Public Health Laboratories (PHL) 101

Hey there, everyone. Thank you so much for joining our OneLab Network Session today. Good morning, afternoon, evening, wherever you are in the world. Thank you so much for joining us. We're very excited for our session today. I'm going to go ahead and jump right in. So my name is Chelsea Parsons, and I'm a consultant with Guidehouse supporting the CDC OneLab Initiative. I just have a couple of notes on today's webinar before we get started. If you're having any technical difficulties at all throughout the session, you can feel free to email our OneLab Inbox. And it's onelab@cdc.gov. That's onelab@cdc.gov.
If you're having questions during the session regarding the session content, you should have a Q&A function down in your bottom panel. So you can open up that function at any time throughout the session, enter the question you have at the moment. If it's for a specific presenter, feel free to put their name in there as well.
And we're going to have a Q&A session at the very end of all the presentations today that will try to address as many of your questions as we possibly can. But if we can't get to them, you can feel free to send some more questions to our OneLab Inbox as well.

So another note. You'll see in the Chat, there's been a link posted to access live captions if that's something you want to access today. You'll go ahead and open that link up. And just to note, you're going to have to keep this Zoom open as well and open up that link in a separate browser. You can pull them side by side. You'll just need to make sure you keep them both open to be able to view both.
So let's go ahead and take a look at today's agenda. So we're going to get started by introducing our presenters. We've got a great group of presenters today. And we're very thankful to have them presenting on this topic.
We'll have our OneLab lead, Alicia Branch, talk to you about some upcoming resources that we'll be creating and launching for our network. We're going to get into our main presentation, and then we'll have that Q&A session that I mentioned. And then, we'll have a couple updates at the end of the session.
So I want to go ahead and get started in presenting our main presenters today. So our first presenter is Rob Nickla. Rob has worked in public health since 2004 and is currently the fellowship program manager at the Association of Public Health Laboratories. Prior to that, he was at the Laboratory Response Network as a biological and chemical threat coordinator, biosafety officer, and select agent responsible official with the Oregon State Public Health Laboratory.
Rob has worked as a microbiologist and bioterrorism coordinator with the Arizona State Public Health Laboratory. And he's an active member of several groups such as serving on the APA Child Preparedness Committee, chair of the APHL Sentinel Laboratory Partnerships and Outreach Subcommittee, co-chair of the APHL Recruitment and Retention Strategic Implementation Group, and a member of the APHL Academic Partnership Workgroup. Thanks Rob for being here today.

Next is Erin Bowles. Erin is the laboratory network coordinator for Wisconsin State Laboratory of Hygiene's Communicable Disease Division. She provides outreach and education to more than 125 laboratories in Wisconsin in order to ensure a coordinated statewide response to any biological threats of public health importance.
Her background in clinical microbiology and expertise in biosafety served her well as a member of APHL's Workforce Development Committee and Sentinel Laboratory Outreach and Partnership Subcommittee and the Sentinel Laboratory Training Special Interest Group.
Some of the committee projects she has contributed to are revisions to the ASM's Sentinel Level Clinical Laboratory Guidelines and the development of risk assessment training and biosafety tools such as Clinical Laboratory Preparedness and Response Guide. Thank you, Erin, for being here. We're so excited to hear from you.

We also have Dr. Michael Pentella joining us today. And Dr. Pentella is a clinical professor at the University of Iowa's College of Public Health and director of the Iowa State Hygienic Laboratory. He is an experienced clinical microbiologist and infection control and prevention professional. He served as the founding chair for the APHL Biosafety and Biosecurity Committee for six years. He has written several articles and book chapters on biosafety and given many presentations. He's also served on the Institutional Biosafety Committees in Florida, Iowa, and Massachusetts. He's also developed multiple successful training courses. Dr. Pentella, thank you so much for being here today.
And finally, I'd like to introduce Jasmine Chaitram. Since 2016, Jasmine has served as the associate director for Laboratory Preparedness and chief of informatics in Data Science Branch in the Division of Laboratory Systems.
She has more than 19 years of experience in developing and managing laboratory preparedness and response programs and began her CDC career by administering an International Quality Assurance Program for 300 laboratories in 35 countries to detect emerging pathogens with resistance to antimicrobial drugs.
She has led the division's COVID-19 and mpox
response efforts, serving as liaison between the CDC and the clinical laboratory community. Jasmine chairs several interagency and partnership workgroups and has created plans and strategies to improve and sustain national laboratory testing capacity. Thank you, Jasmine, for being here.
We have an excellent panel of guests today, as you just heard. And now, I would like to pass it over to our OneLab Network lead, Dr. Alicia Branch, to announce some upcoming OneLab resources before we jump into our main presentation.
Alicia, I think you're on Mute.
Oh. OK. I unmuted myself. Sorry about that. Thanks, Chelsea. Coming this month is the Emergency Preparedness Response Guide, a resource to reference during biological, chemical, and radiological emergencies. It can also help train new laboratory professionals higher to support emergency responses.

I want to remind everyone that the slide deck may contain presentation material panelists not affiliated with CDC. In addition, presentation content from external panelists may not necessarily reflect CDC's official position. We are offering one PACE credit for today's webinar.

And details will be provided at the end of the webinar. And now, I'll turn it over to Rob Nickla to begin our Public Health Laboratories 101 webinar.

Thank you. Hello, everyone. And welcome again to this Public Health Laboratories 101 presentation. On behalf of the other presenters and myself, we would all like to thank CDC for hosting this event and for inviting each of us to speak today.

The objectives this presentation will address are to, one, identify the core functions of public health laboratories; two, explain how public health laboratories interact with partners and customers, including other laboratories; and three, describe the role of federal, state, and local agencies and organizations within the Public Health Laboratory system. Next slide, please.

So what does public health look like? Public health is a very diverse system of interdependent and various partnerships from the local to national levels that all help the overall system function and work toward common goals of meeting the needs of public health.

This includes small, local or larger regional health care systems, law enforcement, academic institutions, federal agencies such as transportation and environmental protection, to robust national disease surveillance systems.

We will primarily focus on public health laboratories within that system today. We will also spend time discussing some of the key public health laboratory partnerships and how we work together. Next slide, please. So first, it is important to understand that laboratory science is a continually evolving discipline. And as our knowledge increases, testing methods along with safety practices also improve. And laboratories become more complex as a result because technology and safety evolve hand in hand. Next slide, please.

So while there are many similarities between public health laboratories and clinical labs, there are also some notable distinctions for the roles of each within the public health system. For example, within clinical labs, we will typically see a focus on providing initial diagnostic and point of care testing, with only some level of reference testing.

Their main area of concern is individual patient care and management in clinical lab support, a frontline response and provide critical specimens and data to public health labs based on local and national disease-reporting rules, whereas within public health labs, we typically see a focus on providing specialized diagnostic and reference-level testing on a population level of concern. And this is accomplished by performing rarely needed and specialized tests in high-containment facilities with staff trained to work with higher-risk biological and chemical threat agents. Public Health Laboratory supports surveillance and monitoring activities with CDC to assist with identifying outbreaks or case clusters, new pathogens, and other agents of concern by being connected to the National Public Health System with CDC and other local and state public health labs. And public health labs also routinely offer technical guidance and training to clinical laboratories. Next slide, please. In the year 2000, the Association of Public

Health Laboratories or APHL developed a white paper titled Core Functions and Capabilities of State Public Health Laboratories that identified and outlined 11 core functions. This work was subsequently published in CDC's Morbidity and Mortality Weekly Report, or MMWR, in 2002 and then was later revised in 2014 within APHL's Special Report. Both of these publications are shown on screen. APHL and CDC work together to co-identify these core functions to assure they would each be available and achievable within each public health lab jurisdiction. Each of the 11 core functions serves as a unifying thread with the others.

To ensure their role that the 11 core functions are carried out, state and local public health labs must engage their entire scalable health care communities to varying degrees in their respective regional systems. We will devote time today to providing some examples of public health lab work within each of the 11 core functions. Next slide, please.
Public health systems are commonly defined as all public, private, and voluntary entities that contribute to the delivery of essential public health services within a jurisdiction. And this concept ensures that all entity's contributions to the health and well being of the community or state are recognized in assessing the provision of public health services.
The 11 public health core functions directly coincide with the 10 established essential public health services. These 10 essential public health services describe the public health activities that all communities should undertake. And these 10 essential public health services have served as a well-recognized framework for carrying out the mission of public health for over 25 years. We will further describe how the essential public health services and the core functions of public health laboratories relate. Next slide, please.

So these are the 11 core functions of public health labs we will cover today. I will be discussing the first four, which are disease prevention, control, and surveillance, reference and specialized testing, food safety, and ending with emergency response. Next, Erin Bowles will cover environmental health protection, partnerships and communication, and ending with training and education.
Then, we will have Dr. Mike Pentella cover integrated data management, public health related research, laboratory improvement and regulation, and then concluding with policy development. Last, we will have Jasmine Chaitram provide an overview of related CDC activities. Like we said earlier, we will also have time devoted at the end for question and answers. Next slide, please.
The first core function we'll discuss is disease prevention, control, and surveillance. And we will begin by outlining some of the respective key public health lab services. So public health labs conduct laboratory testing of public health significance and provide the necessary data to lead to actionable data-driven results with its key partnerships between public health labs, CDC, state and local epidemiologists, clinicians, and other health care professionals.
Public health lab testing supports local and national surveillance system efforts in accordance with nationally notifiable disease-reporting systems and state-specific disease reporting requirements with a goal of tracking life-threatening or other serious infections such as rabies, tuberculosis, HIV, hepatitis, bacterial meningitis, and others. Next slide, please.
Within the National Notifiable Disease Surveillance System, there are currently about 120 diseases under surveillance. These include infectious diseases like bioterrorism agents, sexually transmitted infections, or STIs, as well as noninfectious conditions like lead poisoning. The national system serves as a foundational basis for each state developing their own state-specific disease-reporting- rules based on their own identified jurisdictional needs. Next slide, please.

Public health laboratories play a vital role in outbreak detection, which leads to disease control measures to prevent further spread. This is accomplished by laboratory testing to confirm preliminary diagnoses and early detection of clusters of infections to reveal common sources to address, such as with recent measles or current mpox outbreak cases.

This can also include identifying drug-resistant pathogens to ensure proper patient treatment, such as with tuberculosis, health care-acquired infections, or HAIs, sexually transmitted infections, or other diseases of concern.
This is all a continual and ongoing process with public health laboratories working closely with state and local epidemiologists, CDC, and other partners to monitor emerging and/or circulating strains like various arboviruses and seasonal influenza viruses. Next slide, please.

This timeline shows only a selected handful of significant outbreaks and other events over the last 50 years. Some of these were covered on mainstream news outlets, and you may have already heard about many of these events, such as the detection of new or emerging diseases from back in the 1970s like Legionella; methicillin-resistant Staphylococcus aureus or MRSA; and Norwalk virus, which was later renamed norovirus.
Many of these events have carried on, and the diseases are still with us today, while others have emerged and re-emerged over the years such as outbreaks of Ebola virus; Middle East Respiratory Virus, or MERS; Zika and West Nile viruses; and others.
Unfortunately, one consistent phenomenon is for large-scale foodborne and enteric disease outbreaks throughout the decades, like detecting Salmonella in peanut butter, cookie dough, backyard poultry, leafy greens, or even pet reptiles like bearded dragons. In addition to Salmonella, we will commonly encounter other enteric pathogens, such as Shiga toxigenic E coli, Campylobacter, norovirus, and others. Next slide, please.
The next core function we'll cover is reference and specialized testing, which I believe may be the one most visible and the one public health labs are most known for. Typically, clinical laboratories, local health departments, epidemiologists, or even other partners such as the Game and Fish Department and local veterinary entities may all submit samples for public health lab testing.
And public health labs will perform millions of individual tests per year, ranging from testing STI specimens to support local public health; testing biological, chemical, and radiological threat event samples to support emergency responses; testing for zoonotic diseases like rabies virus and testing that supports the detection and surveillance of arboviral diseases like Eastern equine encephalitis or West Nile virus to raise the public's awareness of risk and to assist other local prevention and response efforts.

This function also includes testing the blood of children to detect exposure to lead as well as seasonal influenza testing to inform annual flu vaccine development and testing for emerging pathogens like mumps, measles, and antibiotic-resistant organisms. Next slide, please.
Public health labs are able to conduct the specialized testing because they have high containment facilities such as level 3 biological safety laboratories or BSL-3s, critical equipment, and highly trained staff necessary to perform the reference level and specialized testing.
Public health labs must maintain and be able to enhance their capabilities-- I'm sorry-- their capacities to bring onboard new tests when needed, such as with MERS, Ebola virus, and highly pathogenic avian influenza strains like H7N9 or H5N1.
This function is also ensured by membership and participation in vital programs such as the Laboratory Response Network, or LRN, for biological and chemical threat preparedness and

response and other infectious disease surveillance networks with CDC and partners. We will discuss LRN some of those other key programs more later on. Next slide, please.
Another reference and specialized testing service that is quite unique to public health labs are newborn screening programs. So each year, almost 100% of all newborns in the US are routinely screened for certain genetic endocrine inheritable metabolic disorders. This amounts to millions of babies being tested each year.
And this crucial screening testing identifies serious but rare metabolic disorders and other conditions that can affect a child's long-term health or even their survival. Early detection, diagnosis, intervention, and treatment can prevent death or disability and enable children to reach their full potential and live a healthy life. Next slide, please.
A few more examples of reference and specialized testing is how public health labs maintain unique, rare, and specialized gold-standard diagnostic tests and methods. This includes such things as providing high confidence and rapid molecular testing of air samples for certain bioterrorism agents, having sequencing capabilities for further organism strain characterizations, such as the ability to differentiate the more than 2,000 serovars of Salmonella, and being capable to test for environmental contaminants in soil and water for things like radionucleotides, per and polyfluoroalkyl substances or PFAS-- P-F-A-S-- as well as heavy metals in drinking water. Next slide, please.
The next core function is how public health labs play a role in food safety. Public health labs are central for foodborne outbreak detection, surveillance, and response. The laboratory testing supports molecular epidemiology in key partnerships with CDC; Food and Drug Administration, or FDA; and the US Department of Agriculture, or USDA.
This testing primarily serves to detect bacterial foodborne pathogens like Salmonella, Campylobacter, Shiga toxin-producing E coli, commonly known as STEC, Listeria, and other targets of interest.

The Partnership Workflow Overview for this routine food safety testing includes clinical specimens and working with CDC, retail meat and working with the FDA, and food animal products, working with USDA. Next slide, please.
An overview perspective of how Public health labs contribute to the food safety process is to look at that system from start to end. So samples and specimens are submitted either for routine surveillance or from an already suspected outbreak to identify pathogens.
Public health laboratories will communicate laboratory testing results with network partners and the public health lab work aids to help detect clusters, outbreaks, and/or antimicrobial resistance. Laboratory results help to conduct sample trace-backs to individual products and sources.
And finally, in some cases, there may be controls implemented, such as a product recall. Epidemiologists, regulators, and policymakers use all of this information to monitor foodborne disease trends, plan food safety programs, and to develop and evaluate food safety policies, among other activities. Next slide, please.
So on a continual basis, public health laboratories perform specialized testing of tens of thousands of samples annually from commercial and clinical sources. Public health labs will identify and also send certain isolates to CDC for additionally enhanced surveillance efforts and to help monitor new or existing environmental contaminants impacting human health.

Much of this work is done within key foodborne pathogen surveillance programs and network systems between public health laboratories and CDC such as the National Antimicrobial Resistance Monitoring System, or NARMS, for enteric bacteria and PulseNet which is a system that has been in place for almost 30 years and is used to correlate outbreak specimens with laboratory data and epidemiologic investigations.

The PulseNet work in public health laboratories was largely performed with Pulse Field Gel Electrophoresis Technology, or PFGE, but in recent years, this has transitioned to more modern sequencing methods and instrumentation to provide enhanced information to better link cases. Next slide, please.

For almost 30 years, PulseNet has been the main program and national network that performs necessary molecular subtyping associated with foodborne disease surveillance. PulseNet was developed in 1996 as a result of the 1993 E. coli O157 H:7 outbreak in the Pacific Northwest. PulseNet results are commonly referred to as DNA fingerprinting because it is able to correlate the linkage from the bacteria within the submitted samples and link to person-to-person and person-to-food source within outbreaks.

An essential element to the success of PulseNet is to provide standardized test methods, technology, and data analysis with its member laboratories. So this national network of labs is also further connected to compatible international food safety surveillance systems and able to perform standardized next-generation sequencing of foodborne bacteria by sharing sequences electronically in real time via PulseNet. Next slide, please.

Lastly, I will cover the function I've always been personally very passionate about, and that is emergency preparedness and response. Public health laboratories, with their key partners, help provide an essential framework for national emergency preparedness and response.

Public health labs and their testing services, in conjunction with their outreach and training efforts with emergency response partners, serves as national critical infrastructure to support efforts by maintaining their laboratory's facilities capabilities, trained staff, network memberships, lab equipment, and critical testing capabilities and capacities.

This function provides rapid and confirmatory laboratory tests of biological and chemical threat agents of interest. It also provides valuable support and training to first responders involved with suspicious samples associated with credible threats such as with white powder events and more routinely to hospitals for initial testing of emerging infections by providing biosafety guidance and training, as was clearly demonstrated with the domestic Ebola virus outbreak in 2014, MERS in 2012, and with the current mpox virus outbreak. Next slide, please.

A couple of primary laboratory preparedness programs that further help support this function is with the Department of Homeland Security, or DHS, Biowatch Program, and the CDC Laboratory Response Network Program, or LRN, for biological and chemical threat response and public health lab testing support.

Within the Biowatch Program, strict chain of custody is maintained, beginning with sample collection, all the way through lab testing in this early warning, high-consequence pathogen detection system. Air filter samples are tested daily from priority sites across the US and Biowatch programs exist in almost all public health labs, whereas all public health labs are participating members to some degree in the Laboratory Response Network for biological and

chemical threat preparedness and response, respectively known as the LRN-B or the LRN-C. Next slide, please.
The LRN-B Program, or Lab Response Network for Biological Threats, was established in 1999 but grew exponentially after the 2001 anthrax bioterrorism attacks, often referred to as the Amerithrax attack events. The LRN is an essential link between Clinical Sentinel Laboratories, CDC, other federal agencies. And the LRN-B is a three-tiered system.
Sentinel Clinical Laboratories serve as the foundation and frontline response labs in the three-tiered system, being able to preliminarily detect high-consequence pathogens with their in-house microbiological testing and by meeting the national requirements to serve as a sentinel laboratory.
LRN-B Reference Labs are able to perform molecular and traditional culture tests to rapidly and accurately identify and confirm rare and unusual pathogens such as select biological agents and toxins or other significant pathogens of interest.
Public health labs typically serve as the middle tier and provide the specialized reference-level testing to be able to detect the pathogens that cause diseases such as Anthrax, Botulism, Plague, Smallpox, Tularemia Brucellosis, Glanders, Melioidosis, Q fever, viral hemorrhagic fevers, and other agents of concern like Ricin toxin. National labs, like the CDC at the top tier, provide additional lab testing support when needed for things like further organism strain characterizations. Next slide, please.

The LRN-C is also a three-tiered system and is capable of rapidly detecting and responding to a wide range of chemical threat agent exposures. Public health labs work with and train key partners such as hospital teams and first responders for early detection, awareness, and response measures.
Level 1 and level 2 LRN-C laboratories provide essential laboratory testing support for the network and level 3 laboratories focus on proper sample collection and shipping to either a level 1 or 2 lab for LRNC testing. This program focuses on chemical threat agents such as cyanide in metals and blood; nerve, blister, and toxin agent metabolites in urine.
Thank you, and at this time, I believe we'll pause for a quick knowledge check. So take a moment and see if you can answer this question for yourselves. How many Public health lab core functions are there, as outlined by APHL and CDC? Well, we'll probably close shortly. Hopefully, you all chose 11 because there are 11 core functions of Public health laboratories. Thank you, and I'll turn it over to Erin Bowles next.
Thank you, Rob. And hello to everyone who has joined us today. Before I start, I'd like to thank my coworker, Noel Stanton, for his help with my first few slides. Noel has had a long, successful career in the Environmental Division of the Wisconsin State Laboratory of Hygiene and has kindly shared his expertise on this topic with me.
If you were to visit several Public health laboratories, you would find that the environmental activities that occur in those public health laboratories and that comprise the core function of Environmental Health and Protection vary widely in both extent and sophistication. If you break down the testing that is performed by broad analytical testing focus, you come up with the following five sections-- inorganic chemistry performs classic water testing, involving comprehensive analysis for things such as ultratrace metals, minerals, and nutrients.

This section of the laboratory may receive samples from the Department of Natural Resources as part of an investigation into a large fish die-off, looking for possible runoff contamination from the dairy industry in lakes or streams. Organic chemistry performs testing for volatile organic compounds such as pesticides and polychlorinated biphenyls.

Microbiology performs testing looking for water contamination with organisms such as coliforms, Vibrio, Pseudomonas, and parasites. Radiochemistry detects emissions of alpha, beta, or gamma radiation as well as identifies specific radioactive isotopes such as radium, radon, and strontium. And last but not least, workplace safety that works primarily with business and industry, performing a lot of indoor air sampling for hazardous elements such as asbestos and molds.

The types of environmental samples these sections receive for testing also vary. Public health laboratories commonly test various types of water. Air, soil or sediment, animal or plant tissue, and food are all samples that may be received. Next slide, please.

Environmental public health laboratories provide service to many diverse submitters and commonly receive samples for testing from partners at the Department of Natural Resources, the Environmental Protection Agency, or the Department of Defense.

There are six primary reasons that environmental testing is essential, and I have them listed here in the order of testing urgency, with emergency response taking top priority. Emergency response encompasses that type of rapid testing that is necessary in new at rapidly evolving emergency situations involving potential chemical threat agents.

Legal enforcement is another driver of environmental testing such as a situation where there is suspicion of illegal dumping of toxic materials. Environmental testing may be performed to ensure regulatory compliance with safe drinking water or clean air regulations. Examples of testing perform for the general public's health and safety are beach water testing and drinking water well testing.

Environmental testing is also performed in cases of remediation to assure adequate site cleanup. And finally, environmental testing may be performed as investigational testing for partners in research and development. Next slide, please.

Some of the high-profile current emerging areas of interest that you may be familiar with that are performed in environmental public health labs are listed on this slide. Microbiological wastewater monitoring has become a focus for environmental laboratories as a tool for monitoring the COVID-19 pandemic. However, diseases and pathogens have been tracked in wastewater nationally and internationally for years. For more information on CDC's wastewater surveillance, the link to the National Wastewater Surveillance System web page has been posted in the Chat.

Microbiological source tracking can be very useful for the differentiation of human versus animal versus avian fecal microbes. In Madison, the City Health Department was frequently having to close a popular city beach due to high fecal contamination that was thought to have come from the Madison Zoo. However, when source tracking was performed on samples of lake water, it turned out the contamination problem was due to the large number of ducks that also liked the lake and beach.

Other emerging areas of interest are broad, non-targeted testing that can identify anything present in a sample rather than looking for the presence of a specific substance or organism

and testing that is performed to monitor for climate change, such as increases in levels of carbon dioxide in the atmosphere.
Perhaps some of the most high-profile areas of interest and recent concern are testing for emerging contaminants. Environmental public health laboratories can test for hazardous cyanotoxins produced by visible or invisible toxic algae blooms that can make people and their pets sick. Environmental testing can identify neonicotinoid insecticides, which are thought to be responsible for the decline in the bee population.
Testing for harmful levels of PFAS contamination found in firefighter foam and many everyday products is just another example of how public health laboratories are committed to the core function of environmental health and protection. Next slide, please.
The next core function that I want to discuss today is critical to me as the outreach coordinator of the Wisconsin Clinical Laboratory Network at the Wisconsin State Laboratory of Hygiene. That core function is partnerships and communication. One of the first things I realized after moving from the clinical laboratory world to the public health laboratory world was how interconnected and mutually reliant public health laboratories are on the partners they serve. Building strong partnerships and establishing effective two-way communication with them is essential. I quickly learned that while it is important to share information and provide guidance to our public health partners, it is equally, if not more important, to listen and learn from those partners.
I think we've all been in situations where we've heard conflicting information coming from different sources. How do you decide who you're going to believe and whose guidance you will follow? In those types of situations, most people choose to believe people that they have established a good personal relationship with, individuals who have always taken the time to communicate honestly with them and who have therefore earned their respect and won their trust.
Laboratories should always use transparency and honesty when communicating with partners. If you can establish a mutually beneficial relationship, where each partner gains something from the relationship, then you have built a bond that with some continual nurturing will only grow and strengthen over time.
It is important to routinely touch base and connect with individuals, as it is never enough to meet someone once and think that you've built a solid relationship that will withstand all challenges. Remember that an emergency is not the time to exchange business cards. Ideally, you want to build the relationship before there is an emergency situation that requires a coordinated effort between you and your partner. Next slide, please.
This slide, while not all-inclusive, does list some of the many and varied partners that public health laboratories work with and would benefit from developing strong relationships with. The column on the left lists some of the many different types of laboratories that public health laboratories work with, while the center column and the column on the right list some of the many other non-laboratory agencies that interact with public health laboratories.
Developing partnerships and effective communications with all these varied partners takes work. But it has great value, and it serves public health laboratories well in those times when threats to public health emerge. Next slide, please.
One of the strongest partnerships our laboratory has developed and nurtured through the years is with the Laboratory Technical Advisory Group we instituted when we built our

Wisconsin Clinical Laboratory Network. We call this group LabTAG. This is a picture of LabTAG from a few years ago when we gathered together for our annual in-person meeting.
We have both regional members and at-large members who commit to at least a three-year term of membership. Their diversity reflects the diversity of the various types of laboratories in the state, ranging from small, rural critical access hospitals to large multi-facility health care systems. Their educational degrees are also diverse, representing all levels, from bench-level laboratory scientists to PhD directors.
LabTAG has an established mission statement and objectives that are reviewed by members on an annual basis. LabTAG provides insight and guidance into the needs of the clinical laboratory and helps me personally to develop and deliver educational outreach activities for our network.
But what do LabTAG members get from their participation? They tell me their win is in the relationships they build with each other and in what we all learn from each other. Next slide, please. Public health laboratories have an amazing wealth of varied information that they need to communicate outwardly to their partners, sharing information such as test results or guidance documents and resources about emerging pathogens like mpox. They also need to receive information from their partners, such as surveillance data.
Public health laboratories may also forward information from one partner to another. Often the information that is communicated is confidential, and it must be shared in a secure manner to meet HIPAA regulations. With all this multi-directional information sharing, it is easy to see why communication is such an important core function for public health laboratories.
How laboratories communicate with their partners is as varied as their partnerships. And I've listed only some of the ways this may be done on this slide. I hope that you will agree with me that partnerships and communications are essential to all we do in public health laboratory. Next slide, please.
The next core function I want to talk about that is closely linked to the core function of partnerships and communication is education and training. Breaking training down into internal and external training, all organizations, including public health laboratories, must provide internal training to their employees when they are new hires and begin working for the company. Internal training also includes refresher training that all employees are required to take on topics that are critical to know and where learning is enhanced by repetitive training, such as fire safety.
Finally, most companies benefit from providing their employees with opportunities for continuing education for their personal enrichment and development. When talking about external training, public health laboratories frequently provide training to fellows, interns, and other students in laboratory related programs such as medical students, public health students, or other graduate students. Their training may be short term or for a longer one or two-year commitment.
I've already discussed that public health laboratories have many varied partners. As an outreach coordinator for our Clinical Laboratory Network, my main role is to engage clinical laboratory partners by providing free educational opportunities and resources for them. It is a win for the clinical laboratories and helps to strengthen our partnerships with them.
Likewise, our environmental section of the laboratory provides educational training for the hazmat teams and first responders they work closely with. Public health laboratories may also

provide education for other customers with whom they partner, such as directions on how to submit a specimen for radon or well water testing. Next slide, please.
On the left of this slide, I've listed some of the various training methods used by public health laboratories to communicate with partners and provide educational content. I found the best success in providing training to adults when I'm able to provide a mix of varied types of training. On the right, I've listed some typical training provided by public health labs. Again, these topics are subjects we want our partners to learn about and understand. Often, they are related to topics such as emergency preparedness, biosafety, biosecurity, and proper specimen collection packaging and transport. Next slide, please.
While it is important for public health laboratories to provide training on topics that we feel it is important for our partners to know, such as proper packaging and shipping, I challenge public health laboratories to think outside the box and to ask the various partners what topics do they want to learn more about.
If a public health laboratory can provide training on the topics that a partner wants to learn more about, the public health laboratory will earn the trust and respect of that partner and forge a strong bond of mutual support. This is a definite win-win. Some of the topics that our clinical laboratories have asked us to provide education on are new technologies, antimicrobial susceptibility testing, quality assurance, best practices, and gram stains.
The public health laboratory may not have expertise in the topic their partner wants to learn about, but maybe they have another partner who does have that expertise that they can contact to ask if they are willing to provide that training. If you are in a position to provide education and training, if you can think a little outside the box and have some fun while you're doing it, you may be surprised by the goodwill that you will receive from those that you are providing training to. Next slide, please.
And I think we're going to do another knowledge check here. So I'm going to read a situation to you, and you can pick the correct answer. The public health laboratory receives an emergency page that there is an unusual smell in a grocery store that has caused several customers and employees to leave the store and go out into the parking lot because they feel lightheaded, dizzy, and nauseous.
The store manager looked around the store and found a spill of some liquid on the floor where the odor seems to be the strongest. The laboratory has been paged to do testing to determine what the spilled liquid is. What partners would likely be contacted to work with the laboratory in this situation? So I'll give you a few minutes here, and we'll see how everybody answers. This one requires a little thinking. OK. The correct answer is B. Typically, the local police are going to get called when there's a spill like this, and they're going to contact Hazmat. And Hazmat is going to be contacting us in the public health laboratory, and the patients who are sick may end up in an ER seeing a clinician there.
So at this time, I'm going to turn the microphone over to Dr. Michael Pentella to continue.
Thank you, Erin. Good afternoon, everyone. Thank you to the organizers for the invitation to present the next four core functions to you. The next core function is integrated data management. In past years, public health labs had to report results via mail or fax.
Of course, now public health laboratories have Laboratory Information Management Systems, also referred to as LIMS. And this enables us to connect with all of our partners that we need

to, as depicted in this slide, whether those partners be hospitals, health departments, and epidemiologists in the CDC.
So to achieve this integrated data management, the LIMS systems that we use incorporate data standards, for example HL7, [INAUDIBLE] SNOMED codes, or they rely on data integration engines like Rhapsody, BizTalk, and Mirth. So integrated data management allows public health labs to transfer information paperless. So no reliance on mail or fax machines.
All the parties receive lab requests and reports electronically, like test orders, results. And the information is received by everyone at the same time so that we're all connected electronically and can act on the information of those test results. Of course, to accomplish this, the public health labs must employ IT professionals to build and maintain our connectivities. Next slide, please.
Why is this integrated data management so important to us? So by using electronic methods, rapid result reporting allows for the results to impact decision making, thereby influencing public health action and policy. So using those standardized data formats is really the key, and all labs need to participate in state-wide disease-reporting networks.
Integrated data management is recognized as an important connector with other states and national laboratory systems. Through linkage with CDC then, public health labs are connected with other international surveillance databases as well. Next slide, please.
When looking at another core function is public health related research. Generally, this is applied research. And the goal often is to help laboratory science evolve and employ the most reliable methods to answer epidemiologic questions. Public health labs have tremendous resources to do public health related research, such as safe samples. We've saved isolates. We have a tremendous amount of data. And this is all great for research projects. The next slide, please.
Of course, public health related research requires collaboration. And I find that collaboration is the key to successful research. Working with key researchers to meet goals of public health significance is most important. And this slide provides you some examples of collaborations that SHL has engaged with, both environmental and clinical, to answer important questions. The next slide, please.
So the next core function is Laboratory improvement and regulation. Public health labs provide leadership for laboratory improvement in the areas of public health importance, such as developing and promoting quality improvement programs, safe laboratory practices, and creating and enforcing regulations and laws.
Public health labs work across the entire laboratory system providing training and education and sometimes in the form of webinars and conferences, other times by providing proficiency testing materials or other times by splitting samples and doing round-robins.
On the next slide, while some states largely differ in regard to their role in laboratory improvement and regulation because of different rules and regulations we all operate under in each of our various state jurisdictions, in Iowa, the Iowa Department of Inspection and Appeals has contracted with the State Hygienic Lab for CLIA inspectors. So they are housed in our facility. And they are a tremendous resource to the whole state, as they go out and do the work of CLIA inspections.
Another state agency, the Iowa Department of Natural Resources, contracts with the State Hygienic Lab for accreditation of environmental laboratories. And we also have a team of

inspectors who go out to environmental labs. So that's just the example of Iowa. As I said, each state differs. The next slide, please.

This slide deals with the core function of policy development. Laboratory improvement regulations assist in the creation of various policies that help solve public health issues. And that's where policy development comes into play. Public health labs are the source of unbiased data and expert knowledge to help solve public health issues.
For example, Public health laboratories may provide information to legislative committees regarding proposed legislation. For example, on this slide, I provided legislative committees information about the risk posed from non-pasteurized milk on multiple occasions in the last decade.
Going on to the next slide, with regards to policy development, as mentioned earlier, the laboratory data is used to monitor the impact public health practice and policy development. Policy development is truly a collaborative process.
And you'll be working with professionals on multiple different areas to accomplish this. So through analysis of high-quality data, the public health lab monitors, of course, for biological, chemical, and radiologic issues.
And those data then inform policymakers. The public health labs have an important role to play in advocating for sound reasoning in infrastructure and policy decisions, data-driven decisions. Therefore, public health lab leaders need to make themselves available to participate in discussions to reach sound decisions.
Thank you. Now, we'll go on to a knowledge check question. And I'll give you some time for knowledge check number 3. Public health lab supplies data to the Department of Natural Resources about the amount and location of arsenic found in well water.
So this data will be used to determine the need for remediation efforts. And this is an example of which core function? Let's wait to see what those results come in.
And you also like this one. And yes, the answer is policy development.
Now, if we go on to the next slide, we have knowledge check number 4. Which of the following is not a core public health lab function? So of the five items listed here, which is not one of the core public health lab functions of the 11 we just described for you?
So as you answer that question, we'll see the results come up.
Right. Infectious waste management is not a core function. It's important but not a core function of the public health lab.
Let's go on to the next slide, and our next speaker is Jasmine.
Hey, everybody. We are going to transition now to CDC and its role in the Public Health Laboratory System. CDC is the lead federal agency-- public health agency in the United States and works with partners and other laboratories to safeguard public health and improve patient outcomes. The agency works closely with the Association of Public Health Laboratories, APHL, and public health laboratories in every state to provide a National Public Health Laboratory System.
States have their own local systems, which can be maintained as regional partnerships with other states or networks with other local and county public health laboratories within their states or with clinical laboratories in their state. Next slide.

CDC has many functions and parts in its organization. Just focusing on the laboratory activities, the agency has more than 1,700 scientists working in more than 200 cutting-edge laboratories across the US from, and including but not limited to, Atlanta, Fort Collins, Anchorage, and San Juan.

Our laboratories perform many functions for research, surveillance, and epi investigations. We provide reference diagnostic testing for clinical samples for rare and unusual cases and also testing in the field to support outbreaks. CDC laboratories generate high-quality data to inform public health action.

We maintain a vast collection of pathogens and develop advanced technologies for detection of novel and emerging threats. And in the next few slides, I will talk more about our support of public health laboratories. Next slide.

So CDC provides a number of services to support public health laboratories and their core functions, which you just heard about. One way CDC does this is through technology transfer by developing and deploying procedures and reagents to enable reference testing at the local level.

Once public health laboratories have established local testing capacity, CDC can provide the means for ongoing external quality assessment or proficiency testing. This has been done for tests to detect biothreat agents, antimicrobial-resistant pathogens, and for new strains of flu viruses.

CDC offers technical consultation and hosts national conference calls as needed. We post guidance and testing recommendations on our web pages, and we provide this information through other channels as well. CDC has also supported public health laboratories by helping to create a pipeline of experienced laboratorians through expanding fellowship programs with partner organizations like APHL for undergraduate and postgraduate laboratory students.

CDC offers a lot of free training opportunities for clinical and public health laboratories such as the one hosted here today through the OneLab Network. Training is offered online, in person, and through virtual reality. Over the years, CDC has made tremendous investments in public health laboratories and upgrading public health infrastructure. And this has helped to ensure that these laboratories have advanced diagnostic tests and other clinical capabilities readily available. Next slide.

Through investments, technical support, policy, and partnerships, CDC has created several federally managed laboratory networks and programs in partnership with public health laboratories that support different missions. Some examples include the Laboratory Response Network for Rapid Biothreat Detection, which you already heard about. This network was mentioned by Rob. And funding by CDC has helped these public health laboratories with emergency response core functions.

The Antimicrobial Resistance Laboratory Network supports nationwide lab capacity to rapidly detect antimicrobial resistance and inform local responses to prevent spread and protect people. PulseNet is a National Laboratory Network that was initiated in 1996 and is also led by CDC.

There's also the Influenza Surveillance Program, which collects data for public health laboratory testing of flu specimens and includes global partners. And there are other surveillance activities

such as those that rely on the participation of testing of public health laboratories for some but not all vaccine-preventable diseases. Next slide.

CDC is the main federal agency through which state and local funding for public health activities flow. CDC uses grants and cooperative agreements to fund research and non-research public health laboratory programs that advance the agency's public health mission domestically and abroad.

A few examples of funding mechanisms are listed here. The first is a need space cooperative agreement called the Epidemiology and Laboratory Capacity For Prevention and Control of Emerging Infectious Diseases, or ELC. Recipients apply for funding based on current need. The mission is to address recipient needs in surveillance and detection, prevention and response, and to develop communication, collaboration, and partnerships to address emerging or re-emerging infectious disease threats.

Next, the Public Health Emergency Preparedness, PHEP, Cooperative Agreement is a formula-based cooperative agreement. Funds are legislatively mandated to be awarded based on a population in a jurisdiction.

There are further requirements that a portion of funding must flow down to local health departments. The goals of the PHEP funding include building operational readiness capabilities to respond to all hazards, emergencies, and public health threats. But it is not response funding itself. So this cooperative agreement is more about preparedness activities.

Other more recent funding opportunities include the strengthening US Public Health Infrastructure Workforce and Data Systems Grant. This funding is the first of its kind, non-categorical, and cost-cutting programs intended to help meet critical infrastructure and workforce needs in the short term. And it should also make possible strategic investments that will have lasting effects on public health agencies across the United States.

There is also funding available for wastewater surveillance, which is supporting the Sewer Coronavirus Alert Network and its expansion to wastewater monitoring to detect mpox. CDC's Data Modernization Initiative, DMI, is focused on leveraging new data sources and partnerships to support public health efforts as well as strengthening the critical and specialized workforce needed to work with public health data.

In addition to providing funds directly to public health agencies for data improvement, the DMI's objectives include developing data standards to ensure cohesion and interoperability of data systems throughout the nation.

CDC also provides funding to critical partners, such as APHL, through a cooperative agreement. The Association of Public Health Laboratories works to strengthen laboratory systems serving the public's health and has been a long-time partner to CDC in building and maintaining the National Public Health Laboratory system.

And now that I've said all that, I think we are ready for our knowledge check, which is on the next slide. Thank you. So how does CDC support public health laboratories?

And your choices are, provides reference testing, established testing guidance for procedures and reagents, conducts external quality assessment, provides technical consultation, develops guidance and testing recommendations, supports workforce development, conducts training, provides funding to support operations, or all of the above. And we will give it a few seconds here for answers to come in.

I don't think-- oh, there it is. OK, great. So hopefully, you all picked all of the above because CDC does support public health laboratories through all of these things that are mentioned here. And I think now we are ready to open it up for Q&A session.
Thanks, Jasmine. And thank you to all of our speakers. So we'll now spend the next few minutes answering some of your questions from the Q&A. And I want to encourage all of our attendees to continue dropping your questions in the Chat.
We've had a few questions come in. So I'll just start it up and open it to all of our speakers. But our first question here is, is a central laboratory the same as a reference laboratory? And I think any of our speakers can answer that. So I'll just open it up to all of them.
I'm not sure who wants to take that one, but I would maybe say no to that. So I think when we talk about central laboratories or core laboratories, it's usually a main hospital laboratory in a single health care system. And a reference laboratory really has to do more with the level of individual tests that are being performed. So they're similar, but I think there are definitely distinct.
I agree with Rob. The terms are used interchangeably a lot, but I think of the core laboratory as the facilities laboratory. And sometimes that is a lab that you send samples to from another facility, but it's the core laboratory.
We can go on to our next question. And our next question is for Erin. So how have your experiences nourished and support your partnerships during the COVID-19 pandemic?
Actually, we were very fortunate during the COVID-19 pandemic that we had developed all of these relationships ahead of time, as things were-- as we were all discovering what was going on. We had this emerging pathogen, and we were waiting for information from the CDC and other agencies. And then, we were able to rapidly share that with all of the clinical laboratories. In turn, CDC got that testing out to us in the public health laboratories.
And then, as there were EUAs out there and clinical labs were able to start doing that testing themselves, we were able to support them in doing that and giving them panels that they could work with to validate their testing in their laboratory. And it was just-- we had webinars, and it was just-- it really was wonderful. We had a very great response, we thought, in Wisconsin because of our networking.
Great. Thank you. So our next question here is, do you all think the job market will be more of public health related in the near future? So I guess they're asking if we move towards, I guess, more public health-oriented jobs in the future.

Well, I'll answer first. I do see that there's
a very bright future for individuals who are in the public health laboratory and those joining. I think that there will be a strengthening of the public health workforce that's already started and begun. So I'm very enthusiastic for jobs in the public health laboratory in the future.
I also see that some testing is going to be done at point of care. That's near to the patient, bedside testing for example, but the more high-complexity testing, very detailed testing, will remain in laboratories such as the public health laboratories.
Thank you, Dr. Pentella. Anybody else want to tackle that question? All right. Moving on. And our next question is for Dr. Pentella. How do you see laboratory reporting technology evolving over the next few years?

Oh, I think that we're going to evolve to a state, where it's connectivity so that order entry can occur at the facility that's ordering it, and then the results can connect to their electronic medical record. Much simpler than occurs now. So I think the connectivity and two-way communication will be enhanced and that we will see this really helping both patient care and public health decisions at the same time. So that's my vision, and I hope it comes to pass.
Thank you. Next question is, do you all have a sense of how public health laboratories in the US compare to those around the world?
Maybe I'll start with that one. I'd say that's pretty tough to gauge because we have different standards and different accreditation systems, different requirements. I think that's a little hard to judge. I know Jasmine's done a lot of international work. She may be able to better address that one, but it's difficult to compare.
Thanks, Robert, pitches that to me. It's been a long time since I've done international lab work. I know that APHL has supported efforts like twinning where public health laboratories visit and support laboratories in other countries to provide guidance and education and training and those partnerships and help with development.
But those are targeted efforts, where they're in countries that probably need more assistance. So it's hard to say when you want to compare on a global level. I think there are varying capacities, just like there are varying capacities within the US.
Thank you both. So we've got time for one more question. And our last question for today is going to be, what certification is required to work in a public health laboratory?
That varies a lot by the state and what the state requirements are. So for example, in Iowa, we don't have a certification requirement. But if you're in California, I know that they do. I know they do in Florida, for example, Tennessee and other states. So you need to check into the state in which you're looking at positions.
All right. So with that, I'm going to pass it back over to Alicia. Thank you again to our speakers. Thank you to our panelists for thoroughly explaining the public health laboratories. Remember, today's slide presentation and audio will be posted at cdc.gov/onelab within the next two weeks. The OneLab Network has a few e-learning courses available for Continuing Education. However, we need pilot testers to complete the courses as part of the accreditation process. So if you're interested in being a pilot tester, please email labtrainingneeds@cdc.gov.
We are excited to introduce to new participants and remind returning participants of the OneLab Education Capacity Hub, better known as One Lab Reach, a targeted and customized learning management system for laboratory professionals.
OneLab Reach is the first of its kind, a CDC-developed learning management system created specifically to meet the needs of laboratory learners. Consider this the laboratory professional's one-stop shop for all COVID-related references and various formats, including videos, downloadable and printable job aids, full courses, and courses for PACE credit.
Speaking of PACE credits, if you would like to receive PACE credits for today's webinar, the link has been added in the Chat. And you'll need registration code V780. That's V780. The code has also been added in the Chat.
You must complete the Evaluation within two weeks to receive credit and download your certificate. You cannot receive credit after two weeks. If you have any trouble receiving credit for the webinar, don't hesitate to get in touch with us at onelab@cdc.gov. Again, that's onelab@cdc.gov.

So don't worry if you miss the link or the code in the Chat because the link and code and instructions will be emailed to you at the end of today's session. I'd like to take this opportunity to say thank you again, and everyone have a great and safe weekend.