Environmental Assessments: An Important Part of

Environmental assessments (EAs) help ensure outbreaks are fully understood and addressed to protect health (Brown et al., 2017). Key information about sick (agent). Environmental health specialists collect environmental samples and data to see how the agent was able to infect the host.

Sharing outbreak data can help determine the system failures (contributing factors) and root causes (environmental antecedents) of an outbreak. These data also help investigators recommend actions to stop the outbreak and prevent another one.

Environmental Assessments Help Investigators Learn How and Why an Outbreak Occurs

An EA helps investigators describe where the outbreak happened (outbreak environment). Investigators study the outbreak environment, like a system made up of many parts. They examine how parts of the system—

inputs, processes, variables, outputs, and outcomes—influence one another (Figure 1) to determine how the outbreak occurred (contributing factors). They can then examine which variables, such as processes, people, economics, and equipment, are responsible for the outbreak (environmental antecedents).
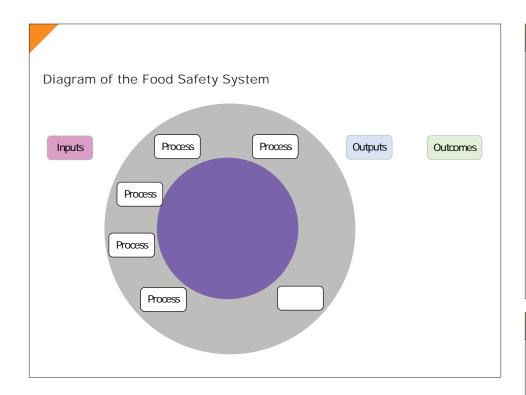
For example, when recurring outbreaks of acute gastroenteritis occurred on two cruise ships in 2019 (Rispens et al., 2019), investigators suspected norovirus as the agent based on the symptoms experienced and duration of illness. They collected epidemiological data and based on prior knowledge, they moved their focus to the supplier. The investigators were able to trace the frozen berries back to a single supplier and determined that contamination most likely occurred from this source. As a result, the World Health Organization issued a recall notice for those berries. Without a traceback investigation to con rm a supplier-based outbreak due to contaminated food, people would have likely continued to get sick.

Diagram of the Food Safety System

Inputs | Process | Process | Outputs | Outcomes

Process

Process

Process

Data Collected During Environmental Assessments Can Help Inform Prevention Efforts

Illness outbreaks are common in food settings. Data from the Centers for Disease Control and Prevention (CDC) show that restaurants with certified kitchen managers had lower rates of foodborne norovirus outbreaks compared to those without certified kitchen managers (Hoover et al., 2020). In addition, EA data from 404 outbreaks showed key gaps in retail food safety practices and outbreak investigations, particularly around sick workers who were noted to be a common source of food contamination and outbreaks (Lipcsei et al., 2019).

EAs can also apply to other settings, like outbreaks related to water. For example, outbreak investigations of Legionnaires disease require an EA to identify potential sources of exposure (Garrison et al., 2016) and such assessments have shown that water management programs are an effective control strategy for preventing Legionella outbreaks (Clopper, Kunz, Salandy, et al., 2021).

Environmental Assessments Are Different From Inspections and Require Different Training

Routine inspections look at regulations, operational violations, and sanitary conditions during normal operations when there is no outbreak. EAs look for clues to understand how factors in the environment led to an outbreak. Since outbreaks can be infrequent in a community, EAs might not be common for health department staff. Everyone needs to know their roles during an outbreak investigation. Training staff before the emergency means they will be ready when an outbreak occurs.

Centers for Disease Control and Prevention Tools to Help Conduct Environmental Assessments

CDCs National Environmental Assessment Reporting System helps food safety programs capture EA data from investigations of foodborne illness. Programs can join for free and use their data to help identify environmental causes of outbreaks and take follow-up actions to reduce or prevent future outbreaks. CDCs Environmental Assessment Training Series provides training on the role of EAs in the context of outbreak investigations and the food safety system.

The Legionella Environmental Assessment Form helps investigators assess a facilitys water system, determine whether to conduct Legionella environmental sampling, and helps investigators design sampling plans.

Environmental Assessment Data

States, tribes, localities, and territories can adopt the Food and Drug Administration's *Food Code* for their own restaurant food safety rules. The Centers for Disease Control and Prevention's environmental assessment (EA) data show that states that have adopted the *Food Code* provision on certified kitchen managers have fewer norovirus outbreaks.

Data from the National Environmental Assessment Reporting System (NEARS) have also helped us understand the following:
- Why investigators did or did not conduct EAs for outbreaks.
- Practices linked to smaller and shorter norovirus outbreaks in restaurants.
- Traits to outbreaks that helped investigators identify their contributing factors.

Learn more about ndings from NEARS at www.cdc.gov/nceh/ehs/nears/publications.htm.

The CDC Toolkit for Controlling Legionella in Common Sources of Exposure can further support EAs during public health investiga-

tions. The toolkit contains essential information regarding design, operation, maintenance, and controls specific to the source of exposure (Clopper, Kunz, & Hannapel, 2021). Investigators can watch educational videos (Photo 1) to learn tips for conducting these EAs and how to interpret results from the form.

Environmental Assessment Data Improve Public Health Outcomes

Outbreak investigations can be complex and difficult to solve. The goal of every investigation is to learn how and why the outbreak is occurring and fix the problem to help prevent more illness. Data collected from outbreaks can inform the most common contributing factors and environmental antecedents. What we learn from EA data can help identify risk factors and stop outbreaks before they occur. Ultimately, this evidence-based information strengthens the science behind the root causes of an outbreak to inform and influence public health practices and policies.

Hoover, E.R., Hedeen, N., Freeland, A., Kambhampati, A., Dewey-Mattia, D., Scott, K.-W., Hall, A., & Brown, L. (2020). Restaurant policies and practices related to norovirus outbreak size and duration. Journal of Food Protection, 83(9), 1607 1618. https://doi.org/10.4315/JFP-20-102

Lipcsei, L.E., Brown, L.G., Coleman, E.W., Kramer, A., Masters, M., Wittry, B.C., Reed, K., & Radke, V.J. (2019). Foodborne illness outbreaks at retail establishments National Environmental Assessment Reporting System, 16 state and local health departments, 2014 2016. Morbidity and Mortality Weekly Report Surveillance Summaries, 68(1), 1 20. https://doi.org/10.15585/mmwr.ss6801a1

Rispens, J.R., Freeland, A., Wittry, B., Kramer, A., Barclay, L., Vinjø, J., Tref letti, A., & Houston, K. (2020). Notes from the eld: Multiple cruise ship outbreaks of norovirus associated with frozen fruits and berries United States, 2019. Morbidity and Mortality Weekly Report, 69(16), 501 502. https://doi.org/10.15585/mmwr.mm6916a3

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