



National Institute of  
Environmental Health Sciences  
*Worker Training Program*

National Institute of Environmental Health Sciences  
Worker Training Program

# Infectious Diseases

Report from the Fall 2016 Workshop



# TABLE OF CONTENTS

<b>Executive Summary</b> .....	1
Targeting Broad Worker Populations and Communities.....	1
Utilizing an All-hazards Approach with Specific Outcomes.....	1
Using Resources to Promote Workers' Understanding of Infectious Disease Principles .....	2
Harmonizing Training Efforts and Augmenting the WTP ESAP Framework .....	2
Supporting Training Synergy and Collaborations with Experts in Various Disciplines .....	2
<b>Background and Introduction</b> .....	3
<b>Lessons Learned and Emerging Issues of Biosafety and Infectious Disease</b> .....	4
Bioterrorism and Anthrax Attacks .....	4
Vector-borne Diseases and Viruses .....	4
Swine and Avian Influenza.....	4
Ebola Virus.....	5
<b>On the Frontlines of Defense for Infectious Disease</b> .....	6
Keynote Address .....	6
Worker Trainer Perspectives on Improving Infection Prevention, Training, and Communication .....	7
<b>Targeting and Tailoring Training for Healthcare and Non-healthcare Sectors</b> .....	9
General Training Barriers and Solutions.....	9
<b>Successful Frameworks and Resources for Occupational Biosafety</b> .....	10
Embracing an All-hazards Approach to Safety and Health.....	10
Learn from the past.....	10
Decision-making Skills, Risk Assessment, and Hazard Control.....	10
Surveillance .....	10
Practice .....	10
Distinguishing Needs for Proactive Versus Reactive Training.....	11
Implementing Universal Precautions and Hierarchy of Controls .....	11
Building a Bilingual Corps of Trainers .....	13
Integrating Resources: Cal/OSHA ATD Standard and PSD Tools.....	14
Cal/OSHA ATD Standard .....	14
PSD Tools and Resources .....	14
<b>Partnerships: A Method to Enhance Delivery of Infectious Disease and Biosafety Training</b> .....	15
<b>Hot Topics in Infectious Disease and Biosafety</b> .....	17
PPE Challenges and Successes: Ebola and Beyond .....	17
Current Science and Efforts for the Zika Virus: A Broad Overview .....	18
Risk Management: From a Single Case to Evidence-based Improvements.....	19
<b>Conclusions: Transitioning to More Effective Preparedness in Biosafety</b> .....	20
<b>Appendix: Meeting Agenda</b> .....	22
<b>Appendix: Training Barriers and Solutions for Specific Occupations</b> .....	25

# EXECUTIVE SUMMARY

The 2014-2015 West Africa Ebola virus disease outbreak was the largest outbreak of its kind in history, both in terms of case-load and geographical spread. This occurrence demonstrated that the spectrum of infectious disease is changing rapidly in conjunction with the environment and occupational climates.

On Sept. 20-21, 2016, the National Institute of Environmental Health Sciences (NIEHS) Worker Training Program (WTP) awardees and federal agency partners assembled in Research Triangle Park, NC for a workshop

The NIEHS WTP has maintained a passionate position on infectious disease response over approximately two decades. Certain aspects of biosafety include rigorous enforcement of standards, including compliance and controls. WTP adds to this a real world experience, with the use of community engagement and participatory training strategies, and these satisfy the implementation of hybrid models that embrace risk stratification for all hazards.

to launch the WTP [\*Ebola Biosafety and Infectious Disease Response \(IDR\) Training Program\*](#). The scope of the workshop was to discuss successful training models and existing strategies relevant to infection prevention and control (IPC). Workshop attendees engaged in the exchange of information related to hazardous waste material handling, Hazardous Waste Operations and Emergency Response (HAZWOPER) approaches, and biosafety practices in an attempt to encourage

the integration of IPC methodologies across a broad scope of occupational sectors for enhanced biosafety preparedness and response.

Panel discussions during the workshop on lessons learned, successful strategies, and delivery of effective training for specific worker populations echoed the fragility of current health and response systems in the United States. Furthermore, these discussions revealed a need to identify necessary actions to fill in the gaps for improved domestic response for infectious disease. Immediate and long-term actions include incorporation of biosafety practices within individual occupational sectors and integration of risk assessment models that follow IPC

methodologies. These actions will be embraced among awardees through awareness- and operations-level training to improve employers' and workers' capacities to recognize and control risks of infectious disease exposure, thereby preventing cases of worker illness and fatality. Workshop breakout groups focused on several target populations that will be trained through the IDR program, and their conversations provided a forum to highlight specific issues and current challenges from respective population representatives and field experts.

Given the goals and strategies identified during the workshop, the following section describes key actionable themes and opportunities for WTP through efforts of the IDR training program.

## Targeting Broad Worker Populations and Communities

On-the ground training efforts of the IDR training program will be carried out primarily by eight institutions (awardees), all of whom propose collaborations to facilitate and integrate biosafety training strategies for dissemination across roughly seventy percent of the United States. The awardees will deliver nationwide IPC training to more than twenty worker populations, including, but not limited to, first responders, custodial/environmental service workers, healthcare professionals, healthcare facility workers, transport and waste handlers, immigrants and other underserved or vulnerable communities.

## Utilizing an All-hazards Approach with Specific Outcomes

Through train-the trainer, awareness-, and operations-level instruction, awardees will focus on the inclusion of hazard recognition, mitigation, and prevention of Ebola and other potential infectious disease exposures for workers in healthcare and non-healthcare sectors. Furthermore, they will utilize and promote training strategies that incorporate all-hazard approaches to infectious disease risk reduction, stratification, and exposure protection for those working in potentially contaminated (high-risk) work environments. Awardees' training curricula should demonstrate the following outcomes:

- Increased capacity to use hazard communication, IPC, and biosafety protection measures;

- Improved knowledge and skills for workers with potential exposure to contaminated materials or infected individuals through their job duties; and
- Use of evidence-based practices that empower workers to understand the science of infectious pathogens, exposure control, hierarchy of controls, and decontamination protocols.

## Using Resources to Promote Workers' Understanding of Infectious Disease Principles

---

WTP will use relevant resources and training modules to promote workers' understanding and knowledge of relevant exposures, precautions, personal protective equipment (PPE), and safety standards along with professional guidance. This will be accomplished through dissemination of different resources, such as the Pathogen Safety Data (PSD) guidebook and training module that aims to help workers understand key components of infectious disease data and medical jargon, and provides resources and tools that are available in the public domain.

## Harmonizing Training Efforts and Augmenting the WTP ESAP Framework

---

WTP will harmonize training efforts through development of rapid response and post-exposure chain of commands in alignment with a broader IDR competence model. Through the National Response Framework (NRF), the Worker Safety and Health Training Support Annex may be activated in support of Emergency Support Annexes as required and established by the NRF and National Incident Management System. WTP proposes to augment the Emergency Support Activation Plan (ESAP) framework with collaborative establishment of efficient communication and guidelines that activated consortia members will follow to facilitate NRF activities, potentially help identify, stratify, triage, and isolate infectious sites and individuals, as well as protect workers from exposure and injury. Using the ESAP will also help integrate practices that prioritize prevention, mitigation and safety of at-risk occupational workers over immediate, intermediate, and extended response phases.

## Supporting Training Synergy and Collaborations with Experts in Various Disciplines

---

WTP will continue efforts to support training synergy among all awardees and identify best practices and successful IPC training strategies in varied occupational settings or populations. Ultimately, this could lead to a broader risk stratification framework for infectious disease outbreaks as they emerge in both healthcare and non-healthcare settings in the U.S. Furthermore, WTP will have opportunities to bring together professionals from a variety of disciplines, including disaster response, hazardous waste management, IPC, biosafety training, medicine, occupational health and safety, and public health. IDR training efforts can be made successful by addressing some of the invisible silos as well as gaps in semantics across respective disciplines.

# BACKGROUND AND INTRODUCTION

In the wake of changing climate and extreme weather events, our environment is subject to many changes, including an increase in vector-borne pathogens or disease-causing agents. With the emergence of new pathogens and re-emergence of old ones, society faces vulnerabilities to serious communicable and infectious diseases, such as the Ebola virus disease.

The [\*Ebola virus disease\*](#), formerly known as Ebola hemorrhagic fever, is an acute, serious illness that is often fatal if left untreated. It is transmitted to people from wild animals (e.g., primates, fruit bats) and is spread through human-human transmission via direct contact with blood, secretions, organs, or other bodily fluids of infected people, and with surfaces and materials contaminated with these fluids.

The first outbreaks of Ebola occurred in Central Africa. In 2014, a larger outbreak took place in urban and rural areas of West Africa.

In 2014, U.S. concern regarding infectious disease response was raised when two medical volunteers serving in Africa became infected with Ebola and were returned to the U.S. for treatment. Further concern for the health and safety of at-risk workers was raised when two medical providers serving an infected patient in a Texas hospital became infected. These vulnerabilities called for a greater capacity of preparedness and response at the local, state, and national levels.

The Centers for Disease Control and Prevention (CDC) recognized the need for a national capacity to develop and deliver awareness- and operations-

level training in infectious disease response for a broad range of workers. As a result, CDC allotted \$10 million to NIEHS for WTP to develop a worker safety and health training grant program for Ebola and other emerging infectious diseases.

In an effort to better inform the new [\*Ebola Biosafety and IDR Training Program\*](#), WTP completed a [\*gap analysis and needs assessment survey\*](#) to determine where the U.S. stands in terms of response for Ebola and infectious disease. Institutional and program review of applications submitted in response to the funding opportunity announcement resulted in [\*eight new awardees\*](#) in 2016.

On Sept. 20-21, 2016, WTP launched the IDR training initiative during a workshop in Research Triangle Park, North Carolina. The event provided a forum for WTP awardees, key stakeholders, and experts to share knowledge about past and emerging infectious diseases, and to discuss effective strategies to reduce workers' risk of exposure to biohazardous materials across broad occupational settings. A brief synopsis of the workshop is provided in a November 2016 NIEHS Environmental Factor [\*article\*](#), and presentation slides are available on the [\*workshop website\*](#).

Notably, the event marked the first gathering of the WTP's eight new IDR awardees. "The new awardees have allowed us to pilot Ebola and biosafety training, and this has changed how we think about the program as a whole," said [\*WTP Director Joseph "Chip" Hughes\*](#). "We are beginning to think about infectious agents in a broader way, and will use longer-term efforts to move beyond Ebola."

WTP anticipates that the new awardees will utilize existing resources, establish partnerships, and merge federal and private funding to overcome training challenges and sustain high-level readiness in biosafety and infectious disease response across the country. Furthermore, training strategies and resources used by the new awardees will have great potential for integration into other programs within WTP.

# LESSONS LEARNED AND EMERGING ISSUES OF BIOSAFETY AND INFECTIOUS DISEASE

New and longstanding awardees shared lessons learned from past disasters and outbreaks. “This is not our first rodeo – we have been dealing with blood borne and infectious diseases for a long time,” stated Jim Remington, program analyst for WTP.

## Bioterrorism and Anthrax Attacks

Between October and November of 2001, 22 cases of [bioterrorism-related anthrax](#) were confirmed in the U.S. During that time, the American Media Inc. (AMI) building

[Anthrax](#) is a zoonotic disease caused by spores from a bacterial species called *Bacillus anthracis*. There are different routes of exposure to anthrax spores; however, inhalation of the spores presents the greatest potential health risk, with a fatality rate of 95% even with antibiotic treatment.

The 2001 incident at the AMI facility was the first U.S. case of inhalational anthrax in 25 years. Fumigation (using chlorine dioxide gas) began at the facility in July 2004, but the quarantine was not lifted until February 2007.

in Boca Raton, Florida, was the first to experience a worker fatality.

Bruce Lippy, Ph.D., director of safety research at the Center for Construction Research and Training (CPWR), served as co-chair on the technical working group that guided the anthrax sampling protocol during post-remedial investigations of the AMI facility. Lippy shared the major lessons learned from his experience working with others during these investigations.

It is important to accept that the federal government will be a partner when responding to disasters; therefore, federal

resources should be leveraged as much as possible. Collaboration with federal partners helped establish the technical working group that guided and approved the

post-remedial anthrax sampling protocol. The protocol included a risk-based strategy with multiple techniques to verify the effectiveness of chlorine dioxide fumigation. U.S. Environmental Protection Agency (EPA) provided some equipment, and this allowed sampling of the building to be completed within a reasonable amount of time. The Occupational Safety and Health Administration (OSHA) template for anthrax cleanup provided a guide in developing the health and safety plan (HASP) for the cleanup efforts.

Depending on the situation and circumstances, different agencies will have regulatory authority. During the anthrax response at the AMI facility, EPA had the regulatory authority because the cleanup relied on bleach. However, following successful clearance of anthrax spores, the Palm Beach County Health Department had the final say in opening the building after quarantine. It is therefore important to know who calls the shots, and to be familiar with the incident command system when responding to disasters.

Sampling of the AMI facility showed that the quarantine could have been lifted prior to 2007; however, a dispute between the owner of the building and the abatement firm delayed a release of the sampling data. During the anthrax response, all team members had their HAZWOPER certification and previous experience working in hazardous sites and materials. Briefing of the HASP was important for an effective response by the team.

## Vector-borne Diseases and Viruses

### Swine and Avian Influenza

Ron Snyder, director of health and safety training for the [National Partnership for Environmental Technology Education](#), described his group's involvement in worker training for protection against swine and avian flu outbreaks. Snyder and colleagues developed the Foreign Animal Disease Response Course (2006) and the Avian Influenza Response Course (2007). They later combined the two courses into a single Animal Disease Response Training Course in 2010; however, this training course was not used until the avian flu hit the Midwest again in 2015.

The [H1N1 virus](#), originally referred to as swine flu, caused a worldwide pandemic in 2009. It is now a seasonal flu virus that also circulates in pigs.

Snyder used the avian flu outbreak as a case study to demonstrate how people are not typically concerned about a biological threat until it becomes a problem. In

The *H5N1 virus*, avian (bird) flu, is a highly pathogenic virus responsible for serious outbreaks in domestic poultry in parts of Asia and Middle Eastern countries, and more recently the United States.

2015, cases of highly pathogenic avian flu were confirmed by the U.S. Department of Agriculture in Iowa. The virus infected over 33 million chickens, turkeys, and ducks. This outbreak severely affected egg and poultry farmers in Iowa, the nation's largest

egg producer. As egg production decreased and prices skyrocketed, economic impacts were felt across the state and nation. Avian flu has also been a topic of discussion in more recent news reports:

- The U.S. Geological Survey released additional evidence that western Alaska remains a hot spot for avian flu to enter North America. Alaska is a key location for bird flu transfer due to routes of migratory birds, which are thought to spread the virus (April 2016).
- An outbreak of low pathogenic avian flu was detected on a turkey farm in Missouri (May 2016).
- A research project that received funding from U.S. Poultry has found a way to inactivate the virus in poultry feeds (July 2016).

"There are many things we need to learn and know about these types of animal diseases in order to be better prepared," Snyder stated. Although there are some concerns with alarming the public when there may not be a true risk of biosecurity, Snyder suggested that the public should be notified anytime there is a potential outbreak so they can have situational awareness, and can begin changing their practices and behaviors as needed.

With regards to swine flu, preventive measures such as hand washing and covering coughs should be enforced. With regards to avian flu, identification of the actual vectors that carry or spread the disease is significant to adequately protect people and to keep livestock populations thriving. It is also important to understand what factors play a role in spread of the viruses, such as wind. If the virus is carried on wind, it will dramatically affect the way officials respond to outbreaks. Finally, adequate and proper biosecurity protocols should be enforced.

## Ebola Virus

In July 2014, Emory Hospital was involved in the transport and treatment of the [\*first U.S. patients who had contracted the Ebola virus\*](#). Alex Isakov, M.D., founding executive director of the Emory Office of Critical Event Preparedness and Response and principal investigator of the new [\*Emory University Ebola Biosafety and IDR Training Program\*](#), and colleagues within the Emory Ebola preparedness team were involved in developing a unique capability to manage these patients.



Isakov (pictured on right) shared lessons learned from Emory University regarding Ebola preparedness and biosafety principles.

Isakov reflected on lessons learned from his team's involvement with this case, emphasizing the importance of education. During this time, images and information portrayed in news and media outlets caused the public to become fearful. "Knowledge and understanding is the best antidote to fear," Isakov stated.

The first step that the Ebola preparedness team took was to address and educate the public. The team talked with and engaged people that were disseminating messages through media, and emphasized the importance of relationships between practitioners and educators. The Emory team educated and trained a number of workers, including physicians, nurses, and emergency medical services (EMS) workers to help them feel more comfortable transporting and accepting patients into the hospital.

Isakov emphasized the importance of helping workers understand the epidemiology of illness for Ebola and other infectious diseases. This includes understanding the natural course of diseases, along with incubation periods, symptoms of illness, methods of transmission, recovery

periods, and potential vaccines. Within this educational component, it is also important to demystify illnesses to decrease workers' anxiety about managing infected patients, which allows them to do their job in a competent and capable fashion. The Emory team offers training for several biosafety practices, including the donning and doffing of PPE, decontamination of biohazardous spills, disinfection of environmental surfaces, and proper waste management. They enforce day-to-day practices, like hand-washing, and take advantage of opportunities for hands-on training.

For more than a dozen years, Emory Hospital has demonstrated biosafety capabilities through effective patient transport, management, and infection control for serious communicable diseases.

Biosafety principles involve considerations towards administrative policies, work practices, environmental design, and safety equipment – altogether, these principles help prevent transmission of biological agents to workers, other persons, and the environment. “In order to effectively develop and implement these principles, education, training, and competencies are needed, along with methods to maintain those competencies over time,” Isakov stated.

The success of Emory's educational and training capacity is made possible by teamwork from a wide range of experts in diverse fields, including nursing, pharmacy, infection control, occupational health, security, emergency medicine, pastoral care, and security. One method that the Emory team uses to avoid competency degradation for biosafety is through observations of trainees while they are performing training practices (e.g., doffing PPE) to ensure it is done correctly. In their experience, doctors and other healthcare workers are happy to be observed during PPE doffing exercises, because in the event of worker fatigue or heat stress, they want to be sure they are doing it correctly. “Practice informs good education and training,” Mitch Rosen, Ph.D., principal

investigator of the [\*New Jersey/New York Hazardous Materials Worker Training Center\*](#), stated. “Observation and supervision are very important, and can guard against competency degradation.”

## ON THE FRONTLINES OF DEFENSE FOR INFECTIOUS DISEASE

### Keynote Address

Richard Hunt, M.D., senior medical advisor for the National Healthcare Preparedness Programs in the Office of the Assistant Secretary for Preparedness and Response (ASPR), U.S. Department of Health and Human Services (HHS), provided the keynote address. Hunt reflected on his background and how his experiences as a healthcare provider and infection control expert have helped him better understand the increased need for preparedness across all levels of infectious disease response. Furthermore, he emphasized the importance of training workers to be prepared for predictable and unpredictable outbreaks, which will help build a frontline of defense.



Hunt gave the keynote address, emphasizing that preparedness is not only about being trained to respond just-in-time, but about dealing with fear and uncertainties upfront surrounding infectious diseases.

Society has dealt with many surprising cases of infectious disease, including Severe Acute Respiratory Syndrome (SARS), [Middle East Respiratory Syndrome](#), and more recently, the Ebola and [Zika](#) viruses. “Historically, we have felt confident about preparedness and response, but Ebola was a huge wake-up call,” Hunt stated. He urged that lessons learned from outbreaks of the Ebola virus need to remain powerful reminders of what has been accomplished, and what changes are needed to improve infection control.

In terms of accomplishments, HHS helped prevent the spread of Ebola and saved lives. Other achievements included the development of the [National Ebola Training and Education Centers](#) (NETEC) – a functional system of institutions that have the capacity to assess and treat Ebola patients. This system was created and operationalized within six months. (For more information about NETEC, see the section of this report on Partnerships).

“Ebola isn’t the only big player, so our attention needs to be aimed at future diseases on the horizon,” Hunt mentioned. In dealing with future diseases, particular attention should be directed towards those that are unknown in origin, spread rapidly, and kill people. Ebola and other infectious diseases can be spread by airborne pathogens. Hunt encouraged worker trainers to consider the potential for airborne transmission for future diseases, and to always be ready for surprises.

“We need to know what is out there, and to be prepared at all times,” Hunt stated. “No matter what surprise we are dealt, those on the frontlines will have the greatest opportunity to defeat a disease or illness and to prevent its spread.” The frontlines of defense will include workers in a variety of predictable and unpredictable occupations, including entertainment (e.g., bowling alleys), transportation (airplanes, boats), healthcare, and waste management.

Preparedness is not only about being trained to respond just-in-time (JIT), but also about dealing with fear and uncertainties upfront. In dealing with uncertainties, it is important to expect the knowledge about certain diseases to change over time. Therefore, worker trainers must be flexible to learn more, and to adapt quickly for response. Hunt summarized the following approach as a method of dealing with uncertainties surrounding future diseases:

- Bridge the science of IPC into occupational health and safety sectors,

- Acquire and learn new knowledge rapidly,
- Package and disseminate information quickly,
- Train quickly (JIT training), and
- Be flexible, and adapt.

Workshop attendees made comments and offered suggestions regarding preparedness. One challenge awardees face is getting employers to offer employees time-off for training. Hunt stated this is an issue he has dealt with before, particularly with Ebola training. Awardees should work to help employers recognize the problem, and bring the right stakeholders to the table for these discussions so that challenges can be attacked head-on. WTP should become creative in developing strategies to help employees set aside time for training.

The idea of JIT training does not necessarily feed into prioritizing preparedness. Some trainees experience significant competency degradation shortly after training. Once a crisis has dissolved, everyone disarms and forgets about it. At that point, there is usually a decrease in resources and funding towards the issue. Given the frequency of unfortunate events that happen in society, people are more attentive and quick to communicate about disasters. There is a need to develop a basic foundation of everyday preparedness, where we can go beyond JIT training.

## Worker Trainer Perspectives on Improving Infection Prevention, Training, and Communication

---

WTP awardees shared frontline reports from a worker trainer perspective, and reflected on challenges and successes in developing and delivering specialized training for different target audiences.

[Lula Odom](#), trainer and development coordinator for the International Chemical Workers Union Council (ICWUC) for Worker Health and Safety Education, described the broad diversity of workers that are represented within ICWUC’s target audiences, including teachers, janitors, police and fire department personnel, sanitation workers, and cemetery workers. ICWUC offers specialized training to these diverse occupations, and the training is customized based on risk of exposure. This includes specialized trainings for PPE, including PPE selection, donning and doffing, and respirator fit testing. For example, they offer a two-day awareness training program on infectious

diseases, where they review materials on the Ebola and Zika viruses. These materials will be made available on the National Clearinghouse for Worker Safety and Health Training (Clearinghouse) [website](#). ICWUC faces certain obstacles in initiating an infectious disease train-the-trainer program, and with overall delivery of infectious disease training for target audiences. Among these challenges are time, language barriers, educational comprehension, faulty norms, and lack of commitment from decision makers. For example, it is difficult to allot time for training when people are not able to get off work. Language barriers and educational comprehension present challenges, as some trainees are not able to grasp the relayed information due to technical jargon or verbiage about infectious diseases. Some trainees may even experience faulty norms, or a lack of urgency, if they feel that risk of exposure doesn't apply to or affect them. Sometimes there is a lack of insight amongst worker trainers on how to deliver training content to audiences, especially when the knowledge about different diseases is constantly evolving. Worker trainers cannot assume that target audiences will always know or understand the messages being conveyed. It is therefore important to help trainers learn how to deliver these messages more effectively. "Do not disqualify the messages delivered to trainees based on your qualifications," Odom recommended.



**Odom explained the different obstacles that are faced when delivering infection prevention training to diverse target worker populations.**

Scott Patlovich, Dr.PH., director of environmental health and safety at the University of Texas Health Science Center at Houston, discussed successes and challenges in the delivery of the biosafety and infectious disease training initiative (BIDTI). There are several indicators of the BIDTI's success, including the dialogue and interactions during training sessions, training evaluation forms, and call-backs received from trainees. "We have received many call-backs due to the great training content that is offered," Patlovich stated. "People have called back and told us how much they love the BIDTI training."

Multiple factors have contributed to the success of the BIDTI, including effective branding and partnerships. "People have really resonated with the branding of the BIDTI," Patlovich stated. The BIDTI involves a partnership between multiple awardees and institutions, including the Indiana University School of Public Health at Bloomington, the University of Texas Health Science Center at Houston, University of Nebraska Medical Center, Dillard University, and the Harvard T.H. Chan School of Public Health. "These partnerships lend to the success of the BIDTI," Patlovich stated. "We have a great team of trainers!" The BIDTI trainers bring in knowledge from various perspectives, including clinical, laboratory, and regulatory settings. The trainers also have unique expertise and experiences, which support the need for accurate and timely references for infectious disease training. Overall, this provides a foundation of high quality and effective training for the BIDTI.

Effective delivery of the BIDTI training relies on trainers' abilities to address different challenges. The BIDTI trainers have found that most training challenges are a result of confused information, rather than misused information. Patlovich stated that it is important to understand and identify the training needs of target audiences, and to acknowledge and manage their expectations. Some trainees may come in with mixed feelings about what to expect during training sessions. Sometimes BIDTI training approaches have to be adapted to fit the needs of different and mixed audiences. In order to accomplish this, Patlovich and colleagues make contact with trainees to determine recommendations for best practices, to ensure that they are going into training with the right materials. Incorporating these practices, while reducing the fear factor, puts training into perspective for all trainees.

# TARGETING AND TAILORING TRAINING FOR HEALTHCARE AND NON-HEALTHCARE SECTORS

Workshop attendees participated in concurrent breakout sessions to discuss the training barriers, needs, and opportunities for workers within healthcare and non-healthcare sectors. Overall discussions about training barriers and solutions are summarized below; however, discussions about workers in specific occupations are summarized later in the Appendix.

## General Training Barriers and Solutions

Attendees shared some general and specific obstacles they have encountered in training target populations on biosafety and infectious disease concepts, as well as some solutions that have proven to be effective.

Work schedules, limited availability, and time can be a challenge for training workers. Due to these time constraints, some trainings may focus on one or two specific infectious agents, but this may not address the next potential threat. More effective strategies would be to provide general training, and provide information for a broad variety of diseases that may be encountered. Trainers could potentially categorize or group diseases that have similar methods of transmission. Furthermore, limiting terms to a specific disease or disease process, such as Ebola, can be problematic for training audiences. It is much more effective to use broader terms related to serious communicable diseases, which can then be adapted for specific training scenarios.

Some awardees have experienced disconnects with the organizational and institutional systems that are in place to offer training. For example, there is often a lack of site-specific training programs due to limited interest and buy-in from employers. Having the support and backing from employers to create safety culture in the workplace makes an amazing difference for training. Educational background and language can present training barriers as well; therefore, it is important to build the bilingual

capacity of training in different languages such as Spanish, Vietnamese, and others. Decreases in federal funding and resources affects trainees' access to appropriate PPE ensembles, which thereby affects the capacity for organizations to deliver effective training, especially at the operations-level.

Pre-existing myths, perceptions, stigmas, and fear can also present a barrier for infectious disease training. These myths sometimes cause people to opt out of training that they really need. Awardees must learn to challenge and undo these myths before offering training to their target audiences. By acknowledging these misperceptions, worker trainers can become more effective in delivering valid information through training. Some target audiences can be very apprehensive towards outsiders, and they may have a lack of trust for the government. Trust must be built with target audiences before offering training. Using trust-building exercises for newer audiences, and establishing and building relationships over time, can be useful for trainers.

# SUCCESSFUL FRAMEWORKS AND RESOURCES FOR OCCUPATIONAL BIOSAFETY

Awardees have demonstrated the success of several frameworks for effective delivery of infectious disease and biosafety training, and are working towards the integration of different resources to enhance the delivery of training for workers from different backgrounds and in various occupational settings. The following section provides a summary of these strategic frameworks and resources.

## Embracing an All-hazards Approach to Safety and Health

Mitch Rosen emphasized the need for an all-hazards approach for infectious disease and biosafety training. The following section summarizes the components of an all-hazards approach.

### Learn from the Past

“We do not always incorporate the lessons we learn,” Mitch Rosen stated. “We need to learn from the workers to accommodate their needs into training.” He referenced the 1996 NIEHS WTP and U.S. Department of Energy Office of Worker Health and Safety guidance document and technical workshop report, “Anticipating Occupational Hazards of Cleanup Technologies: Remembering the Worker,” as a guide for embracing an all-hazards approach. There are several commonalities between the previous Technology Safety Data Sheets (TSDS) referenced in the guidance document, and the newly developed PSD training module. This is an example of learning from the past, and incorporating lessons learned into new trainings, modules, and resources. Development of these resources is an iterative process. Furthermore, taking into account what the WTP has learned from previous disasters, there is a need to prioritize hazard recognition, mitigation, response, and recovery activities for infectious disease training.

### Decision-making Skills, Risk Assessment, and Hazard Control

Decision-making skills include risk assessment, anticipation, recognition, evaluation, and control. Risk assessment and hazard control enforces an understanding of risks, potential impacts, likelihood of exposure, and necessary controls. The questions listed below should be considered for training individuals in small or large group activities. Asking individuals these questions will help them critically think about and anticipate where they might encounter hazards, and to consider a whole system of hazards rather than one specific hazard.

- What hazards will you be exposed to?
- Where will you encounter them?
- How do you protect yourself?

Individual and organizational tools are needed to facilitate better understanding of risk assessment concepts, and these will be useful in helping workers and employers create a safer work climate. Mitch Rosen demonstrated the utility of the striped bow tie analysis model as a tool to facilitate infectious disease training at the individual and organizational level. Worker trainers can use this model to help workers and employers think more critically about hazards and layers of controls.

### Surveillance

Surveillance involves methods to systematically detect and assess the early signs of adverse effects on the health of workers exposed to certain hazards. Surveillance is not a control, rather it is a check to make sure that the appropriate controls are in place. It involves an organization's use of data from a variety of sources (e.g., local and state health departments, federal agencies, hospitals, etc.) to prospectively or retrospectively examine what actions are taking place to change workplace safety.

### Practice

Hands-on training and practice is important for workers. It is just as important to give workers immediate feedback to help them distinguish between correct and incorrect safety practices. For example, this type of intervention was effective in helping healthcare personnel reduce the risk of contamination during removal of PPE.<sup>1</sup>

1 Tomas ME, Kundrapu S, Thota P, et al. 2015. Contamination of health care personnel during removal of personal protective equipment. *JAMA Intern Med* 175(12):1904-1910. doi:10.1001/jamainternmed.2015.4535

## Distinguishing Needs for Proactive Versus Reactive Training

---

Isakov explained how maintaining a response capability contributes to the capacity to respond. Emory Hospital had developed response capability to Ebola in 2002, several years before the outbreak occurred in 2014.

Although the capability was not mobilized very often until the outbreak, investment in the capability yielded several procedures and practices that were maintained among a small cadre of individuals.

Isakov reflected on the Emory experience of JIT training for workers during the 2014 Ebola outbreak. They used the Emory [Health Stream Learning Center](#), a web-based online learning management system (LMS), to train 700 personnel at the awareness-level on proper triage, isolation, assessment, and initial management of patients that presented signs of exposure to Ebola. A tiered approach was implemented to train workers based on risk of exposure and anticipated duration of patient contact.

The Emory team received calls from many external individuals who were interested in learning more about ways to prepare for Ebola patients. This prompted the team to launch the Emory Healthcare Ebola Preparedness website in August 2014, which now has over 30,000 registrants. The website includes information about policies and procedures, PowerPoint presentations, and video demonstrations. Isakov noted that working within the private sector offers flexibility for rapid dissemination of information without the burden of having to obtain clearance from federal agencies.

The Emory team draws on a broad network of industry and federal partners for JIT training. Industry partners include American Medical Response (AMR) and Air Methods, while their federally funded framework includes partners such as ASPR, the Health Resources and Services Administration, and NIEHS. Isakov articulated the importance of relationships for JIT dissemination of education and training. For example, Emory's collaboration with CDC and UNMC facilitated the launch of a training initiative in November 2014 during which they shared more information about Ebola safety procedures and specialized PPE to increase domestic capacity for hospital management of patients with Ebola, and to establish Ebola treatment centers (ETCs) around the country. This initiative welcomed exactly 263 attendees from 53 institutions nationwide. Partnership with CDC also facilitated

development of clinical outreach and communication activity webinars, during which information was shared about Ebola preparedness and the transport of patients. A separate collaboration with [Coursera](#), a well-renowned educational platform, allowed the Emory Ebola educational program to reach over 7,000 learners in more than 145 countries.

Several other collaborations have yielded effective outreach opportunities and results for the Emory team. Collaboration with the Georgia Department of Public Health provided an opportunity for an 8-hour educational and training program for EMS workers, which resulted in training for 230 medics over the course of two months. This program provided the foundation for the Georgia Infectious Disease Transport Network. Another collaboration with the AMR provided a platform to load a webinar into an LMS aimed at over 18,000 employees in 2,100 communities across 40 states.

## Implementing Universal Precautions and Hierarchy of Controls

---

[Cameron Wolfe, M.B.B.S.](#), co-investigator in the Duke Infectious Disease Response Training (DIDRT) Consortium and representative from the [Duke Infection Control Outreach Network \(DICON\)](#), described how infectious disease training is executed within the DIDRT Consortium, and their success of implementing universal precautions and hierarchy of controls.

The DIDRT Consortium targets adult worker populations in and out of healthcare settings, including workers in the Transportation Security Administration (TSA), customs, EMS, waste management, and police officers. Training methods involve adult learning techniques, such as active participation, hands-on activities, peer-sharing activities, and case studies. Electronic teaching and courses are available, and workers are offered opportunities to train in the spaces where they will be performing their jobs.

Precautions  
Eg: Ebola

Precautions  
Eg: SARs

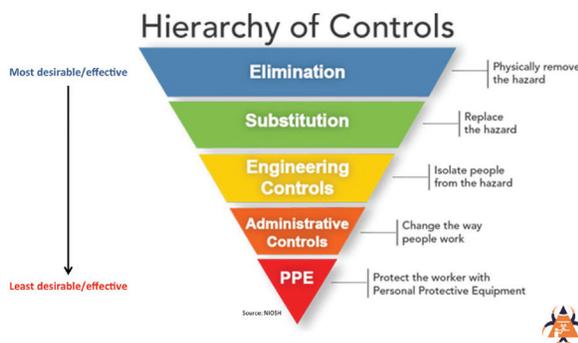


**Figure 1: Wolfe described the linear model that DIDRT uses to teach workers about universal precautions.**

Image source: Dr. Cameron Wolfe's workshop presentation, [https://www.niehs.nih.gov/about/events/pastmtg/hazmat/assets/2016/wtp\\_fall\\_16\\_wolfe\\_508.pdf](https://www.niehs.nih.gov/about/events/pastmtg/hazmat/assets/2016/wtp_fall_16_wolfe_508.pdf)

The Consortium uses a linear model to teach individuals about universal precautions for infection control (Figure 1). This model is an effective teaching tool, which would allow trainers to educate workers about a broad range of precautions, from things that are extremely contact sensitive (e.g., Ebola) to things that are extremely airborne sensitive (e.g., SARS). When considering necessary PPE, everything fits within this linear model.

The hierarchy of controls – elimination, substitution, engineering controls, administrative controls, and PPE – is used to minimize risk of exposure. The top-down approach is most effective in implementing feasible and effective controls (Figure 2).



**Figure 2: The top-down approach is effective in teaching workers about the hierarchy of controls.**

(Image source: National Institute of Occupational Safety and Health <https://www.cdc.gov/niosh/topics/hierarchy/default.html>)

Selection of PPE requires discussion about the hierarchy of regulatory controls. The DIDRT Consortium's PPE guidance is dependent on a worker's risk of exposure, and the donning and doffing of PPE are crucial components of training. A common misperception about PPE is that more is better; however, the very opposite is true quite frequently. "The best PPE is the PPE you have been trained in, that you feel comfortable with, and that is applicable to your area or position of work," Wolfe stated.

Ultimately, administrative controls change the way people work within and outside of healthcare settings. For example, the University of North Carolina at Chapel Hill Ebola Health Care [campaign](#) encourages hospital and outpatient clinic staff to use a three-step process – ask, isolate, and call – to identify and manage Ebola biosafety risks. The DIDRT Consortium has found success in implementing stringent administrative controls to minimize Ebola risk, including the following:

- Re-engineering individual patient rooms,
- Isolating hallways,
- Securing ward entrances (e.g., limit EMS access to certain areas),
- Using cameras or teleconference to increase availability to clinical space, and
- Reserving spaces for storage of equipment.

DICON exists as an externally-facing infection control service within the Department of Medicine and Division of

Infectious Disease at Duke University. DICON provides a number of services, including training courses, prevention initiatives, symposia, and website management. Their LMS offers online learning programs for topics like basic infection prevention and risk assessment, and it includes a timeline of needs for refresher courses.

Notably, training courses for healthcare providers can be extended beyond the clinical environment. These include courses on a wide variety of topics, such as safe injection practices, proper hand hygiene practices, prevention of surgical site infections in operating rooms, and others. These online courses have been used by over 200 hospitals and surgery centers, and DICON has licensing agreements with hospitals in 29 different states. Prevention initiatives are used to provide these hospitals with practical solutions to common important problems.

Their simulation lab is effective in facilitating worker training on the transport of patients, activation of the isolation ward, donning and doffing of PPE, and handling of biological specimens. It has also provided a means of training workers how to respond to common work-related mishaps, such as dropped samples, ripped gloves, and respiratory distress. Use of this simulation lab is made possible via collaboration with the Duke University Human Simulation and Patient Safety Center.

In closing, Wolfe stated that the best worker training programs incorporate a variety of educational strategies and approaches. The best strategy will vary depending on a number of factors, including risk of exposure and physical environment. He noted that media can be a powerful tool for disseminating information, but can also cause panic and sensationalism for audiences.

## Building a Bilingual Corps of Trainers

Arturo Archila from the Steelworkers Charitable and Education Organization (SCEO), highlighted the organization's accomplishment in developing a very successful model of bilingual training. This bilingual training model was developed through a consortium of partner organizations, including the SCEO, the Communications Workers of America, Make the Road NY, United Steelworkers, the National Day Laborer Organizing Network, and the Labor Institute. This consortium represents a wide range of target populations, including workers in healthcare, aviation (flight attendants, airport agents, baggage handlers), corrections, social services,

service industry, and telecommunications. These organizations also represent thousands of immigrant workers who are employed in these industries.

Archila and colleagues will build on gained experience and skills to continue providing Ebola and infectious disease training that started under the NIEHS WTP grant and Ebola supplemental award, and will tap into the cadre of authorized outreach trainers that has been in development over the past three years. The SCEO's training will include a combination of participatory and student-centered teaching strategies that include small group activity methods and popular education techniques to increase knowledge retention. They will offer a variety of bilingual courses and training focused on HAZWOPER, OSHA 511 and 501, resiliency, PSD, and infectious disease. Additionally, they will offer train-the-trainer courses for infectious disease, and disease-specific training focused on viruses such as Ebola, Zika, and *Chikungunya*.



**Archila highlighted his organization's development of a bilingual training model for infectious diseases.**

Archila urged that cultural sensitivity is the key for engagement and efficient outreach for target populations, like immigrants. To properly engage vulnerable and immigrant workers, training must be provided in a manner that empowers, promotes action, and increases consciousness of safety in the workplace, home, and community. The training must be delivered in a way that engages the target audience to ask questions, and provides hands-on experience on how they can protect themselves from infectious diseases. Furthermore, training safe spaces must be created in order to maximize the impact of training, because workers' life experiences and culture are key to addressing issues in the workplace.

Prior to grant funding from NIEHS through WTP, there was essentially no nationwide capacity for health and safety training in Spanish for immigrants, who represent a very vulnerable population. However, the SCEO proposes to change this trend by building the largest capacity in the country to conduct Spanish language Ebola and infectious disease training.

“Education for domestication is an act of transferring knowledge; whereas education for freedom is an act of knowledge and a process of transformation that should be exercised on reality.” – Paulo Freire

The need for bilingual health and safety training programs becomes even more evident when looking at sociodemographic predictions over the next few decades. The *Economic Policy Institute* predicts that the working class, (a large portion of which is non-English speaking),

will become the *majority-minority group* in the year 2032. In order to prepare for the changing demographic and to overcome social barriers, the following should be considered:

- Cultural exchanges and training exchanges should go hand in hand.
- Worker training should be developed in a manner so that workers can become community educators.
- Key components in trainer exchanges should include cultural perspectives while addressing infectious disease.

In closing, Archila shared a video demonstrating the SCEO’s first bilingual exchange pilot training called “Intercambio de entrenadores (Trainers exchange).”

## Integrating Resources: Cal/OSHA ATD Standard and PSD Tools

### Cal/OSHA ATD Standard

Kevin Riley, Ph.D., director of research and evaluation at the University of California, Los Angeles Labor Occupational Safety and Health (UCLA-LOSH) Program, and Mark Catlin, occupational health and safety director for the Service Employees International Union (SEIU), discussed the great potential for the California Division of Occupational Safety and Health (Cal/OSHA) Aerosol Transmissible Diseases (ATD) standard to be used and adapted for infectious disease training by WTP awardees.

The ATD standard was developed and proposed by the Cal/OSHA standards board under their OSHA state plan authority. The final board vote on the ATD standard was made in May 2009, which was during the beginning of the swine flu pandemic. Notably, it is the very first enforceable comprehensive worker health and safety protection standard for aerosol transmissible disease in the U.S. and around the world.

The scope and application of the ATD standard are relevant for healthcare workers, contractors at healthcare facilities, emergency responders, medical transport, skilled trades, and waste handling workers. It covers several droplet and airborne-spread diseases, including Ebola, tuberculosis, measles, SARS, and small pox, and it incorporates the general flow of other existing occupational health and safety prevention standards. This work prepared Cal/OSHA for the Ebola outbreak, and the agency was able to release proper guidance quickly.

Despite the fact that the ATD standard exists, Riley and Catlin recognized the need for more user-friendly resources for workers, and they seized the opportunity to develop new biosafety training resources for workers in California. They are working with other colleagues at UCLA-LOSH and the SEIU to develop and distribute new training curricula for target audiences. These new curricula include an 8-hour module on hazard recognition for nurses; a bilingual 2-hour module for environmental service workers in healthcare on clean-up of patient rooms and isolation facilities; and a 4-hour module for leaders and worker unions. They will use these newly developed modules to train close to 400 workers throughout the state of California. One of their main goals is to build the capacity of union organizations to respond to ATD-related issues of their members.

### PSD Tools and Resources

Jonathan Rosen, industrial hygienist with the Clearinghouse, facilitated discussion on the WTP PSD tools and resources. These resources are relatively new, and few awardees have tested the effectiveness of the PSD tools for infectious disease worker training at their sites. Workshop attendees engaged in review of the PSD training module and guidebook during a breakout activity. The activity was followed by open dialogue regarding realistic approaches and suggestions for customizing and integrating the PSD training module and guidebook into infectious disease training for workers.

Overall, workshop attendees agreed that the PSD training module and guidebook contained clear, thorough content, which is adaptable for different target populations. They were pleased with the glossary and color coordination for different sections, and found the training module to be a great potential resource for train-the-trainer refresher courses. They also offered suggestions to consider in tailoring the PSD resources for different target audiences. For example, it was suggested that different versions of the training module would be needed for healthcare versus non-healthcare workers since a general audience and non-healthcare workers would need less technical jargon and simpler terminology to understand the material. Others noted it is important to consider that translation for some terminologies may be especially difficult for non-English speakers. Another idea was to tailor the PSD module to specific companies or work environments, which employees could use and work through with their employees at their own pace.

Workshop attendees offered other suggestions for improving content, organization, and implementation of the PSD module and guidebook for training. It was noted that a step-by-step, detailed instructional guide on how to use the module would be helpful. Some suggested that it would be useful to incorporate case-based scenarios, and to include a reference sheet with terminologies related to exposures and pathogens that is less comprehensive than the glossary. It was also suggested that it would be useful to highlight commonalities between different pathogens and infectious diseases to eliminate redundant information. Others stated that the material is too dense and overwhelming to be integrated into a single training module, and that certain parts may have to be covered during separate training sessions. Some thought integration of the PSD module into existing training programs would take some time, and that it would also require a great deal of due diligence for trainers to understand the actual risks and hazards encountered by the trainees. Others suggested it may be useful to consider integrating the PSD tools and resources into an online self-paced module.

## PARTNERSHIPS: A METHOD TO ENHANCE DELIVERY OF INFECTIOUS DISEASE AND BIOSAFETY TRAINING

Awardees shared how partnerships have expanded their reach to target audiences, and how these partnerships have created new opportunities to deliver infectious disease and biosafety training for workers.

Shawn Gibbs, Ph.D., principal investigator for the BIDTI, discussed more about the synergy between Indiana University School of Public Health at Bloomington, the University of Texas Health Science Center at Houston, the University of Nebraska Medical Center, Dillard University, and the Harvard T.H. Chan School of Public Health. He explained how the partnership creates an expansive geographic reach for infectious disease and biosafety training. The BIDTI reach encompasses a wide variety of target audiences in different regions of the U.S., including the Northeast, Southeast, and Midwest.

“The BIDTI partnership is supported by the complimentary backgrounds of different experts, and it is built on trust, as well as knowing and understanding each other’s limitations and strengths,” Gibbs stated. “It is important to define roles and responsibilities clearly, communicate effectively, and work complementarily.” Each partner brings unique expertise to the table. For example, Harvard T.H. Chan School of Public Health has lots of intellectual resources and medical expertise, and access to lots of EMS personnel. Dillard University brings a culturally-focused expertise drawing on experiences from their [\*Deep South Center for Environmental Justice\*](#).

Gibbs described how trust, communication, commitment, as well as many other elements, are key for the success of partnerships. Ideally, partnerships should be in established prior to a disaster. Trust and respect are vital, as well as transparent and frequent (but not overburdening) communication. For example, he explained how BIDTI partners maintain communication via monthly Consortium

conference calls, and they maintain a shared box account for working documents and materials. To make sure that everyone is on the same page, they revisit the purpose and objectives of projects regularly, and explicitly outline expectations and delegate responsibilities. Each partner takes ownership of these responsibilities without micromanagement. An additional element that contributes to the success of the BIDTI partnership is the External Advisory Committee, which contains leaders that represent target populations, and ensures that the training curriculum is appropriate for intended audiences.

John Lowe, Ph.D., director of research for the Nebraska Biocontainment Unit at the University of Nebraska Medical Center, provided some background information on the [NETEC](#) network of partnerships launched by HHS in response to the massive need for Ebola preparedness in 2014.

NETEC includes U.S. hospitals that have successfully evaluated and treated patients with Ebola in the U.S. As part of the NETEC effort, CDC developed a [tiered strategy](#) of healthcare facilities to prepare for patients with possible or confirmed Ebola. This strategy helped identify which facilities would provide different levels of care for patients being assessed and treated for Ebola. Partnership amongst federal agencies and state officials facilitated a readiness assessment to identify hospitals that exhibited potential as state and regional treatment centers for Ebola and other special pathogens. Three institutions were designated as regional treatment centers (RTCs), University of Nebraska Medical Center/Nebraska Medicine in Omaha, Emory University, and Bellevue Hospital Center. These institutions were also selected as co-leads of the NETEC, for which they received funding to train and prepare other U.S. healthcare facilities for Ebola and emerging threats.

Since December 2014, Emory and Nebraska have provided training to more than 460 healthcare workers from 87 healthcare systems, including 37 designated ETCs. These trainings covered aspects of infection control and patient care for individuals with Ebola. Presently, Emory and Nebraska are offering additional training opportunities for up to 400 staff from Ebola assessment hospitals. This training is free and some travel costs are covered with Hospital Preparedness Program grant funds. Over the next five years, NETEC will offer support to RTCs, ETCs, assessment hospitals, and state and local health

departments, to enhance their Ebola preparedness and response capabilities.

Lowe described the core activities of the NETEC over the five-year project period. In collaboration with ASPR, CDC, and other stakeholders, the NETEC will:

- Develop metrics to measure facility and healthcare worker readiness to care for patients with Ebola virus disease;
- Conduct peer review and readiness assessments of RTCs and state designated hospitals;
- Create and maintain a comprehensive suite of educational materials (e.g., curricula, JIT training, templates, train-the-trainer modules, tools, simulations, online resources, webinars) for policies and procedures related to care of patients with possible Ebola;
- Launch a repository of resources for healthcare facilities (NETEC.org);
- Support public health departments and healthcare facilities through the provisions of training and technical assistance; and
- Hold Ebola Preparedness Courses in November 2016, January, February, March and April 2017.

The NETEC provides access to a range of experts with content knowledge in a variety of fields, including clinical care, infection control, waste management, PPE, and others. These experts have had direct experience with caring for patients with the disease, and have a vast amount of knowledge and resources to share. Lowe discussed how key collaborations between NETEC experts and other partners could make great impacts towards biosafety preparedness and infectious disease response at the national level. This includes partnerships with external agencies and programs, such as the WTP and OSHA.

Damas Rugaba from [LIUNA Training and Education Fund](#) described how a partnership between LIUNA and the [Environmental Contractors Association \(ECA\) of New York City](#) facilitated integration of the HAZWOPER model with environmental service workers. The ECA, founded in 1996, is an association of 50 contractors with wide ranging areas of expertise, including hazardous materials removal, emergency response, remediation, infectious clean-up, chemical spills, and contaminated water.

Following the Ebola outbreak, the ECA recognized the immediate need for training environmental service workers

to help them reduce their risk of exposure. They reached out to LIUNA to conduct Ebola training for this group of workers. LIUNA seized this opportunity for training development, which involved two primary steps – 1) to train people with experience, and 2) to develop training materials quickly.

LIUNA relied on available guidance from federal agencies such as the CDC and World Health Organization (WHO) to develop Ebola introductory training materials, as well as other materials focused on proactive and protective clean-up procedures for biological waste and hazardous waste remediation processes. For example, they adapted the WHO PPE rapid advice guidelines, as well as the OSHA 29 CFR 1910.1030 bloodborne pathogens regulations. They also adapted information from the Department of Transportation guidance on preparing packages of Ebola contaminated waste for transportation and disposal.

Training content for the environmental service workers was focused on a number of topics that encompass a proactive and protective approach for Ebola. This includes an introduction to Ebola, as well as how PPE can be adapted for Ebola protection. Requirements for workers in biological clean-up, types of cleanings, and steps to follow during and after clean-up were also included in the training content.

## HOT TOPICS IN INFECTIOUS DISEASE AND BIOSAFETY

### PPE Challenges and Successes: Ebola and Beyond

During the Ebola response, CDC and the National Institute of Occupational Safety and Health (NIOSH) developed PPE guidance and recommendations. However, this guidance was modified over time as Jill Shugart, senior environmental health specialist at NIOSH, and colleagues learned more about issues related to heat stress, glove integrity, and body fluid permeability that workers and other stakeholders experienced in the field.

Shugart shared the challenges and successes that her team has experienced related to the research, evaluation, and testing of PPE. For example, they partnered with the National Personal Protective Equipment Laboratory to

perform heat strain testing for PPE ensembles in a test chamber that exhibited humid conditions similar to those in West Africa. They used a sweating thermal mannequin and human subjects to evaluate how long workers can wear various PPE ensembles, and were able to predict and measure the amount of time a human subject can safely wear different PPE combinations before reaching critical levels of heat stress.

CDC and NIOSH received questions about the recommended use of alcohol-based hand rubs between each step of the doffing process, and how this would affect glove integrity. Shugart and colleagues tested the elongation and tensile strength of gloves after the application of six alcohol-based hand rubs. This testing allowed them to tailor their recommendations to ensure

During response efforts, Shugart and colleagues form a small worker safety and health team within the CDC/NIOSH Emergency Prepared and Response Office located in Atlanta, Georgia. This team has been activated for the past two years, given the pressing issues surrounding the Ebola and Zika viruses.

adequate protection was provided through the doffing process. CDC and NIOSH also received many questions about the level of PPE impermeability that is appropriate to provide protection against Ebola. In order to help answer this question, researchers evaluated the impermeability of gowns and coveralls via elbow lean tests to determine if blood penetrated through the fabric. These tests helped CDC and NIOSH recommend standards for impermeability that ensure blood and bodily fluids will not soak through PPE even with the anticipated pressures in a healthcare setting.

Through their interactions with healthcare workers, Shugart and colleagues learned important lessons on conducting training and wearing hazardous materials (HAZMAT) style PPE in healthcare settings. For example, they learned that the frequency of PPE training needs to be continuous, and not just months or weeks before a hospital receives a patient. They also learned that hands-on training is necessary to ensure that workers understand how to assemble, don, work in, and doff PPE safely. Team- or cross-training are also effective training methods for infectious disease, as it is important for workers to understand how to interact with coworkers and patients to perform daily tasks. It is also important to provide an environment that is conducive to retraining staff so that all workers understand and are comfortable with the use of PPE. Moreover, healthcare workers need to understand their limitations with wearing HAZMAT style PPE. For example, working for 12 hours straight in a patient room wearing this level of PPE would be extremely uncomfortable. In order to perform tasks effectively, workers should safely doff PPE, rehydrate, and take rest breaks as needed.

Shugart and colleagues at NIOSH have developed resources for workers and other stakeholders to learn more about PPE and biosafety practices for infectious disease. For example, they created the [PPE-Info database](#), which is a comprehensive tool that allows users to search for relevant PPE standards, product types, and accredited lab information. The tool also contains guidance for medical response personnel in selecting PPE appropriate for specific diseases, such as Ebola. NIOSH has also created a video to train healthcare and mortuary workers how to care for those who have died from Ebola. The video is in the final stages of editing, and will be available online soon.

## Current Science and Efforts for the Zika Virus: A Broad Overview

---

Shugart gave a broad overview of the current science and efforts surrounding the Zika virus, and she provided a list of resources where more information can be found on the disease.

The Zika virus is spread primarily through the bite of an infected mosquito (*Aedes aegypti* or *Aedes albopictus*). Other mechanisms of Zika transmission include that from a pregnant woman to her fetus or sex with an infected person. Zika can be passed through sex before symptoms start, during, and after symptoms end. Of note, the virus can remain in semen longer than other bodily fluids, including vaginal fluids, urine, and blood. Studies are underway at CDC to find out how long Zika remains in semen and vaginal fluids of people, and how long it can be passed to sex partners.

There is a possibility that the virus can be spread through blood transfusions, organ or tissue transplants, or fertility treatments. To date, there are no reports of infants getting Zika through breastfeeding, although this mechanism of transmission is probable. Due to its benefits, mothers are encouraged to breastfeed even in areas where the Zika virus is found.

Anyone who lives in or travels to an area with Zika, and has not already been infected, can get the virus. Many people who have been infected with Zika will display little or no symptoms of the disease; however, the most common symptoms are fever, rash, joint pain, and conjunctivitis (red eyes). Symptoms may last several days to a week, though severe disease requiring hospitalization is uncommon. The symptoms can be treated; however, there is currently no specific medicine or vaccine to treat or prevent the Zika virus itself.

The Zika virus has been shown to cause microcephaly and other severe fetal brain defects during pregnancy. Microcephaly is a birth defect in which a baby's head is smaller than expected when compared to babies of the same sex and age. There is currently no evidence that previous infection will affect future pregnancies. Other problems have been detected in fetuses and infants infected with the Zika virus before birth, including miscarriage, stillbirth, absent or poorly developed brain structures, eye defects, hearing deficits, and impaired growth.

CDC watches for and reports the number of Zika cases and the areas where the virus is spreading (data reported

[here](#)). Zika is a nationally notifiable disease, as local transmission has been reported in the continental United States. State and territorial health departments are encouraged to report laboratory-confirmed cases of Zika to the CDC through ArboNET, the national surveillance system for arboviral diseases. Healthcare providers should report cases to their local, state, or territorial health department according to the laws or regulations for reportable diseases in their jurisdiction.

NIOSH and OSHA have published guidance [documents](#) related to Zika protection for the general public and for specific worker populations. An [interim guidance](#) document was published from through these federal agencies on exposure protection for outdoor workers, mosquito control workers, healthcare and laboratory workers, and business travelers. The latest travel notices for Zika can be found [here](#).

To support and carry out efforts for Zika, CDC has activated its Emergency Operations Center to level 1. CDC is providing on-the-ground support in areas affected by Zika, providing laboratories with diagnostic tests, and educating healthcare providers and the public about the virus. This includes the creation and distribution of Zika prevention kits to affected U.S. territories. Partnerships with other agencies and organizations will enable the CDC to:

- Monitor and report Zika cases;
- Conduct studies to learn more about the potential link between Zika and Guillain-Barre syndrome;
- Create action plans for state and local health officials to improve Zika preparedness;
- Publish and disseminate guidelines to inform testing and treatment of people with suspected or confirmed Zika infection; and to
- Publish and disseminate conclusions on the causal association between Zika and microcephaly.

## Risk Management: From a Single Case to Evidence-based Improvements

Lisa McCormick, Dr.P.H., principal investigator of the [Deep South Biosafety and Infectious Disease Response Training Consortium \(Deep South Consortium\)](#) at the University of Alabama at Birmingham (UAB), described a story in which a series of unfortunate events and miscommunication led to unnecessary panic regarding a potential case of Ebola in Birmingham. In August 2015, a man returned home to

Birmingham after visiting family in Liberia. Upon arriving at the airport and learning he had been in a country where the Ebola outbreak was occurring, he was placed under direct active monitoring by the health department. He was provided a cell phone, and was instructed to take his temperature on a routine basis and to notify the health department if he ran a fever. His father, who was skeptical about the involvement of the local health department, advised him to take Tylenol to keep any fever down. The health department later found out that the patient was taking Tylenol and directed him stop, but then he developed a fever the very next day.

Having developed a fever, the patient dialed 911 and Birmingham Fire and Rescue was dispatched. At the same time, the patient called the health department to notify them that he was running a fever. When the rescue team arrived at the man's residence, he was in his front yard on the phone. During the process of EMS protocol, the patient handed over his cell phone to a paramedic. (This paramedic could now potentially be contaminated with Ebola via contact with the patient's cell phone).

Once the EMS workers and first responders learned that the patient may have Ebola, they began to panic. The officer radioed over an unsecured channel and mentioned Ebola. The media got a hold of this information and showed up to investigate. Not following proper protocol, the EMS workers transported the patient to the UAB Hospital where he was taken to the secured back entrance; however, he was left in the ambulance with a paramedic until a room was set up to receive him. (Room set up can take a long time, as hospital rooms designated as Ebola patient care rooms are normally set up for routine patient care use).

Later after admitting the patient, a bedside malaria smear came back positive. At the time, providers were reasonably sure that the patient had malaria, but also considered the possibility of co-infection. Consultations with the Jefferson County Department of Health (JCDH) and a state epidemiologist led to the decision to test the patient for Ebola. The gathering and testing of the patient's blood sample involved an extremely detailed process, and required specific packaging to maintain the chain of custody. The JCDH was responsible for transferring the blood specimen to the state lab, but at the time they did not have a process in place for doing so. They ended up having a sheriff's deputy escort a JCDH employee to meet an Alabama Department of Public Health employee halfway between Birmingham and Montgomery to transfer

the specimen. The state lab opened in the middle of the night to test the blood sample, which came back negative for Ebola.

McCormick discussed the lessons learned from this single case. No matter how much you prepare, mistakes will be made. For example, neither the patient nor first responders followed proper protocol. Reports on an unsecured channel caused media to report to the scene (at the hospital and patient's home), which resulted in a loss of anonymity and a breach of the patient's private medical information. She noted that media relations from every department need to work together when releasing information to the press, which can be accomplished by a joint press release. She stressed the importance of communicating early and with a unified message. Pre-scripted messages for press releases are very useful. Trust is also key, and can be established through long, working relationships between responders and receivers.

McCormick described how these lessons are being applied for evidence-based improvements in risk management through the Deep South Consortium, which targets workers in Alabama, Mississippi, and the Florida panhandle region. Regarding risk management in Mississippi, McCormick and colleagues are working with partners from the Mississippi Department of Health and the University of Mississippi Medical Center to reduce risks during patient transfer from EMS to the hospital. Together, they have developed a comprehensive plan to address the monitoring of known travelers using CDC guidance and technical assistance. This plan will decrease exposure risk, and will influence efficient use of training and equipment expenditures for EMS and hospitals.

The Deep South Consortium has also found the use of advanced technologies to be useful for reducing workers' risk of exposure in healthcare settings. The use of human patient simulators and simulation labs have enabled them to teach providers how to care for patients in a PPE environment. Increased use of telehealth technology and portals in healthcare settings facilitates the monitoring of patient status during treatment, and reduces providers' potential exposure to infectious disease.

In the future, Consortium members plan to increase use of technology to further improve patient-provider interactions and patient-family interactions without increasing risks to non-exposed persons. They also anticipate the use of technologies that will improve educational opportunities for students, interns, and residents to participate in the learning environment.

## CONCLUSIONS: TRANSITIONING TO MORE EFFECTIVE PREPAREDNESS IN BIOSAFETY

The NIEHS WTP maintains a unique capacity for worker safety and training, and is becoming well-positioned to take on response efforts for current and emerging infectious diseases. Lessons learned from previous disasters and vector-borne disease outbreaks provide a foundation for WTP to move forward with improved biosafety principles to educate and train workers, as well as the general public. Given their unique position on the frontlines of defense for infectious diseases, it is important for WTP awardees, partner agencies, and organizations to embrace that preparedness goes beyond JIT training. Rather, it calls for the capacity to deal with fear and uncertainties upfront.

Awardees within different programs are targeting and tailoring biosafety training for workers in healthcare and non-healthcare sectors. Some are actively training workers in new, and relatively untargeted sectors, such as environmental services and nail salons, and their insights will be useful for others who are considering opportunities to train workers in these areas. However, certain obstacles persist in developing and delivering specialized training for workers, including time, resources, language barriers, faulty norms, and lack of commitment from employers and decision makers. Many awardees have overcome these obstacles through partnerships and improved communication with target audiences. This communication is improved by identifying the training needs of target audiences, managing their expectations, and adapting existing resources to meet their needs. For example, the integration of existing tools, such as the ATD standard and the PSD resources, is a key strategy for awardees to consider in meeting the training needs of their target audiences. Both the ATD standard and PSD tools include content that may be adapted for course modules or train-the-trainer refreshers on airborne and infectious diseases, and both are being pilot tested for training effectiveness among several awardees.

Awardees have also demonstrated successes in implementing frameworks for effective delivery of

occupational biosafety and infectious disease training. An all-hazards approach is critical for infectious disease – it involves being prepared to address current and forthcoming hazards. A proportionate response is achievable for infectious disease training by prioritizing hazard recognition and decision-making skills, recognizing and enforcing worker protection standards, communicating risks and science, and practicing and establishing appropriate controls. Moreover, being able to distinguish needs for proactive versus reactive training, and implementing universal precautions and hierarchies of control, are also important for effective infectious disease and biosafety training. Cultural sensitivity is also an essential component of infectious disease training, and a new bilingual corps of trainers offers WTP promise in reaching, educating, and training non-English speaking populations.

Partnerships have proven effective in enhancing awardees' reach to target audiences, and creating opportunities to access various networks of expertise and resources to deliver infectious disease training. Successful partnerships require essential components such as trust, communication, and clear establishment of roles and responsibilities. WTP will continue the promotion of partnerships amongst awardees as well as external agencies, networks, and organizations.

PPE and risk management will continue to be hot topics in biosafety on the cusp of new infectious diseases, such as the Zika virus. Testing different styles and combinations of PPE is critical to develop regulatory standards, guidance, and recommendations for use in workplaces. Awardees and federal partners have learned the importance of hands-on training for complex styles of PPE to ensure safe donning and doffing practices for workers. Furthermore, awardees are developing comprehensive plans and using technologies to mitigate exposure risk for workers, specifically in healthcare settings.

Overall, there is a great opportunity for the WTP to perform infectious disease training that will lead to visible systems change across the country. In order to make training more effective, core biosafety skills and principles should be taught at different employment levels across all industries and organizations. Training content should be focused on helping workers feel prepared and confident about addressing issues during response activities. However, it is equally as important to ensure that training content and resources are culturally appropriate for diverse audiences, and presented in plain language with limited jargon.

# APPENDIX: MEETING AGENDA



## NIEHS WTP 2016 Infectious Disease Workshop Let's Get Viral!

September 20-21, 2016

NIEHS Building 101 ▶ Rodbell Auditorium

111 T.W. Alexander Drive, Research Triangle Park, North Carolina

### ▶ DAY ONE: Tuesday, September 20, 2016

8:00–9:00 a.m. **Registration** ..... Building 101 Lobby

9:00–9:15 a.m. **Welcome and Kickoff** ..... Rodbell Auditorium

Welcome and short kickoff presentation from NIEHS WTP on prior infectious disease involvement.

- *Joseph “Chip” Hughes, Jr., Director, WTP*

9:15–10:00 a.m. **Lessons Learned and Emerging Issues of Biosafety and Infectious Disease**

Panel session will provide an opportunity to hear about lessons learned from past outbreaks; identify common themes and essential details from the different types of responses. Grantees who have been involved with these outbreaks and disasters will have an opportunity to share their story: how they participated; what challenges they faced/overcame; and lessons learned. This section will allow existing and new grantees to integrate feedback.

- **MODERATOR:** *Jim Remington, WTP*
  - **Bioterrorism and anthrax attacks**—*Bruce Lippy, Ph.D., CPWR - The Center for Construction Research and Training*
  - **H5N1 and H1N1 outbreaks**—*Ron Snyder, National Partnership for Environmental Technology Education*
  - **Ebola case study**—*Alex Isakov, M.D., Emory University*

10:00–10:30 a.m. **Keynote Address**

Keynote address to provide an overview of the infectious disease preparedness efforts in the United States, building resources and national capacity for frontline workers and bridging the science of infection prevention and control into occupational health and safety sectors.

- *Richard Hunt, M.D., National Healthcare Preparedness Programs, ASPR*

10:30–10:45 a.m. **Break**

10:45–11:15 a.m. **Frontline Reports: Trainer Perspectives on Improving Infection Prevention Training and Communication**

Reflective session will provide an opportunity to hear experiences from trainers in the frontline about challenges in the training process.

- **MODERATOR:** *Sharon Beard, WTP*
  - **The diversity of Infectious Disease Awareness Consortium programs**—*Lula Odom, International Chemical Workers Union Council (ICWUC)*
  - **Successes and challenges in the delivery of the Biosafety and Infectious Disease Training Initiative (BIDI) training curriculum**—*Scott Patlovich, Dr.P.H., University of Texas School of Public Health*
  - **Q&A**



11:15 a.m.–12:30 p.m. **Targeting and Tailoring Training for Healthcare and Non-Healthcare Sectors**

Breakout activity to discuss needs, access, barriers, and opportunities for training populations in healthcare and non-healthcare sectors, such as those listed below (Concurrent sessions).

- **Breakout A: Healthcare providers (physicians, nurses, midwives, laboratory clinicians), First responders (e.g., law enforcement, firefighters, EMT's), clinical healthcare facility workers and funeral and mortuary services (e.g., workers handling dead bodies)** .....Rodbell A
  - **FACILITATORS:** *Jim Remington, WTP and Elizabeth Harman, International Association of Fire Fighters*
  - **DISCUSSION FOCUS 1:** *Thoughts on the relationship between educators and trainers and the practice community and how can training be improved?*
- **Breakout B: Transportation (e.g., airline, cruise, airport, shipping, cargo, border control, national guard) and construction industry workers** .....Rodbell B
  - **FACILITATORS:** *Sharon Beard, WTP and Damas Rugaba, LIUNA Training and Education*
  - **DISCUSSION FOCUS 1:** *What may be some persistent challenges or training gaps in this field and what are the possible solutions?*
- **Breakout C: Environmental services, custodial, non-clinical healthcare facility workers, maintenance professionals, immigrant workers and waste handlers industry workers** ..... Rodbell C
  - **FACILITATORS:** *Chip Hughes, WTP and Arturo Archila, The Steelworkers Charitable and Education Organization/The Labor Institute*
  - **DISCUSSION FOCUS 1:** *Thinking about handling medical waste in the era of emerging infectious pathogens, what are the industry and site-specific health and safety training needs in the sector?*
- **Breakout D: Community workers, teachers, daycare workers, nail salon workers, correctional officers, public health workers, disaster relief workers & other hazardous workers** .....Lake View Conference Room
  - **FACILITATORS:** *Demia Wright, WTP and Janelle Rios, Ph.D., Texas-Utah Consortium for Hazardous Waste Worker Education and Training*
  - **DISCUSSION FOCUS 1:** *How can the OSHA 8-hr HAZWOPER or other like infectious disease training material be integrated into a 2-3 hour refresher curricula?*
- **Additional discussion focus for all breakouts:**
  - **DISCUSSION FOCUS 2:** *What are current barriers to providing and/or implementing training in the respective sectors?*
  - **DISCUSSION FOCUS 3:** *Thoughts around training length for awareness and operations training?*

12:30–1:30 p.m. **Lunch** ..... NIEHS Cafeteria

1:30–2:30 p.m. **Successful Training Strategies and Frameworks for Occupational Biosafety (part I)** ..... Rodbell Auditorium

Panel session will feature presentations from grantees to discuss the following topics below.

- **MODERATOR:** *Kevin Yeskey, M.D., National Clearinghouse/MDA, Inc.*
  - **Embracing an all-hazards approach: How can we embrace an all-hazards approach for biosafety and infectious disease training? How can surveillance and risk assessment be incorporated?**—*Mitch Rosen, Ph.D., Rutgers*
  - **Proactive versus reactive training: Distinguishing needs for delivering preparedness versus just-in-time training with emergency responders**—*Alex Isakov, M.D., Emory*
  - **Universal precautions and hierarchy of controls in and out of healthcare settings**—*Cameron Wolfe, MBBS, Duke University, Duke Infection Control Outreach Network*

2:30–2:45 p.m. **Break**

2:45–3:45 p.m. **Successful Training Strategies and Frameworks for Occupational Biosafety (part II)**

Panel session will feature presentations from grantees to discuss the following topics below.

- **MODERATOR:** *Nina Jaitly, M.D., WTP*
  - **Building a bilingual corps of trainers**—*Arturo Archila, The Steelworkers Charitable and Education Organization/The Labor Institute*
  - **Aerosol Transmissible Disease (ATD) Cal-OSHA Standard Integration**—*Kevin Riley, Ph.D., University of California, Los Angeles, Labor Occupational Safety and Health Program, and Mark Catlin, Service Employees International Union*
  - **Obstacles to initiating an Infectious Disease Train the Trainer program**—*Lula Odom, ICWUC*



3:45–4:45 p.m. **Integration and Delivery of Pathogen Safety Data Tools and Resources**

Presentation highlighting the WTP Pathogen Safety Data (PSD) training module and web resources. This will be followed by a small group activity to discuss what may be some realistic approaches to customization and implementation across populations and training programs.

• **Moderator:** *Nina Jaitly, M.D., WTP*

- **Overview of the WTP PSD training module and guidebook**—*Jonathan Rosen, National Clearinghouse/MDB, Inc.*
- **Small Group Activity and Discussion**

4:45–5:00 p.m. **Meeting Wrap-up and Adjourn Day 1**

5:10 p.m. **Bus Departs for DoubleTree**

## DAY TWO: Wednesday, September 21, 2016

9:00–9:15 a.m. **Welcome and Revisit Day 1** ..... *Rodbell Auditorium*

• *Chip Hughes, WTP*

9:15–10:15 a.m. **Enhancing Partnerships for Delivery of Infectious Disease and Biosafety Training**

Panel session will feature 10-minute presentations on examples of effective partnerships that have been formed, and to discuss the needs for others to effectively deliver infectious disease and biosafety training.

• **MODERATOR:** *Chip Hughes, WTP*

- **Bringing IUB/Nebraska/Harvard/Texas Partnerships Together**—*Shawn Gibbs, Ph.D. Indiana University Bloomington*
- **National Ebola Training and Education Center (NETEC) Partnerships**—*John Lowe, Ph.D. Nebraska Medical Center*
- **Integration of HAZWOPER Model with environmental services: A partnership between LIUNA and NYC Environmental Contractors**—*Damas Rugaba, LIUNA Training and Education*

10:15–11:30 a.m. **Hot Topics**

Panel session will feature presentations to discuss the topics below.

• **MODERATOR:** *Donald Elisburg, National Clearinghouse/MDB, Inc.*

- **PPE and respiratory protection technology issues: How to work with the challenges**—*Jill Shugart, National Institute for Occupational Safety and Health (NIOSH)*
- **Zika: Current Science and Efforts**—*Jill Shugart, NIOSH*
- **Ensuring Biosafety Training Improvements and Precautions are Adequate and Appropriate**—*Lisa McCormick, Dr.PH., University of Alabama at Birmingham*

11:30 a.m.–Noon **Open Discussion and Meeting Wrap-up**

How we can transition from current efforts to more effective preparedness?

• *Darryl Alexander, American Federation of Teachers*

12:10 p.m. **Bus Departs for Airport**

# APPENDIX: TRAINING BARRIERS AND SOLUTIONS FOR SPECIFIC OCCUPATIONS

The sections below summarize the training barriers discussed and solutions identified for specific occupations by workshop attendees.

---

## Construction Workers

Union and non-union workers deal with hazards differently, so ensuring that all infectious disease standards are handled similarly among these two groups can be a challenge. Another critical challenge that the WTP should try to address is the enforcement of worker safety and health standards at construction sites, particularly in larger cities where there is a limited number of inspectors.

Some awardees have faced challenges with maintaining and keeping construction worker training up-to-date when there is no imminent threat or big push for infectious disease training. Some potential solutions for this would be to incorporate an infectious disease module as part of a HAZWOPER 8-hour refresher course, which most workers are required to have and maintain. An additional solution would be to request that OSHA develop an infectious disease module as part of their 10-hour construction course, which some contractors require workers to have.

Awardees have also encountered more unique issues in delivering infectious disease training to construction workers. For example, during recent outbreaks of the Zika virus, workers were concerned about standing water at construction sites. Common misperceptions about the virus caused workers to believe that the virus was only a concern for pregnant women. In general, workers have encountered limited or conflicting information about the virus, in terms of how to protect themselves. This may include information about the use of DEET as an insect repellent, or advice on how often the repellent should be applied daily.

There are some issues with training construction workers that work on or around hospital sites as well. Most training right now discusses how to protect patients in the healthcare facility, rather than how to protect workers around or within those environments. For example, CPWR does infection control risk assessment at hospitals, and the current state of training is patient rather than worker-focused; however, this is starting to change

slowly. The change is slow because in this industry there is no requirement for this training other than hospital accreditation as it relates to the construction work force or local guidelines. NIOSH has a toolbox talk on this subject.

Overall, it is best to encourage these workers to keep up with infectious disease training, even when there is no imminent threat. More specific solutions for training on Zika would be to use a toolbox talk. Federal organizations, such as OSHA, have existing materials and guidance on the Zika virus that would also be useful. It is important to inform and train workers based on complete risk, and go beyond their individual level of risk. This may include recent findings and information about how the virus can be transmitted sexually.

---

## Correctional Officers

Correctional officers at private prisons receive very limited, if any, type of training; however, state prisons receive lots of training when they need it. Odom stated that the ICWUC is currently planning a two-day training for a private prison focused on infectious disease, and this training is being combined with another curriculum.

---

## Environmental Service Workers and Waste Handlers

Huge amounts of waste are created domestically, and waste often has to travel long distances to facilities that can handle or process it. The federal government has standards and procedures in place for waste handling; however, awardees face problems in reaching workers that are involved in environmental services or waste handling for training. Unions may be helpful in getting this training information to the target audiences, but all states do not have unions. Other worker centers, primarily those that work with immigrants, may be able to help reach these populations as well.

---

## Healthcare Providers

The lack of occupational health and safety concepts in medical and nursing school curricula is a very concerning issue for healthcare providers. Training for healthcare providers needs to begin at the student level. Moreover, there are systemic problems within the healthcare industry that present barriers for training. For example, long work shifts can inhibit the ability of individuals to protect themselves. The amount of time available for training is often an issue; however, some awardees have been more creative in reaching healthcare workers by offering trainings during lunch hours, or through online videos. The culture within the healthcare industry can also prevent the opportunity for certain people to have a voice towards developing or participating in training programs.

---

## Immigrant Workers

Immigrant workers have largely been off the radar until recently. Arturo Archila and colleagues from SCEO have created a unique bilingual training program for this target population (see pages 15-16).

---

## Nail Salon Workers

Time and language barriers are the most common challenges encountered with training nail salon workers. Additionally, the culture of safety is typically not an urgent issue to these workers.

Tippy Reed and colleagues at Opportunity Advancement Innovation (OAI), Inc. are currently developing a three-day training curriculum for nail salon workers. Reed talked about the outreach that they performed for Vietnamese communities and nail salon workers in Georgia, Texas, and Virginia. Train-the-trainer courses were well received by the communities, and OAI is rolling out a 2 to 3-hour training focused on chemical hazards and protection in nail salons. They have trained 300-400 people within these communities so far.

Reed suggested that the key to reaching nail salon workers is to target the salon owners. Other venues for outreach include local churches, cosmetology schools, and community events. For this population, she suggested training must be short and focused, and that they learn best within small group atmospheres.

---

## Daycare Workers and Teachers

One obstacle for training daycare workers is that very few states have regulatory requirements for daycares. One of the greatest risks within a daycare setting is the death of a child.

Attendees inquired about the hierarchy of risk for daycare workers, and what types of training should be offered to prevent the loss of a child. Awardees from United Automobile Workers (UAW) and ICWUC offered insights on methods of training that have been effective for daycare workers with their organizations. For example, Odom and others at ICWUC provide 4-6 hours of training for daycare workers, and 1-hour of the training content is focused on blood borne pathogens. They use Glo-Germ, which shows up under a black light so trainees can see how well they cleaned after an exercise changing diapers.

Grant Grace and others at UAW successfully completed a 4-hour training and 1-hour refresher training with daycare workers, and they worked with the state to implement regulatory requirements for the training. The training was offered after hours at daycares, and childcare was provided so that interested parents could participate in the training. Trainees were given diapers that had melted chocolate, and they had to see how well they could change the diaper. UAW served pizza at the end of the training so no one had to worry about what to eat for dinner. Completion of the training was documented by sign-in sheets, registration forms, and certificates.

Other obstacles exist for training teachers in grades K-12. Grace stated that the State Department of Health reviewed and interfered with UAW's training curriculum for teachers. One potential solution would be to partner with teachers' unions to define strategies to make training accessible for teachers. Another solution would be to attend annual teacher conferences and get their input on agendas for teacher training days. It is important to target teachers in public, private, and charter school systems. Corruption is another challenge for training, because there is known falsification of training certificates. An example of this would be one administrator taking the training for other staff members and teachers.

---

## Transportation and TSA Workers

There are several unique challenges that awardees encounter when training transportation workers. One challenge that is experienced in the transportation sector is access to work forces in airports or shipping ports, especially in situations dealing with multiple employers or contract-based employment. This makes it particularly difficult to identify employers, and even more difficult to reach the workers that need training. Multiple federal agencies have jurisdiction over different parts of transport chain sectors, and it can be cumbersome figuring out what agency is responsible for different pieces. Additionally, getting buy-in from these agencies varies because each individual agency has different ideas about what their role or responsibility is for worker safety and health. TSA workers and baggage screeners focus on security as they screen passengers, and this could pull their attention away from identifying a passenger that may be infected.

Although training is typically performed for one group of workers at a time, it would be more effective to integrate training for multiple worker groups. Utilizing a top-down approach to access target groups may be effective, and this can be accomplished by working with airport managers.

In the transportation industry, placarding is a very popular tool that is used to identify hazardous materials along the transport chain. The placard system could be implemented as a model for infectious disease training through the WTP, which could help workers recognize different biosafety hazards.



National Institute of  
Environmental Health Sciences  
*Worker Training Program*

This publication was made possible by order number HHSN273201500075U from  
the National Institute of Environmental Health Sciences (NIEHS), NIH.

