risk assessment, effective communication, community mobilization, equity advocacy, organizational infrastructure, evaluation and quality improvement, and performance management.

NEPHIP interns now have the exclusive opportunity to engage in career mentorship sessions with these accomplished EHLA graduates. The mentorship program focuses on offering timely and credible career advice, aiding interns in navigating the multifaceted field of environmental health, exploring diverse career paths, and keeping abreast of the evolving landscape of the profession. The mentorship sessions enable interns to tap into the rich knowledge and practical experiences of the EHLA graduates, who are eager to share their insight and expertise.

"The NEPHIP mentorship program helped me make meaningful connections and offered valuable career guidance," stated Nikita Nunez, a spring 2023 NEPHIP intern. She added that being accepted into the mentorship program introduced her to many opportunities. She mentioned that the "mentors in this field were quite exceptional in providing real-life expectations and shared the educational insights and resources needed to become instruments within the environmental public health workforce." Christopher Walker, NEHA senior program analyst, commented that "having access to EHLA graduates, who are recognized leaders in the environmental health community, provides our interns with a wealth of knowledge and guidance as they embark on their professional journeys."

By connecting NEPHIP interns with these esteemed mentors, the program fosters the growth of professional networks within the environmental health community. Interns are encouraged to forge lasting connections, potentially identifying future mentors or collaborators who can offer ongoing support and guidance throughout their careers. Furthermore, the program empowers interns to gain practical skills while developing a profound understanding of the environmental health landscape from experienced professionals. This unique opportunity lets interns lay a solid foundation for their future careers, positioning them as the next generation of envi-

"The NEPHIP Mentorship Program helped me make meaningful connections and offered valuable career guidance. The mentors in this field were quite exceptional in providing real-life expectations and shared the educational insights and resources needed to become instruments within the environmental health workforce."

– Nikita Nunez, 2023 National Environmental Public Health Internship Program (NEPHIP) Intern

ronmental health leaders. As the mentorship program unfolds, the positive impact it will instill on the careers of NEPHIP interns—and the broader environmental health community—is eagerly anticipated. With the guidance and mentorship of EHLA graduates, the interns are poised to make meaningful contributions to environmental public health initiatives across the nation.

In addition to the NEPHIP Career Mentorship Program, we also offer NEPHIP interns the opportunity to participate in a virtual career fair. The career fair aimed to support past and current NEPHIP interns by connecting them with STLT environmental public health agencies that are recruiting new talent. This direct interaction allowed the interns to showcase their skills, knowledge, and passion for environmental public health and make a lasting impression on prospective employers while increasing their chances of securing future employment within environmental public health.

Additional objectives of the career fair included offering a networking opportunity to participants and presenting an avenue for STLT environmental public health agencies to promote their work to potential recruits. The career fair provided interns with the opportunity to engage potential employers and gather valuable information about different environmental health roles, responsibilities, and career paths. This exposure helped the interns make informed decisions about their career trajectories and gain insight into the skills and qualifications sought by employers in the field.

The virtual career fair was successfully hosted in May 2023. The fair featured a variety of exhibitor booths and provided a diverse range of organizations and opportunities for NEPHIP interns. One student with a full-time job expressed satisfaction with the virtual format as it enabled her to attend during her lunch hour. Feedback from attendees highlighted the openness and interactive nature of the platform. Participants appreciated the freedom to engage with others at their own pace, fostering meaningful connections and networking opportunities. One intern expressed enthusiasm about applying for an open position that was highlighted during the career fair, indicating the tangible impact the event had on their career prospects. Samiah Elgazzar, a spring 2023 NEPHIP intern, commented that she made many connections at the career fair and is excited to see where those connections lead her.

Professional Development and Networking at the NEHA AEC

The integration of our AEC into the revised version of NEPHIP has been a pivotal step in maximizing the environmental public health learning experience of NEPHIP interns. This strategic integration has yielded several notable benefits that have empowered interns and equipped them with valuable skills and resources. Foremost, NEPHIP interns were offered complimentary registration to the AEC. The AEC serves as a platform for aspiring and experienced environmental public health professionals to expand their knowledge base, acquire industry insights, and develop a deeper understanding of the multifaceted challenges that face environmental health professionals. The complimentary registration granted interns access to a diverse array of educational sessions, workshops, and presentations delivered by esteemed experts in the environmental health field. By immersing themselves in this comprehensive learning environment, interns gained exposure to cutting-edge research, emerging trends, and innovative practices that shape the landscape of environmental health. The revised program also offered travel scholarships to 10 select interns to cover their travel costs to the AEC.

Additionally, the revised program offers NEPHIP interns with complimentary access to a preconference workshop specifically designed for professional development.

Meet Megan Gray-White, an exceptional undergraduate student at Colorado State University who is majoring in biomedical sciences with a concentration in environmental public health. Her passion for promoting community well-being has propelled her towards remarkable achievements, setting her on a path to make a lasting impact in the field.

During her academic journey, Gray-White completed a hybrid internship that combined both in-person and virtual experiences. This unique opportunity took place at the Broomfield Department of Public Health and Environment. Within this setting, she undertook a transformative project that focused on developing a comprehensive written plan for a healthy homes program specific to the jurisdiction.

Impressed by Gray-White's outstanding performance and dedication, the Broomfield Department of Public Health and Environment offered her a full-time position. This exciting opportunity allows Gray-White to further apply her skills and knowledge to drive positive change within the community she served during her internship.

In 2022, this workshop covered an array of pertinent topics, such as building effective resumes, seeking mentorship, understanding the importance of the Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) credential and other environmental health credentials, delivering scientific presentations, and building a professional network. The workshop equipped interns with the practical skills and knowledge essential for their future careers in the environmental health field.

We also facilitated a virtual networking event exclusively for NEPHIP interns to help them connect with NEHA leaders, mentors, and affiliates. This networking opportunity provided a platform for interns to establish meaningful professional relationships, seek guidance from experienced practitioners, and expand their network within the environmental health community. Such connections proved instrumental in fostering mentorship, accessing future opportunities, and building a supportive community of like-minded professionals.

Sustained Support for Internship Work

Support to Interns

Under the revised version of NEPHIP, we provide enhanced coordination and evaluation support to interns, thereby strengthening the experiential learning outcomes of the program. Our staff play a vital role in assisting interns throughout their internship journey, such as helping them develop impactful presentations and publications based on the successful outcomes of their projects. This support ensures that interns are equipped with the necessary skills to effectively communicate their findings and contribute to the broader field of environmental health.

To further support the professional growth and development of NEPHIP interns, we offer a complimentary 1-year membership to our association. This membership grants interns access to an array of valuable resources exclusively available to our members. They gain the opportunity to participate in NEHA committees and engage in collaborative efforts to shape environmental health policies and practices. Moreover, interns gain access to the *Journal of Environmental Health*, a peer-reviewed publication tailored to the needs of researchers and practitioners in the field. This access enables interns to stay abreast of the latest research findings, emerging trends, and best practices.

Additionally, we provide interns with an extensive continuing professional education portfolio, offering more than 20,000 hours of e-learning opportunities. This comprehensive educational platform enables interns to enhance their knowledge and skills and ensures they remain up-to-date with the evolving landscape of environmental health. Furthermore, interns benefit from discounted registration fees for the AEC, our flagship event that offers unparalleled networking opportunities and exposure to cutting-edge advancements in the field. To facilitate ongoing communication and support, our exclusive newsletters keep interns informed about relevant trainings, funding opportunities, inclusion in national environmental public health workforce surveys, and upcoming events. These resources not only empower NEPHIP interns with the latest industry insights but also assist them in achieving their professional development goals.

Support to Participating Environmental Public Health Programs

As part of the revised version of NEPHIP, participating environmental public health program host sites receive financial support packages to alleviate the expenses associated with hosting an intern. This support aims to create a more sustainable and accessible internship experience for both the interns and the organizations involved. An exemplary instance of the positive impact of these financial support packages can be seen through the experience of the New Orleans Health Department, which hosted a virtual intern in fall 2022. With the assistance of the support package funds, the department was able to purchase a tablet specifically for the intern's mentors to use during virtual inspections (Photo 1). The financial package enabled the New Orleans Health Department to facilitate a comprehensive, immersive, and technologically adept virtual internship experience, despite the remote setting. For the intern, the opportunity to participate in virtual inspections using advanced technology was a vital experience and provided real-world skills and understanding that they could not have gained otherwise.

Photo 1. Sarah Baker, an environmental health officer with the New Orleans Department of Health and mentor to a National Environmental Public Health Internship Program (NEPHIP) intern, performs an inspection using the tablet provided through the NEPHIP Support Package. Photo courtesy of the New Orleans Department of Health.

The tangible benefits of the support packages extended beyond the duration of the internship, leaving a lasting impact on the operations of the health departments. For instance, during a housing inspection of a multi-unit building, the tablet proved to be an asset. The intern's mentors, accompanied by a representative from the office of code enforcement, used the tablet to document and record the inspection process. The convenience and efficiency afforded by the tablet greatly enhanced the inspection experience, surpassing the traditional method of relying on paper forms and clipboards. The significance of this support package did not go unnoticed by the New Orleans Health Department and the individuals involved in the inspection. They expressed their sincere gratitude for the difference the tablet made in their work. In fact, the representative from the office of code enforcement even expressed a touch of envy, recognizing the benefits of using a tablet for inspections in contrast to the more cumbersome paper-based approach.

This example highlights the tangible impact of the financial support packages provided through the revised program. By facili-

tating the acquisition of necessary tools and resources, such as tablets, laptops, and sampling equipment, host sites can enhance the internship experience, promote efficiency, and improve overall work quality. The support truly makes a difference in empowering environmental health professionals to excel in their roles and contribute effectively to their respective organizations.

Conclusion

Our strategic enhancements to NEPHIP showcase a steadfast commitment to creating enriching experiences for interns and fostering growth within environmental public health programs. These developments offer interns helpful opportunities for professional growth, networking, and positive contributions to the field of environmental public health. By investing in the future of the environmental health workforce, we strive to safeguard community well-being and enhance collective responsiveness to public health challenges.

None of this work, however, would be possible without the active involvement of committed health departments and STLT public health agencies. Therefore, we encourage STLT public health agencies and environmental public health programs to take part in this transformative journey as a host site for NEPHIP. In our pursuit of environmental public health excellence, we remain steadfast in fostering this program and laying the groundwork for a resilient, adaptable, and diverse workforce. As we endeavor to shape the future of public health, we value the contributions of all our partners and stakeholders.

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Did You Know?

The National Environmental Public Health Internship Program (NEPHIP) is a 400-hr paid internship opportunity that links environmental health undergraduate and graduate students with funded internship placements at qualified environmental public health agencies. NEPHIP focuses on building the environmental health workforce by exposing students to firsthand environmental public health work and career opportunities. Student applications for the spring 2024 session are open and will close on October 9. Applications for environmental health agencies are always open and will be accepted on a rolling basis if positions are open and available. Learn more at www.neha.org/nephip.

BUILDING CAPACITY

Tim Callahan, MPH

Everyone's Data Are Special—Or Are They?

Editor's Note: A need exists within environmental health agencies to increase their capacity to perform in an environment of diminishing resources. With limited resources and increasing demands, we need to seek new approaches to the practice of environmental health. Acutely aware of these challenges, the *Journal* publishes the Building Capacity column to educate, reinforce, and build on successes within the profession using technology to improve efficiency and extend the impact of environmental health agencies.

This column is authored by technical advisors of the National Environmental Health Association (NEHA) Data and Technology Section, as well as guest authors. The conclusions of this column are those of the author(s) and do not necessarily represent the views of NEHA.

Tim Callahan is a technical advisor of the NEHA Data and Technology Section. He is the director of the Evaluation and Support Program within the Environmental Health Section of the Georgia Department of Public Health.

Environmental health data systems and structures are more confoundingly diverse than even the variety of food inspection rules in place across the U.S. This situation is primarily due to the environmental health profession not evolving as many other public health operations have over the past years. Chronic and communicable diseases and other programs were developed out of national assessments or outbreaks where federal resources and requirements were formative to the creation of relatively uniform state and local operations. Conversely, environmental health started with cholera in a well here, malaria there, a community wanting safer food, or similar local concern to improve the quality of life and the longevity of the public.

This local, organic germination and maturing process is why environmental health is profoundly local, as often said by Dr. David Dyjack, executive director of the National Environmental Health Association. With over 2,800 public health operations in the U.S., there are just as many independent ways to collect, store, and analyze data collected. Another great supporter of our profession, Darryl Booth, general manager of environmental health at Accela, says something very similar: "If you have seen one health department, you have seen one health department." Booth is in the data management industry and has seen enough environmental health operations to know that each is as unique as its staff. The science that drives our work, however, is no different across agencies. The data we collect and use should be like the science we use, and should not be influenced by the personalities, policies, and practices of each agency.

Science at Its Center

Consider what makes up the basic work we record every day. We capture the location, date, time, type of service performed, and observed measurements. While that is an oversimplification, when we examine these pieces we do see potential items that could be standardized to allow for several benefits without having to change rules or having identical policies or practices.

Some examples of these benefits are:

- Ease of sharing data to compare:
  - » Policy impacts
  - » Best practices
  - » Results of changes in workload
- Substantial decreases in the cost to set up or change data systems
- An increase in reliable research to help prevent illness
- Identification of efficiencies or ways to support prioritizing efforts when resources are slim
- Ability to define the return on investment made into environmental health operations
- Incorporation of environmental health factors used in local medical decisions to support systems
- Reliable and valid data-centered storytelling to inform constituents and partners

These benefits require that the data we collect every day fit a structure that allows it to move. If you have ever moved your household, you will be familiar with the benefits of knowing the size and shape of the boxes and the weight of their contents. Data stan-

dards are the route to having the right size and shape of boxes to collect your data. This understanding makes it not only easier to move but also allows you to know where to get the stuff you need whenever you need it.

The Standard for Aquatic Facility Environments–Data (SAFE-D) model demonstrates this idea. Each piece of data is defined to support collecting whatever information you need from swimming pool inspections, regardless of your regulations, location, or jurisdiction. Setting up standards for each of the services we provide would require a similar focus on the science—and not any single regulation or way to get the service completed. If all fields of environmental health had standard data dictionaries that had common definitions, we could advance our ability to assess our data against other data, such as comparing socioeconomic factors, demographics, and public policies.

Cost Benefits

The reduced cost of setting up or changing your data system based on a standard dictionary comes from the fact that most, if not all the pieces, are already defined. As such, system developers and programmers can focus on making the user interface and reports as needed, and not have to reinvent the basic structure of the backend database. Using standardized data will also prevent cost and time overruns by helping you define the scope of your data project. Having a standard data dictionary and relationship structure to start with limits the customization, which is often the problem with project scope issues.

If you have your existing data already boxed up in a standardized system, it is far easier and less costly to convert it to another system should you find the need to change database systems or contractors. Most often, the greatest cost in time and funds in changing systems is the conversion of your data, if that is possible at all.

Get on Board or Build Our Own Ship?

The rest of public health is seeing huge investments in the Data Modernization Initiative (DMI), an initiative from the Centers for Disease Control and Prevention that aims to modernize data across the federal and state public health landscape (www.cdc.gov/surveillance/data-modernization/index.html). Even this massive federal effort to build a standard way to share data so that we can better identify disease threats is struggling with the fact that local offices do not have a data standard or have conflicting views of what should limit data sharing. As our data are related to primary prevention that only overlaps with the rest of public health when outbreaks happen, we are not a central part of this initiative.

So, we have a decision to make: Do we chase this DMI ship that is already sailing or do we prepare for our own journey that focuses on the needs of environmental health operations? Either way, now is the time to use the political winds to drive our efforts.

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DIRECT FROM CDC ENVIRONMENTAL HEALTH SERVICES

Tanya Telfair LeBlanc, PhD

Perri Ruckart, DrPH

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Educating Communities, Families, and High School Students About Lead Exposure as a Public Health Problem

Editor's Note: The National Environmental Health Association 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 this column on environmental health services from the Centers for Disease Control and Prevention (CDC) in every issue of the *Journal*.

In these columns, authors from CDC's Water, Food, and Environmental Health Services Branch, as well as guest authors, will share tools, resources, and guidance for environmental health practitioners. The conclusions in these columns are those of the author(s) and do not necessarily represent the official position of CDC.

Dr. Tanya Telfair LeBlanc is a senior health scientist/epidemiologist. Dr. Perri Ruckart is a health scientist and team lead. Shannon Omisore serves as a health communication specialist. All work in the Lead Poisoning Prevention and Environmental Health Tracking Branch at CDC.

One major public health achievement in the U.S. is lead exposure reduction among children but many remain at risk. Lead is a naturally occurring metal that has become a widespread environmental health hazard due to its broad use in industrial and commercial applications. Exposure to lead can seriously harm the health of children. The effects can include damage to the brain and nervous system, slowed growth and development, and learning and behavior problems. No safe blood lead level has been identified and adverse health effects have been documented for very low-level exposures. Children younger than 6 years are especially vulnerable because of their hand-to-mouth behavior and rapidly developing brains and nervous systems (LeBlanc et al., 2022; Wani et al., 2015). Though lead was banned in house paint in 1978 and in gasoline for on-road vehicles in 1996, additional routes of exposure have been identified.

Increasing lead use in industries and the expansion of global trade have opened additional exposure routes. Lead has been traditionally found in plumbing pipes, in paint in older homes, and in industries such as construction, mining, and manufacturing (Centers for Disease Control and Prevention, 2023). Toys, jewelry, cosmetics, food, and products imported from other countries might also contain lead, which has attracted additional attention with the expansion of global trade. Parents employed in industries that use lead (such as automotive repair and construction work) or those engaged in certain hobbies (such as hunting, fishing, and some arts and crafts) can inadvertently bring traces of lead into the home or vehicles on shoes or clothing. This situation can create potential risks to young children. Lead exposure is still a public health threat with long-term consequences for children, families, and society—but it may be under-recognized.

Children within populations with lower access to economic and social advantages or who live in lower-income households bear a disproportionate risk of exposure because they are more likely to live in housing built before 1978, which could contain leaded paint and plumbing (Woolf & Brown, 2022). Children might also lack access to foods rich in iron and calcium, which could block lead absorption (Hauptman et al., 2022). Additional populations, such as children who are recent immigrants or refugees, might be exposed to risks such as imported goods with high levels of lead.

Working With Partners to Raise Awareness About Lead

The Centers for Disease Control and Prevention (CDC), in partnership with the American Academy of Pediatrics, developed two community lead exposure prevention education videos suitable for posting online, sharing on social media, and disseminating via other opportunities to reach general audiences. These videos provide brief overviews of what lead is, where it is found, and why it is important to protect young children from exposure. One video was created for high school students at the 10th grade level. The language and content are specifically crafted to appeal to the 15–16-year age group. The other video is designed for parents, teachers, and people employed in many occupations that would benefit from this information, including real estate agents, plumbers, construction workers, and others.

Closed captions for the hearing impaired and 508 compliant versions for the visually impaired are available for each video. The videos are posted on the CDC website and

FIGURE **1**

Definition and Information About Lead

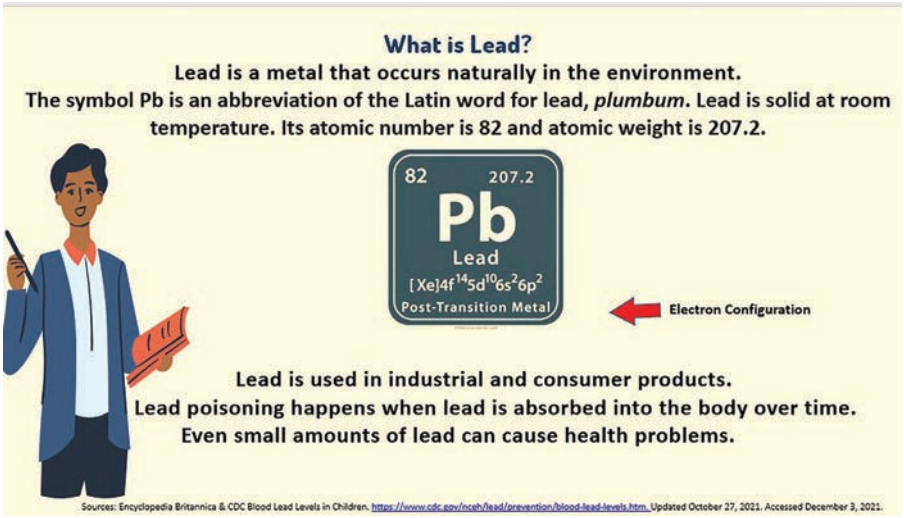

FIGURE **2**

Example of the Room-by-Room Tour of a Home That Points Out Potential Sources of Lead Exposure

include links to resources that can be shared via newsletters, through listservs, and in webinars and conferences. The videos are posted at www.cdc.gov/nceh/lead/resources/lead-poisoning-prevention-training.htm.

The videos include:

- **Childhood Lead Poisoning Prevention Education: Heads Up for High Schoolers**
  Using graphics and age-appropriate narration, this animated video shows how and where people can be exposed to lead. It also demonstrates how lead poisoning is harmful to children, adolescents, and adults. It begins with a definition of lead (Figure 1) and where it is found in the environment. The content demonstrates that lead exposure is harmful to everyone and affects multiple organs in the body, including the brain, kidneys, liver, blood, and reproductive systems. The video emphasizes that children under 6 years are most vulnerable to lead.

  In addition, the video takes an in-depth, room-by-room tour of a sample home and points out different places that can be a potential source of lead exposure (Figure 2). The content also provides a comprehensive list of occupations and industries known for potential lead exposure and other sources of exposure including toys, jewelry, and cosmetics. The video also shares a list of action items for adolescents to get involved in preventing lead exposure.
- **Childhood Lead Poisoning Prevention: Information for the Community**
  The purpose of this video is to show that lead exposure is a major public health problem and to highlight its continuing impact on children and adults (Figure 3). It reviews the sources of lead exposure, the major short- and long-term health outcomes of exposure, and how to help protect children from lead exposure.

  Some of the highlights include the adverse effects of lead poisoning by blood lead level and the impact lead exposure has on adults and children. The video describes age-specific developmental impacts on children affected by lead exposure, from preschool through high school, which include attention deficits to high-risk behaviors. In addition, the video provides information for home buyers, renters, and landlords regarding potential exposures in housing. It also describes lead-safe behaviors, including dietary recommendations and handwashing (Figure 4).

Knowledge and Awareness Is Essential to Prevention

Many parents and caregivers of children, as well as the general public, may not be aware that childhood lead poisoning is still a public health threat with long-term negative consequences for children, families, and society. The good news is that lead poisoning is preventable. Awareness and education are important components for initiating behavior changes and taking actions to prevent lead exposure at the community level (Arlinghaus & Johnston, 2018). These videos take a much-needed step

toward health equity and promote health self-advocacy related to lead exposure in populations that can benefit the most.

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FIGURE **3**

Impact of Lead Exposure on Children and Adults

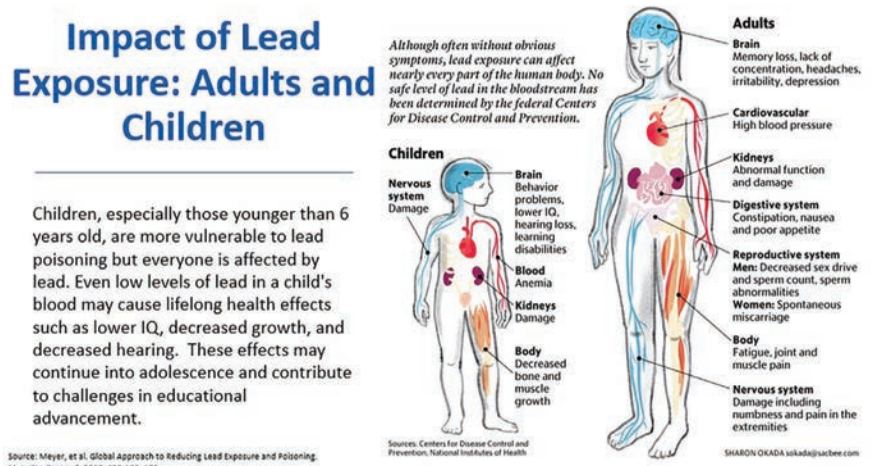

FIGURE **4**

Lead-Safe Behaviors

Did You Know?

Our new Health in All Policies (HiAP) Preparedness Guide provides a framework to take a HiAP approach to public health preparedness to improve the depth and effectiveness of collaboration at all stages of a response. Environmental public health officials can use the HiAP framework detailed in our guide to create a multisector approach to disaster preparedness. Visit www.neha.org/hiap-preparedness-guide to view the guide and download the available worksheets.

National Environmental Health Association

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Nicole Hill, MPH

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Weathering the Storm: Climate Change and the Mental Health of Children

Editor's Note: The National Environmental Health Association (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 this column from ecoAmerica whose mission is to build public support and political resolve for climate solutions. We are an official partner of ecoAmerica and we work closely with their Climate for Health Program, a coalition of health leaders committed to caring for our climate to care for our health. The conclusions in this column are those of the author(s) and do not necessarily represent the official position of NEHA.

Nicole Hill is the research and marketing manager for ecoAmerica. Ben Fulgencio-Turner is the director of Climate for Health within ecoAmerica.

Children today live in a complex world with numerous stressors on their mental health and well-being. From living through the COVID-19 pandemic and its far-reaching impacts to gun violence in schools, racism, and threats to civil and human rights and democracy, the uncertainties surrounding youth safety and security are growing.

Our climate continues to change at an alarming rate. Between 2011–2020, temperatures increased 1.1 °C above what they were between 1850–1900 (Intergovernmental Panel on Climate Change, 2023). This change has translated into hot summer days, poor air quality, and severe storms, oftentimes occurring at the same time in different areas of the country. In July 2023, the world experienced some of its hottest days on record (Feedman, 2023).

These changes have immediate physical health impacts on children, including but not limited to injury, asthma, waterborne and vectorborne diseases, heatstroke, and malnutrition (Clayton et al., 2021).

The impacts of climate change on mental health are, in some ways, even more concerning, beginning as early as in utero with ongoing exposure increasing the impacts. Research suggests that exposure to environmental stressors in utero might increase the risk of cognitive dysfunction in children (Vergunst & Berry, 2022). Another study shows an increase in mental health outcomes such as anxiety and depression among children who were in utero during Hurricane Sandy (Nomura et al., 2023). Children and youths who experience traumatic events such as extreme weather or wildfires may suffer from post-traumatic stress disorder (PTSD) or depression. Many young people face "climate anxiety," which is a chronic fear of climate or environmental-related doom. Further, research shows that exposure to polluted air increases the risk of poor mental health outcomes such as depression and anxiety (Latham et al., 2021; Lu, 2020; Trombley, 2023).

Environmental health professionals can play a key role to help support the mental health of children in the face of climate change. Just as climate change impacts children and youth in many ways, there is also a wide range of ways that environmental health professionals can act.

Some of these ways include:

1. **Education and Awareness:** Many educational resources are available, whether they are for yourself or for a young person in your life. The American Public Health Association (2020) created a Climate and Health Youth Education Toolkit designed for public health professionals. Connecting with and empowering high school students on climate change and health is a powerful way to use your experience as an environmental health professional. By educating yourself on the issue—such as completing the Climate for Health Ambassador Training (Climate for Health, n.d.)—you can help build awareness and encourage your colleagues to get involved in taking action, too.
2. **Risk Assessment:** Environmental health professionals who assess the risk of air pollution, flood waters, and other environmental hazards are already taking action on climate change. If the risks to children's mental health are not already being evaluated, making sure they are included in risk assessments could help understand the severity of the impacts. This process starts with conversations with your colleagues and other partners

about the risks children face, including negative mental health outcomes as a result of air pollution exposure.

3. **Community Resilience Building:** Many environmental health professionals work in local communities. As a member of your community, you can support community resilience by ensuring that local disaster preparedness plans are in place that take climate risks into account. Advocate for young people in your area so that their voices are heard and their perspectives are included in the plans. Making sure that all communities are equipped for climate-related emergencies might include, for example, designating buildings as cooling stations during heat waves or advocating for increased access to green space. Listening to the voices of young people, particularly from underrepresented groups and communities of color, will strengthen the final action plan with their perspectives. Climate for Health (2021a) has put together a Climate Solutions for Your Community resource document that may help.
4. **Support Parents:** Supporting parents is critical in the time of climate change because the well-being of children can be influenced by not only their experiences but also the experiences of others around them, especially their caretakers. Parents and caregivers often struggle to regain their own emotional stability after extreme events, which impacts their ability to offer support to their children (Zacher et al., 2022). Including parents and caregivers in resilience and preparation efforts can help identify their needs and link them with supportive resources.
5. **Policy and Systems Change:** You can educate policymakers and push for better climate change and mental health policies at community, state, and federal levels. One resource that may help you get started is Climate Solutions: Advocacy With Policy Makers (Climate for Health, 2021b). Also, look for ways to support young people as they advocate for change. There have been impressive actions presented by young people, such as the U.S. House of Representatives resolution that was authored by Schools for Climate Action and promotes youth mental health (Promoting Youth Mental Health, 2023). The voice of environmental health professionals matters and can help young leaders make lasting change.
6. **Research:** The field of children's mental health and climate change is growing. Additional research on the impacts, as well as on effective interventions and solutions, is necessary to continue guiding community leaders, policymakers, parents, health professionals, and educators in the right direction. The ecoAmerica (2023) report, Mental Health and Our Changing Climate: Children and Youth Report 2023, summarizes much of the current research. More research on impacts and effective responses can help families and health professionals to support children in a changing climate.

While we have presented some ways that environmental health professionals can get involved in protecting and advocating for the mental health of children, this list is not exhaustive. There is a plethora of actions that environmental professionals can take. You are likely already taking some actions to increase community resilience or to mitigate climate impacts in your personal and professional lives (Climate for Health, 2021c, 2021d). Look for ways to connect colleagues, family, and neighbors with this work (Climate for Health, 2021a), especially in the context of protecting children's health. The library of resources to help people get involved is growing and your voice as an environmental health professional can make a difference.

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NEPHIP INTERNS IN THE SPOTLIGHT

Tyler Zimmerman

Constructing a Robust Evaluation System for Improving Medical Needs Shelters: A Transformative Environmental Health Internship Experience

Editor's Note: The National Environmental Public Health Internship Program (NEPHIP) is a paid internship opportunity that links environmental health undergraduate and graduate students with funded internship placements at qualified state, tribal, local, and territorial environmental public health agencies. This workforce initiative supports the establishment of qualified applicant pipelines to help meet current and future environmental health professional workforce needs across the nation. NEPHIP is supported by the National Center for Environmental Health within the Centers for Disease Control and Prevention through a cooperative agreement (CDC-RFA-OT18-1802).

We are pleased to offer a new column in the *Journal* that shines a spotlight on the project work being done by NEPHIP interns within their host agencies. Through these columns, we hope to highlight the value and importance of practice-based internships for students and environmental public health agencies, as well as share ideas and information relevant to the profession. The conclusions of this column are those of the author(s) and do not necessarily represent the official position of NEHA, the host agencies, or the funders of the program.

Tyler Zimmerman was a NEPHIP intern during summer 2022 and completed his internship with the Office of Public Health Preparedness–Pee Dee Region within the South Carolina Department of Health and Environmental Control.

Last summer, I had the opportunity to participate in the National Environmental Public Health Internship Program (NEPHIP), a prestigious initiative by the National Environmental Health Association (NEHA). Despite the challenges posed by the ongoing COVID-19 pandemic, NEPHIP adapted its format to offer a remote internship experience. Through my placement with the Office of Public Health Preparedness–Pee Dee Region within the South Carolina Department of Health and Environmental Control (SC DHEC), I delved into the world of environmental health, expanded my knowledge, and honed my skills. Although lacking the fieldwork aspect, NEPHIP exceeded my expectations and provided me with valuable project work and industry exposure.

Transitioning to a Virtual Internship

NEHA and SC DHEC seamlessly transitioned the internship program into a fully remote format. Although I missed out on the hands-on experience of fieldwork, the support provided was exceptional. My liaison, Mary Ramirez, diligently arranged virtual agency meetings on diverse topics that allowed me to gain industry insights. Additionally, my project supervisor, Mark Hendrix, devoted time each week to address any challenges I encountered during my internship. The welcoming and supportive nature of the public health preparedness team helped me find my place within the bureau, fostering a productive environment.

Exploring the Pee Dee Region: A Study in Socioeconomic Contrasts

The Pee Dee Region—consisting of Chesterfield, Clarendon, Darlington, Dillon, Florence, Georgetown, Horry, Lee, Marion, Marlboro, Sumter, and Williamsburg counties—stretches across the northeastern quadrant of South Carolina. While the region is home to Myrtle Beach, the popular tourist destination, it also faces significant socioeconomic challenges. With 6 of the top 14 poorest counties in South Carolina, the Pee Dee Region exhibits a unique social demographic, highlighted by an immense wealth gap. These disparities underscore the need for comprehensive public health preparedness strategies in the region.

Developing a Strategic Evaluation System

During my internship, my primary project revolved around researching and identifying key factors that impact the day-to-day operation of medical needs shelters within the Pee Dee Region. Leveraging the Pee Dee Public Health Preparedness Bureau's online database, I collated information and synthesized it into a comprehensive evaluation

system. This system aimed to strategically score medical needs shelters on multiple operational factors, such as proximity to the shoreline, capacity, staffing requirements, access to emergency departments, evacuation routes, feeding options, past hurricane damage, and the social vulnerability index score of the surrounding county. By eliminating potential biases inherent in the current rating system, this tool could assist the Pee Dee Public Health Preparedness Team in assigning numerical scores that represent the strategic value of each medical needs shelter.

Immersing in Environmental Health: Igniting Passion for Equitable Practices

My internship experience sparked a profound passion within me for the fields of emergency preparedness and risk assessment. The process of developing the evaluation tool not only captured my interest but also ignited a deep sense of purpose. I became truly passionate about making a significant impact by improving the evaluation tools available for medical needs shelters, knowing that my contributions could positively transform the lives of vulnerable individuals in the Pee Dee Region.

I became acutely aware of the critical role that equitable practices play in safeguarding communities, particularly those facing disproportionate environmental risks and hazards. The opportunity to be involved in a project that aims to eliminate biases in the current rating system further fueled my drive to ensure fairness and justice in healthcare provision.

Moreover, I found myself fully engaged in exploring the complexities of environmental public health principles, health equity models, and mass care and emergency management concepts. This comprehensive understanding deepened my commitment to finding innovative solutions and strategies to address environmental health challenges not only within medical needs shelters but also on a broader scale.

Working on this project enabled me to create real and meaningful impacts on individual lives, while also deepening my understanding of the intricate relationship between environmental health and public health. It fueled my drive to advocate for equity and inclusivity in healthcare, and this unwavering dedication continues to motivate me as I pursue a career focused on enhancing community well-being and fostering a healthier, more sustainable future.

The Leadership Report: A Showcase of Learned Skills and Accomplishments

To culminate my internship, I prepared and delivered a leadership report that showcased my project and its potential implications. This experience pushed me to enhance my presentation, communication, and education skills, which allowed me to effectively convey the significance of my work. The report garnered interest from senior leadership who expressed enthusiasm for implementing and expanding my project within their respective departments. Mark Hendrix, director of the Office of Public Health Preparedness–Pee Dee Region, commended the project, stating, "Thanks to this project, our agency now has a means to evaluate sites that have been chosen based on a framework of inclusion and access to potentially vulnerable communities during hurricanes and flooding events. We are continuing to use this to evaluate new sites and adopting this concept to our medical countermeasures planning for old and new sites." This recognition from senior leadership affirmed the significance of my efforts and provided me with a sense of accomplishment and motivation to continue pursuing my passion for creating positive change in the field of environmental public health.

Reflecting on a Transformative Internship: A Road Map for Future Aspirations

Reflecting on my internship, I am overwhelmingly satisfied with the opportunities it presented. Despite the limitations imposed by the remote format, I was fully immersed in my project and the work it entailed. Moreover, being paired with a health department outside my home state broadened my perspective and exposed me to unique regional challenges. While the absence of in-person engagement was regrettable, the skills and experience I gained from this internship have significantly prepared me for a future career in the environmental health profession. As I embark on the final year of my degree and prepare for subsequent employment, the invaluable lessons from NEPHIP will undoubtedly guide my path.

The Power of a Robust Internship Experience: The Lasting Influence of NEPHIP

NEPHIP offered an exceptional experience, even in the face of the virtual limitations imposed by the COVID-19 pandemic. Through my placement, I was able to delve into the complexities of environmental health, develop a strategic evaluation system, and refine my skills. The supportive network and valuable insights gained from this internship have shaped my understanding of the environmental health industry, preparing me for future challenges and endeavors. While virtual, NEPHIP served as a transformative stepping stone toward a career dedicated to safeguarding public well-being.

About the Author: Tyler Zimmerman is a senior at Central Michigan University majoring in environmental health and safety and minoring in leadership. He was a NEPHIP intern during summer 2022 and completed his internship with the Office of Public Health Preparedness–Pee Dee Region within the South Carolina Department of Health and Environmental Control. He is a Leader Advancement Scholar, student body president of Central Michigan University, and recipient of the 2023 Future Alumni Leader Award. Zimmerman is currently employed as an environmental compliance assistant with the Department of Risk Management, Environmental Health, and Safety at Central Michigan University. He will graduate with his bachelor of science in 2024.

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Did You Know?

October 12 is Children's Environmental Health Day. The Children's Environmental Health Network established the observance to increase the visibility of children's environmental health issues and empower action. Learn more at https://cehday.org.

ENVIRONMENTAL HEALTH **CALENDAR**

UPCOMING NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION (NEHA) CONFERENCE

July 15–18, 2024: NEHA 2024 Annual Educational Conference & Exhibition, David L. Lawrence Convention Center, Pittsburgh, PA, https://www.neha.org/aec

NEHA AFFILIATE AND REGIONAL LISTINGS

Alabama
December 5–8, 2023: Annual Conference, Alabama Environmental Health Association, Rogersville, AL, https://www.aeha-online.com

Colorado
October 11–13, 2023: 67th Annual Education Conference, Colorado Environmental Health Association, Estes Park, CO, https://ceha49.wildapricot.org

Florida
October 1–7, 2023: 75th Annual Education Meeting (AEM), Florida Environmental Health Association, Crystal River, FL, https://feha.org

Illinois
November 8–9, 2023: Annual Educational Conference, Illinois Environmental Health Association, Oglesby, IL, https://www.iehaonline.org

Kansas
October 10–12, 2023: Annual Fall Conference, Kansas Environmental Health Association, Mulvane, KS, https://kansasenvironmentalhealthassociation.org

Nebraska
October 24, 2023: Annual Education Conference, Nebraska Environmental Health Association, Mahoney State Park, NE, https://nebraskaneha.com

North Dakota
October 17–19, 2023: NDEHA–NCAFDO–Region 4 NEHA Regional Education Conference, North Dakota Environmental Health Association (NDEHA), North Central Association of Food and Drug Officials (NCAFDO), and NEHA Region 4 Affiliates, West Fargo, ND, https://ndeha.org

Ohio
April 11–12, 2024: Annual Educational Conference, Ohio Environmental Health Association, Columbus, OH, http://www.ohioeha.org

Oregon
October 24–26, 2023: Annual Education Conference, Oregon Environmental Health Association, Newport, OR, https://www.oregoneha.org/about-1

Texas
October 16–20, 2023: 67th Annual Educational Conference, Texas Environmental Health Association (TEHA), Georgetown, TX, https://myteha.org

December 6–8, 2023: 20th Annual TEHA-STC Educational Conference, South Texas Chapter (STC) of TEHA, South Padre Island, TX, https://myteha.org/page/SouthTexas

Utah
October 4–6, 2023: Fall Conference, Utah Environmental Health Association, Park City, UT, https://sites.google.com/ueha.org/ueha/home

TOPICAL LISTINGS

Food Safety
January 22–24, 2024: Integrated Foodborne Outbreak Response and Management (InFORM) Conference, Washington, DC, https://www.neha.org/inform

General Environmental Health
May 20–24, 2024: 17th IFEH World Congress on Environmental Health, International Federation of Environmental Health (IFEH), Perth, Australia, https://www.wceh2024perth.com

One Health
October 2–6, 2023: One Health Conference: One Health | One Global Environment, Jamaica Association of Public Health Inspectors, Montego Bay, Jamaica, https://www.onehealthconference.com

Water Quality
October 22–25, 2023: Onsite Wastewater Mega-Conference, National Onsite Wastewater Recycling Association, Hampton, VA, https://www.nowra.org/conference/mega-conference

November 13–15, 2023: World Aquatic Health Conference, presented by the Pool & Hot Tub Alliance, Las Vegas, NV, https://wahc.phta.org

Did You Know?

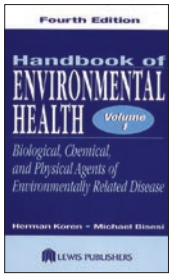
You can share your educational events on our website at www.neha.org/education/events. Events should be educational and should benefit the environmental health workforce. Just fill out the submission form with your event information and we will review the submission for posting.

RESOURCE CORNER

Resource Corner highlights different resources the National Environmental Health Association (NEHA) has available to meet your education and training needs. These resources provide you with information and knowledge to advance your professional development. Visit our online bookstore at www.neha.org/store for additional information about these and many other pertinent resources!

Handbook of Environmental Health, Volume 1: Biological, Chemical, and Physical Agents of Environmentally Related Disease (4th Edition)

Herman Koren and Michael Bisesi (2003)

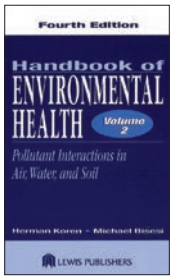


A must for the reference library of anyone in the environmental health profession, this book focuses on factors that are generally associated with the internal environment. It was written by experts in the field and copublished with the National Environmental Health Association (NEHA). A variety of environmental issues are covered such as food safety, food technology, insect and rodent control, indoor air quality, hospital environment, home environment, injury control, pesticides, industrial hygiene, instrumentation, and much more. Environmental issues, energy, practical microbiology and chemistry, risk assessment, emerging infectious diseases, laws, toxicology, epidemiology, human physiology, and the effects of the environment on humans are also covered. Study reference for the NEHA Registered Environmental Health Specialist/Registered Sanitarian credential exam.

790 pages, hardback
Member: $215/Nonmember: $245

Handbook of Environmental Health, Volume 2: Pollutant Interactions With Air, Water, and Soil (4th Edition)

Herman Koren and Michael Bisesi (2003)

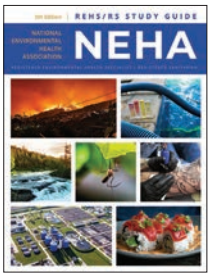


A must for the reference library of anyone in the environmental health profession, this book focuses on factors that are generally associated with the outdoor environment. It was written by experts in the field and copublished with NEHA. A variety of environmental issues are covered such as toxic air pollutants and air quality control; risk assessment; solid and hazardous waste problems and controls; safe drinking water problems and standards; onsite and public sewage problems and control; plumbing hazards; air, water, and solid waste programs; technology transfer; GIS and mapping; bioterrorism and security; disaster emergency health programs; ocean dumping; and much more. Study reference for the NEHA Registered Environmental Health Specialist/Registered Sanitarian credential exam.

876 pages, hardback
Member: $215/Nonmember: $245

REHS/RS Study Guide (5th Edition)

National Environmental Health Association (2021)



The Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS) credential is the premier credential of NEHA. This edition reflects the most recent changes and advancements in environmental health technologies and theories. Incorporating the insights of 29 subject matter experts from across academia, industry, and the regulatory community, paired with references from over 30 scholarly resources, this essential reference is intended to help those seeking to obtain the NEHA REHS/RS credential. Chapters include general environmental health; statutes and regulations; food protection; potable water; wastewater; solid and hazardous waste; hazardous materials; zoonoses, vectors, pests, and poisonous plants; radiation protection; occupational safety and health; air quality and environmental noise; housing sanitation and safety; institutions and licensed establishments; swimming pools and recreational facilities; and emergency preparedness.

261 pages, spiral-bound paperback
Member: $169/Nonmember: $199

Control of Communicable Diseases Manual (21st Edition)

Edited by David L. Heymann, MD (2022)

The 21st edition of the *Control of Communicable Diseases Manual* (*CCDM*) was updated to include new chapters on SARS-CoV-2, Zika virus, and many other pathogens and infectious diseases. This landmark publication is essential to people working in and around public health. The manual is one of the most widely recognized sourcebooks on infectious diseases and provides detailed, accurate, and informative text for public health workers. Each listing is easy to read and includes identification, infectious agent, occurrence, mode of transmission, incubation period, susceptibility, and resistance. The *CCDM* is a study reference for the NEHA Registered Environmental Health Specialist/Registered Sanitarian and Certified Professional–Food Safety credential exams.

750 pages, paperback
Member: $75/Nonmember: $85

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NEHA **NEWS**

NEHA Policy Statements

One of the responsibilities of the National Environmental Health Association (NEHA) is to speak up on issues of concern to our members and the profession through the adoption of policy statements. These statements have been vetted by our team and adopted by our Board of Directors as official statements of the association. Each statement sets forth our beliefs on a specific subject related to environmental health and is shared with state, local, and federal policymakers, as well as relevant environmental and public health boards. The policies remain active for 5 years.

Several of our policy statements were updated and approved by our board in July 2023. The following is a list of the updated statements:

- **Policy Statement on Climate Change:** We recognize climate change as a global environmental health problem that has health and safety impacts on individuals and communities. We support building the capacity of environmental health professionals to address the health impacts of climate change with risk assessment, adaptation, and mitigation planning. We support federal, state, local, tribal, and territorial jurisdictions in developing policies, using frameworks, and implementing plans to address climate and health, including technical assistance and training.
- **Policy Statement on Enrollment and Conformance With the Voluntary National Retail Food Regulatory Program Standards of the Food and Drug Administration:** We recommend all federal, state, local, tribal, and territorial governmental agencies to enroll in the Voluntary National Retail Food Regulatory Program Standards to implement current national standards that outline a process of program self-assessment and continuous improvement of existing regulatory program measures to help reduce foodborne illness risk factors. Enrollment and conformance ensure the safety and security of the food supply at the retail level.
- **Policy Statement on Food Safety Related to Consumable Cannabis Products:** We support the implementation of regulations related to consumable cannabis products that contain sufficient authority to prevent illness and encourage the inclusion of policies and actions to ensure food safety.
- **Policy Statement on Raw Milk:** We have long supported preventive measures to protect the safety of food for the public. Further, we acknowledge the importance of milk as a source of nutrition and are concerned about the safety of milk and milk products. Our position regarding raw milk is consistent with sound, science-based, preventive public health measures.
- **Policy Statement on Recreational Waters and the Model Aquatic Health Code:** We support national, state, and local policies, regulations, research, and resources that will enhance the abilities of environmental health professionals to ensure aquatic venue safety and to protect public health.
- **Policy Statement on the Need for Data Modernization and Informatics in Environmental Health Programs:** We support investments, regulations, and requirements as appropriate for standardization of data structures, data dictionaries, data sharing laws and policies, and messaging systems. Standardized system structures will support cross-jurisdictional data sharing; data collection, analysis, and visualization (DAV) systems; and research that aids decision support systems for policy and practice implementation. We also advocate for advanced training of the environmental health workforce in informatics and DAV systems.

Thank you to our committee members, board, and staff for their work on updating these policy statements. The updated statements, along with our other current statements, can be viewed at www.neha.org/policy.

NEHA Position Statements

Position statements reflect our position on certain concerns and actions that we will undertake as an association. These statements have been vetted by our staff and adopted by our Board of Directors as official actions or directions of the association. These statements set forth our beliefs on a specific subject related to environmental health. These positions remain active for 1 year. We have recently posted two new position statements:

- **Position Statement on Natural Disasters**
- **Role of Environmental Health in Addressing Environmental Justice**

Thank you to our committee members, board, and staff for their work on updating or drafting these policy statements. View all of our position statements at www.neha.org/positions.

NEHA Sunsets Three Credentials

Our Board of Directors voted in July 2023 to discontinue three of our credentials:

- Certified Food Outbreak Investigator (CFOI)
- Certified in Food Safety Supplier Audits (CFSSA)
- Registered Food Safety Auditor (RFSA)

While we will no longer be able to certify new individuals for these credentials, they continue to be a mark of distinction. We will continue to stand behind the credentials and encourage current credential holders to keep their credentials up-to-date by maintaining the necessary continuing education contact hours.

This change will allow us to focus our limited resources on our three premier credentials:

- Registered Environmental Health Specialist/Registered Sanitarian (REHS/RS)
- Certified Professional–Food Safety (CP-FS)
- Certified in Comprehensive Food Safety (CCFS)

Learn more about our credentials at www.neha.org/credentials.

Call for Abstracts for the NEHA 2024 AEC Closes on October 9

The Call for Abstracts for the 2024 Annual Educational Conference (AEC) & Exhibition opened on August 28 and will close on **October 9**. We invite you to take advantage of this opportunity to provide unique insight and share your experience, expertise, knowledge, and research by submitting an abstract for our 2024 AEC in Pittsburgh, Pennsylvania, on July 15–18, 2024. Your insight can provide fellow environmental health professionals with practical skills and knowledge they can take back to implement in their jurisdictions and departments.

The 2024 AEC Review Committee will review all abstract submissions based on quality, relevance, impact, and originality. Furthermore, the review committee reserves the right to request edits to submitted presentations or to reject a submitted presentation if it does not meet review criteria or follow submission guidelines.

Learn more about the submission process and our educational tracks, as well as submit your abstract, at www.neha.org/aec-call-abstracts.

NEHA-FDA RFFM Grant Program Portal Closes October 11

The grant portal for Year 3 of the NEHA-Food and Drug Administration (FDA) Retail Flexible Funding Model (RFFM) Grant Program will close on **October 11**. This annual funding opportunity supports state, local, tribal, and territorial retail food regulatory programs to meet the FDA Voluntary National Retail Food Regulatory Program Standards. These grants are supported by FDA under award U2FFD007358.

Retail food safety programs can apply for a base grant (through one of two tracks) and up to three additional add-on grants (for Track 2 applicants and Track 3 grantees). Consider applying for:

- A Track 1 Development Base Grant with options to be a mentee and/or attend a self-assessment and verification audit (SA/VA) workshop.
- A Track 2 Development Base Grant with options to be a mentee, work on Standard 9, and/or attend retail training courses.
- Optional Add-On Grants:
  - » In addition to the options above, Track 2 applicants may also apply to be a mentor (instead of a mentee) and/or apply for a Special Projects Grant.
  - » Existing Track 3 Maintenance and Advancement Base Grantees may apply to be a mentor or a mentee, request funds for retail training courses, and/or apply for a Special Projects Grant.

Learn more at www.neha.org/retail-grants.

2024 InFORM Conference

The Integrated Foodborne Outbreak Response and Management (InFORM) Conference brings together the network of public health officials involved with foodborne and enteric disease outbreak response. This network includes current federal, state, and local public health and environmental health specialists, epidemiologists, health communicators, and laboratory scientists. Held every 2 years, the conference consists of a keynote speaker, plenary and discipline-specific sessions, and poster presentations. The 2024 InFORM Conference will be held on January 22–24, 2024, in Washington, DC.

Invited participants include public health colleagues from local, state, tribal, or federal agencies and departments involved in enteric disease surveillance and outbreak response. This includes but is not limited to:

- Environmental health specialists involved in enteric disease outbreak investigations.
- Epidemiologists who investigate local or multistate enteric disease outbreaks.
- Health communicators involved in enteric disease outbreaks, prevention, and food safety education.
- Laboratory scientists who are a part of the PulseNet Network or who are interested in learning more about PulseNet.

The InFORM Conference celebrates this robust network of public health officials who are connected by cause, driven by data, and empowered by collaboration. If you are currently a public health official who works in foodborne and enteric diseases, please consider joining us for the first in-person InFORM Conference since 2017.

The initial abstract submission period closed on August 25, but a late breaker abstract submission period will open on October 2 and close on October 16. Take advantage of this submission window to ensure the environmental health perspective is included in discussions about foodborne and enteric disease outbreak response.

For more details on the 2024 InFORM Conference, visit www.neha.org/inform.

NEHA MEMBER SPOTLIGHT

Vincentiu Anghel, MPA, REHS, REALTOR®
Wardley Real Estate

The National Environmental Health Association (NEHA) is shining a spotlight on the people within our membership through this new feature in the *Journal*. This month we are pleased to introduce you to Vincentiu Anghel, an independent environmental consultant and realtor who works at Wardley Real Estate in Las Vegas, Nevada.

Anghel attended the University of Nevada, Las Vegas, and earned a science degree in environmental studies. He has been in the environmental health profession for 8 years. He started out in the profession as an intern at the Clark County Water Reclamation District, then spent the bulk of his public sector career at the Southern Nevada Health District (SNHD). While working in the solid waste enforcement section of SNHD, he developed an interest in real estate.

His background as a registered environmental health specialist is instrumental in helping his clients. Anghel uses his experience to educate clients on potential environmental issues related to a property so they can make informed decisions. In addition to real estate, he recently became an environmental consultant and provides guidance to local businesses around Las Vegas to improve their compliance with local environmental health regulations.

Why did you join NEHA and what aspects of membership have you found most valuable to your career?
I joined NEHA for the training opportunities and the most valuable is the Annual Educational Conference (AEC). I attended the 2019 AEC in Nashville and it was an experience I will never forget. NEHA did a wonderful job of bringing together like-minded public health individuals. I enjoyed not only spending time with my colleagues but also meeting other people in the industry from all over the U.S. and the world.

Why did you choose the environmental health field?
I grew up between city and rural life in my home country of Romania, and later in Las Vegas. From my days as a kid, I loved spending time outdoors. Environmental health was the best fit for me as I enjoy venturing into the field versus being stuck in an office all day.

What accomplishment are you most proud of?
I am proud of publishing my first book, *Deputy V8: The Vegas Health Patrol*, to honor the environmental health profession through the comical situations I came across during my career. V8 was my nickname while working at SNHD and I decided to permanently preserve that nickname along with the memories from my time in the public sector. The book is available on Amazon.

Who do you look up to and why?
I look up to my ancestors—both my direct family and historical figures—because you can never grow a strong tree without the power of the roots. My roots started in Romania, a resilient country that has survived plagues and wars. My forebearers survived a communist regime and without their effort and sacrifice, I would not exist. I am also grateful for my parents who never gave up on the dream to bring us to the U.S. After 10 years of rejection on the visa lottery application, we finally made it to the U.S. in 2005. The opportunity to come to this country was a key turning point in my life.

Is there a resource that you use frequently for your work that you would recommend for other environmental health professionals?
The NEHA website is my top recommendation. The monthly E-*Journal* is excellent in keeping up with current environmental health trends. And if you need continuing education units, watch the recorded AEC sessions online. They cover every environmental health topic you can think of from previous AECs.

What was the best professional advice given to you?
The best professional advice I ever received was to never stop evolving because complacency kills the soul. I simplified this advice as it was a repeated message to me from various perspectives by all the inspiring professionals, teachers, coaches, and countless others who have impacted me across my life journey. In today's world, I noticed people have distanced themselves from the creative sides that we all have. In my case, I read daily and write down multiple ideas each day for how I can improve my business or literary works. Most of the ideas are trash—cordially known as solid waste—but occasionally one idea works out. The key is to never stop applying yourself in pursuing your passions because one day you will realize you are doing the very activities you dreamed about in the past.

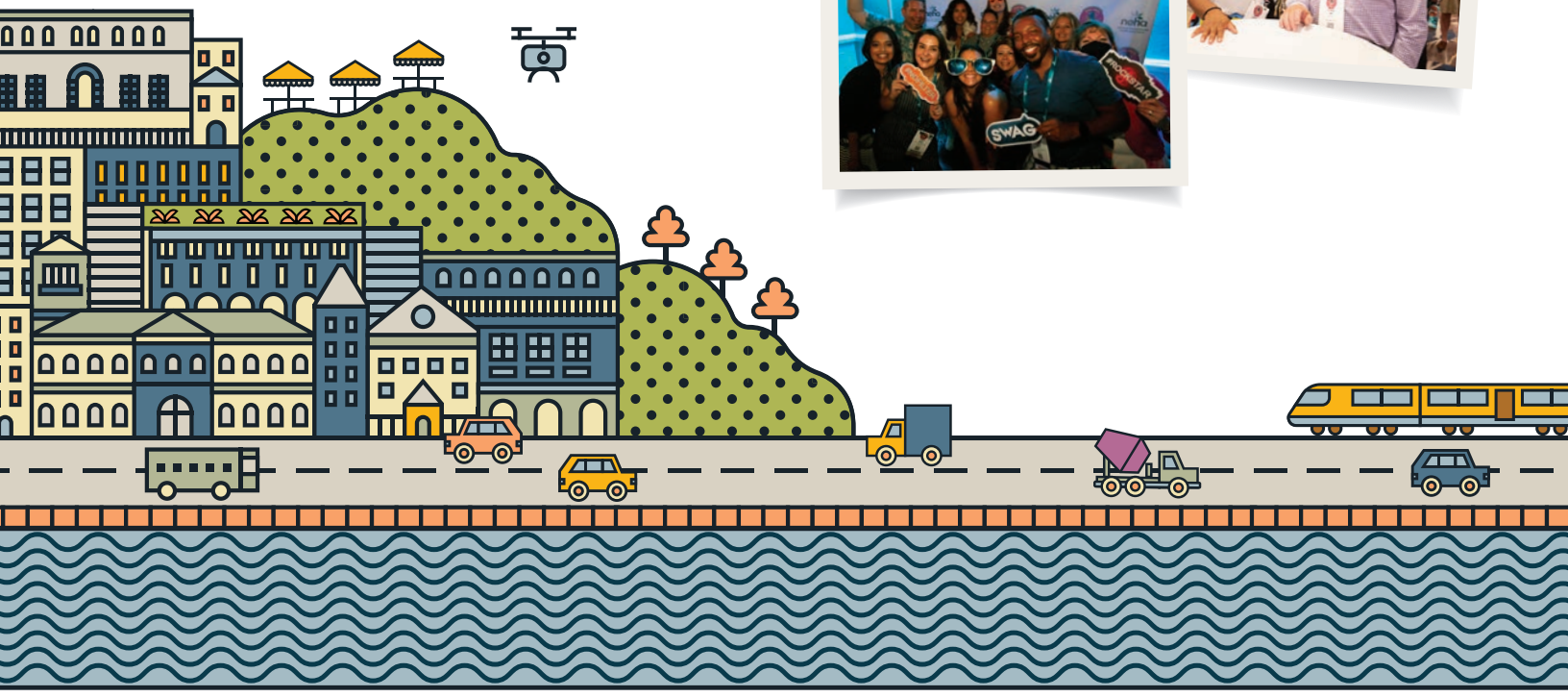
We thank Vincentiu Anghel for sharing with us! You can read a full version of this spotlight at www.neha.org/membership/spotlights.

Save the Date.

Pittsburgh, PA
July 15–18, 2024

AEC 24

Call for Abstracts Closes **October 9.**
Exhibitor Registration Opens **October 2.**
Attendee Registration Opens **December 1.**



Learn more at **neha.org**

neha National Environmental Health Association Presents

87th Annual Educational Conference & Exhibition

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NEHA 2023

HS GovTech™ was proud to be the presenting sponsor for NEHA 2023 AEC for the 3rd year in a row. As always, it was great to see everyone who attended. Connecting with friends and colleagues, sharing ideas and experiences are the most important aspects of attending conferences.

We were excited to welcome the attendees on opening night, engage in hundreds of conversations, give speeches on interesting topics in the EH industry, give away prizes, and unveil our next generation of product enhancements including GIS functionality, enhanced chat features, and advanced ad-hoc reporting tools.

We are thrilled to roll out additional innovative product enhancements for 2024.
See you in Pittsburgh!

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