

Food Defense



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Editor's Notes

By James D. Hessman



The total world population, according to the U.S. Census Bureau, is currently more than seven billion. As diets change and the quantity of imports to and exports from countries around the world increases, protecting the many food supply chains from unintentional contamination as well as deliberate agroterrorism can be challenging. Ensuring the safety and continued viability of those supply chains requires a multi-discipline approach of federal governments, state and local governments, farmers and cattlemen, grocery stores and restaurants, and even the mom-and-pop stores that can be found in small towns and major cities around the world.

In this printable issue of DPJ, 12 practitioners share their knowledgeable insights about protecting the food supply at various stages of those chains. Michèle Samarya-Timm begins by discussing the overwhelming dimensions of the task facing those who grow, produce, and distribute food products. The food handlers and inspectors also share the daily challenge of ensuring that massive quantities of food are free from disease and infection – caused by both accidental or deliberate acts.

Patrick Rose then describes the important role that food security plays within the critical infrastructure of the United States. Such high-risk vulnerabilities require engagement by the private sector to create an effective food defense plan to deter acts of agroterrorism. Thomas Cotter and Earl Stoddard join forces to focus on zoonotic diseases, which are passed from animals to humans and are extremely difficult to control – H1N1, for example. Dana Pitts focuses on controlling the quantity of foodborne illnesses, and emphasizes promoting greater awareness about the deadly germs, like *Listeria*, that thrive in contaminated food. Danelle Bickett-Weddle and Pamela Hullinger discuss the danger that foot-and-mouth disease poses to the milk supply and how effective communication and information sharing can help reduce the actual as well as the perceived threats.

Although these dangers are not totally new, there is a growing need to increase awareness and find new ways to combat various food-related dangers. Kay Goss provides an illuminating overview of the roles that national and international agencies and their private sector partners play in the food-safety and inspection processes. Chris N. Mangal focuses special attention on the threat detection, training procedures, and information sharing that occurs between a broad spectrum of government laboratorians, epidemiologists, and law enforcement personnel directly involved in protecting the food supply chain.

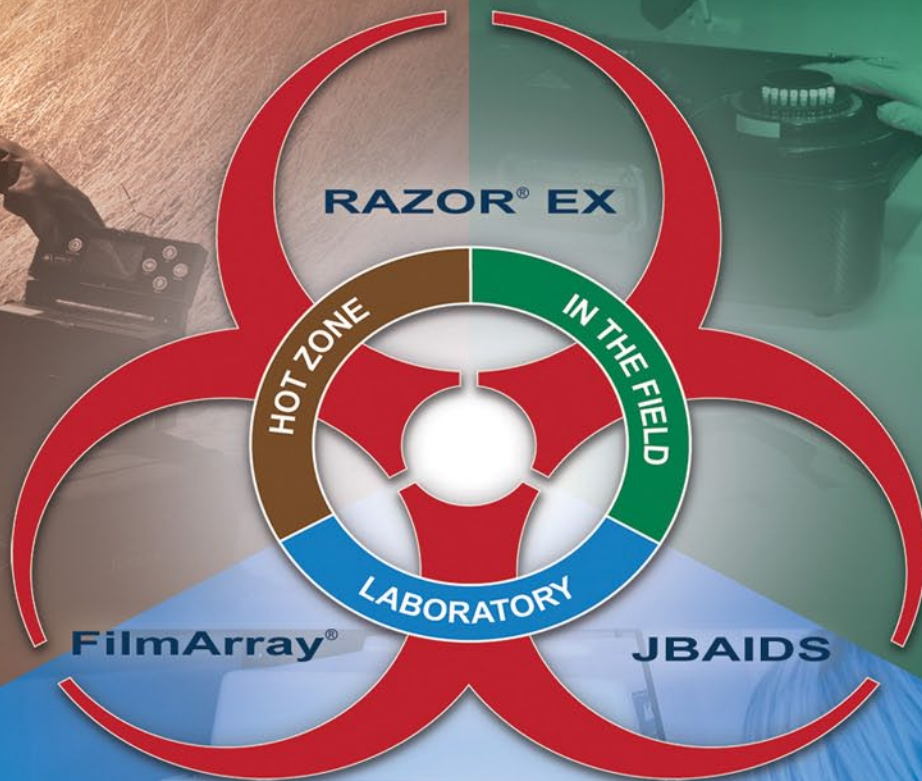
Rounding out the issue are three special features by: (a) Joseph Cahill, who analyzes the intricacies of safeguarding a city's water supply from deliberate contamination; (b) Former Wisconsin Governor Scott McCallum, who discusses the increasingly important role that charitable agencies play in feeding the poorest and least protected populations, and scaling that response to include those affected by disaster; and (c) Rodrigo Moscoso, who examines the national implications of the "shelter in place" mandate issued by the Boston police immediately after the terrorist bombings at the Boston Marathon.

About the Cover: Feeding time at the chicken coop (iStock photo). Ensuring that the food chickens eat is free from disease is the first bite on a long list of protective measures now being taken to ensure that the U.S. food supply chain is safe not only from various poultry diseases but also from many other dangers, including agroterrorism.

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Defending the Food Supply: The Basic Recipe

By Michèle Samarya-Timm, *Health Systems*



The term “food defense” can be a perplexing concept, especially since it represents protecting the food supply from intentional, criminal, and/or malicious contamination. In practice, food safety and food defense overlap in certain respects, but still can be used in a synergistic fashion to build on existing food protection programs. In other words:

Food Safety + Food Defense = Food Protection.

For food defense efforts to be effective, though, some common myths must be dispelled and certain resources shared to lay the groundwork for a culture of overarching food protection at local as well as state and federal levels. Among the most important aspects of an effective food defense strategy are the steps taken to: (a) involve the local level; (b) determine vulnerabilities; (c) integrate federal requirements; (d) locate and/or develop essential resources and training plans; and (e) fund the preceding and other initiatives that might be taken.

Essential Involvement Starts at the Local Level

Similar to the regional and global nature of food supply chains, foodborne outbreaks and food recalls also can be either localized or geographically widespread. Regardless of the origins of the food itself, the first indicator – and usually the first response to a foodborne incident – will originate locally.

In the United States, food protection regulators at the local level oversee, inspect, and provide technical guidance governing a wide variety of food operations within their service areas to help ensure a safe food supply. Thanks in large part to this supervision, local jurisdictions often may be the first to hear of or otherwise detect an illness or outbreak – and usually the first ones to respond as well.

An effective public health response depends on the timeliness of reporting, investigation, and regular communications among federal, state, and local partners. Developing these important working relationships before an incident – usually by means of networking, plan development, exercises, and similar activities – ensures a better coordinated response when intentional contamination is suspected. Regulators’ knowledge of these partner food protection agencies – as well as adequate training in surveillance, reporting, and response techniques – is critical to reduce disease and sometimes deaths resulting from contaminated food.

Intentional Contamination at the Food Service Level

Many U.S. food defense efforts are targeted at agriculture, processing, and packaging purveyors because of the vast geographic spread of the nation’s

food distribution system. Although targeting food defense efforts at the farm and industry levels is important to prevent large-scale, multi-regional foodborne outbreaks, it also is important to remember that smaller independent retail food establishments – the so-called “mom and pop stores” – are a significant source of food products for many consumers. Specific efforts are needed, therefore, to protect these and similar establishments through the use of various types of prevention campaigns.

The vulnerability of retail food service to conscious contamination is well documented. In 2009, for example, [G. R. Dalziel](#), a researcher at the Nanyang Technological University in Singapore, examined all known incidents of intentional and malicious contamination of foodstuffs along the entire food supply chain in that area. Almost 98 percent of the intentional food contamination incidents he studied, Dalziel found, “occur downstream in the food supply chain – at retail outlets, the home, and workplace.” In addition, he determined that cases occurring at the food service point of the supply chain led to the greatest number of illnesses and had the largest impact on public health. (The perpetrators for most of these incidents, it should be emphasized, were not involved with terrorist cells.)

Researchers at the University of Missouri agree with Dalziel’s findings, and explain – in their 2009 [Food Defense](#) planning guide – that intentional contamination “may be caused not only by people outside an operation, but also by workers, family members, or others with regular access, and most cases have occurred for more mundane reasons than ideology.” These scholarly agreements help to support both the need for an increased focus on food defense education and the creation of preventive initiatives at the point of food service operations.

Many local inspectors and regulators are not sure, though, exactly how to integrate food defense into their own working routines and processes. For example, as forensic sanitarian Robert Powitz reflected – in a

2007 article in [Food Safety Magazine](#) – the federal requirements “outlined for a comprehensive, secure retail food establishment ... [are] somewhat daunting, confusing, and sometimes quite illusive if applied to a smaller operation of limited financial and facility resources.” Nonetheless, it is often the influence of a health inspector that facilitates the use of food defense initiatives in small local establishments. Unfortunately, many health departments throughout the United States are simultaneously burdened both by shrinking budgets and by the double loss of both experienced personnel and material resources. When attempting to do more with less, integrating food defense into traditional regulatory food safety inspections often comes as an afterthought.

Food protection programs involve not only the safety of the food processing facilities in the food supply chain, but also the development and use of effective defense measures against intentional contamination.

Such perspectives may be amended by envisioning food defense as an “enhanced” version of business as usual. In other words, it is particularly important to find new and perhaps more imaginative ways to combine food safety and food defense – food protection, in general – into the same integral component of traditional inspection activities. By encouraging relatively simple policies and procedures – posting signs, for example, that no one should enter the kitchen without permission – neither regulators nor the frontline food service personnel they work with are likely to be unduly burdened. Education, awareness, and implementation are obviously easier when all of the agencies and individuals

directly involved consider achievable successes in assuring the availability and consumption of safer food.

A Wealth of Resources & Training Courses Already Available

Douglas Powell, professor of food safety at Kansas State University, noted – in a June 2013 article about food protection on the food safety daily [barfblog.com](#) – that access to the right tools, coupled with compelling messages, has been demonstrably effective in promoting food defense. Free and credible resources are immediately available for elected officials, health departments, and food service personnel to begin or enhance their food defense efforts. Following are brief examples of some of those resources:

- FoodSHIELD (www.foodshield.org) is a web-based system for communications, coordination, education, and training between and among the nation's food and agriculture sectors. Regularly scheduled food defense webinars, online training sessions, and a searchable database all provide professionals involved in food protection with the tools they need to build and improve their food defense capabilities.
- The National Center for Food Protection and Defense website (www.ncfpd.umn.edu) is a robust online resource portal that provides a wealth of information for food service professionals, students, and educators. Of particular value are the site's online training modules, which explain food protection and defense concepts in relatively short didactic presentations intended for anyone – food industry workers, government officials, and academic educators and researchers – seeking to learn more about food defense.
- The U.S. Food and Drug Administration (FDA) also has numerous free print and online resources available (www.fda.gov/Food/FoodDefense). For example:
 - The Food Related Emergency Exercise Bundle (**FREE-B**) is a compilation of scenarios based on both intentional and unintentional food contamination incidents. It is designed primarily to assist government regulatory and public health agencies in assessing existing food emergency response plans, protocols, and procedures that may already be in place, or that are in the process of being revised or developed. The FREE-B is designed to allow various jurisdictions and organizations – the medical community, private sector organizations, and law enforcement and first responder communities – to “play” with the host agency, or for individual agencies to test their own plans, protocols, and procedures independently.
 - In May 2013, the FDA released [The Food Defense Plan Builder](#), a user-friendly software program designed to help owners and operators of food facilities develop their own personalized food defense plans. This computer-based program harnesses existing FDA tools and resources for

food defense planning into a single place. These tools and resources include the FDA's food defense guidance documents: the [Vulnerability Assessment Software Tool](#) and the [Mitigation Strategies Database](#).

Grant Funding Available For Food Defense Initiatives

The FDA encourages regulatory stakeholders to consider the possibilities of incorporating the agency's food defense ideas into the stakeholders' own food safety-related programs. As part of this focus, the agency provides [Innovative Food Defense Program](#) grants, which are designed primarily to help build additional food defense tools and resources that can be easily replicated and therefore complement, aid in the development of, or improve state, local, tribal, and territorial food defense programs. Access to previously [awarded and completed projects](#) is free and provides additional valuable and replicable resources that agencies or food supply professionals can use to create and/or enhance current food defense programs.

Michèle Samarya-Timm has an MA in Homeland Security and Defense from the United States Naval Postgraduate School and a BS and MA in Health Education from Montclair State University. A Masters Certified Health Education Specialist and New Jersey Health Officer, she has 20+ years as a Registered Environmental Health Specialist. Employed with the Somerset County Health Department (NJ) since 2009, she has extensive involvement in emergency preparedness and response, food safety and outbreak prevention, public health analysis, and health communications. She is recipient of a Special Citation from the FDA Commissioner for her educational work to reduce foodborne illness in the United States, and also for her efforts in maximizing collaborative efforts between federal, state, and local regulators. Currently she is overseeing the implementation of an FDA-funded food defense program, and is completing a thesis exploring the impacts of inter-governmental communications on foodborne outbreak threats and response.

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Counter-Agroterrorism 101

By Patrick Rose, CIP-R



An “all-hazards approach” to disaster preparedness includes manmade disasters, which in large part are attempts of various forms of aggressors – for example, state-sponsored or non-state actors – to violently destroy life and property. The malicious intent of any aggressor is to undermine a sense of security, destabilize a government’s ability to function, and severely disrupt the economy. All of which is the reason why the protection of critical infrastructure and key resources (CIKR) has been a major focus in the nation’s efforts to prevent aggressors from: (a) successfully executing an attack; and (b) meeting their objectives. The primary focus of current CIKR plans and policies, though, seems to be on securing the nation’s transportation and energy infrastructure – and, by doing so, sometimes neglecting food security (i.e., animal and agriculture).

The U.S. food supply represents a high-risk vulnerability for the entire nation. What is officially referred to as the Food and Agriculture Sector of the U.S. economy – and, therefore, the nation’s food industry as a whole – contributes upward of \$1 trillion to the U.S. Gross Domestic Product. In fact, as Agriculture Secretary Thomas Vilsack pointed out in a press release on [1 February 2013](#), U.S. agricultural exports alone accounted for \$478 billion from 2009 through 2012, largely because the United States is one of the dominant producers of the world’s grain supplies.

In addition, as the American Farm Bureau Federation notes on its [website](#), an estimated 15 percent or so of the total U.S. workforce is employed in the food industry, in jobs ranging from animal and agriculture stewardship and processing to selling food products at local markets.

Food – An Easy & Desirable Target

These statistics demonstrate not only how integral and important the Food and Agriculture Sector is to the nation’s overall economy, but also how attractive the food industries may be as potential targets for terrorist attack. Perhaps less attention has been given to preventing terrorist attacks against the Food and Agricultural Sector because the potential death toll following an attack on any link in the food chain – production, processing, supply, and distribution – would be much less than, for example, a deliberate biological weapons attack in a large metropolitan

city. Nonetheless, a successful attack on the nation’s food supply could lead to disastrous economic losses and raise understandable doubt about the nation’s ability to secure its own food supply.

Today, unfortunately, that sector has several exploitable vulnerabilities that make securing the food at each stage an almost impossible task. Production facilities – farms, for example – are widely scattered throughout the nation, are easily accessible by would-be terrorists, and usually have little if any security. In addition, each step within the food production pipeline – from maintaining to processing livestock and/or distributing the food – is highly concentrated, making a large-scale and surreptitious contamination attack much easier to carry out.

During the last quarter of 2012, the U.S. Food and Drug Administration (FDA) recorded on average up to six recalls of food products per day. Most of the recalls were because of unintentional food contamination. Moreover, according to the U.S. Centers for Disease Control and Prevention’s [website](#), an estimated 48 million Americans suffer annually from various foodborne illnesses, 128,000 of that number are hospitalized, and 3,000 die.

There have been numerous prominent examples of mass poisonings, both planned or accidental, in recent years – for example, according to the U.S. Centers for Disease Control and Prevention, the salmonella contamination of peanut butter in 2009 infected [714](#) people nationwide – that not only illustrate how vulnerable the nation’s Food and Agriculture Sector really is but also give potential aggressors optimism that intentional attacks would have a high likelihood of success.

Compounding these obviously exploitable vulnerabilities is the widely accessible arsenal of biological agents now available to would-be terrorists. The plant and animal pathogens that could be used as biological weapons are much easier to acquire than deadly human pathogens are – or probably ever will be. Moreover, because most plant and animal pathogens do not put the people who handle them at risk during the mass production or release stages of an attack, they are much more desirable weapons than are human pathogens that could harm or kill the aggressors themselves.

Foodborne Illnesses

48 Million Americans Sick

128,000 Hospitalized

3,000 Dead

2011 CDC Estimates

In addition to the ease of acquiring plant and animal pathogens, the delivery mechanisms of introducing these same biological agents are relatively simple to use – or misuse. In most cases, the pathogens are highly contagious and could rapidly spread through crops or animal populations dispersed over fairly large geographic areas. A major related problem is that any medical countermeasures used are rather limited when it comes to protecting plants and animals. That deficiency means in turn that the rapid spread of a biological weapon introduced against a plant or animal can often be stopped only after the susceptible crops or livestock are destroyed.

The Role of the U.S. Private Sector

In developing a plan of action to protect the Food and Agriculture Sector, the burden cannot fall entirely on state and local law enforcement agencies – primarily because of the many strategic challenges they would face in carrying out this mission by themselves. Efforts certainly have been made to develop effective strategies for protecting the sector – at the federal level, for example, beginning with Homeland Security Presidential Directive 9 (i.e., [Defense of United States Agriculture and Food](#)) issued in 2004.

Nonetheless, several federal agencies, such as the U.S. Department of Agriculture (USDA) and the Food and Drug Administration, have been struggling, with limited resources, to effectively secure the nation's food and agriculture on their own. However, even as many federal, state, and local agencies have been stressing the importance of a truly integrated engagement, with the private sector

heavily involved, to expand and improve the nation's all-hazards preparedness capabilities, it also has become apparent that the private sector itself can play a critical role in the overall protection of the nation's food supply.

It is equally important that members of the private sector also understand the risks and consequences of unintentional contamination as well as the connection between food safety and their businesses' bottom lines. Paralleling the governmental efforts to integrate food-safety mechanisms will help the private sector contribute to a larger, significantly enhanced, and more effective nationwide food defense strategy. Moreover, although federal resources are limited, there have been several actions taken to expand and facilitate the private sector's engagement in food defense. For example, the U.S. Department of Agriculture already supplies tools to assist the private sector in developing its own plans and strategies.

In addition, a recent effort by the U.S. Food and Drug Administration – creation of a new software program ([Food Defense Plan Builder](#)) – also assists the private sector in developing a customized food defense plan. The new software allows private industry to review current gaps and areas for improvement, as well as to make changes needed to provide greater protection against the threats posed by the intentional release of any biological agent.

Of course, the success of such efforts will continue to be dependent on the intended audience applying the cautionary steps needed. For a nationwide food defense system to be truly comprehensive, affordable, and capable of mitigating threats that could put the entire nation at risk, the private sector must work more closely and more effectively with local, state, and federal agencies to coordinate their combined efforts and close the vulnerability gaps still threatening the entire nation.

Patrick Rose, a Senior Analyst at Gryphon Scientific, holds a Ph.D. in Microbiology and Immunology from Oregon Health and Science University. Prior to joining Gryphon Scientific, he was a senior policy analyst at the Center for Health and Homeland Security. He managed numerous projects through the Homeland Security Exercise and Evaluation Program and was an instructor for the Senior Crisis Management Training Program at the U.S. Department of State Office of Anti-Terrorism Assistance. His tenure includes positions at the National Institutes of Health and the Los Alamos National Laboratories. In addition, he was a National Research Service Award postdoctoral fellow at the University of Pennsylvania. In the spring of 2011, he was recognized for his research as one of the top 100 International Academics worldwide by the German Scholars Organization and the President of Germany. He also is an alumnus of the Emerging Leaders in Biosecurity Initiative through the Center for Biosecurity at the University of Pittsburgh Medical Center.

Food Safety: An Emergency Manager's Perspective

By Kay C. Goss, *Emergency Management*



Food safety is an issue that significantly affects public health, national security, emergency management, agricultural security, homeland security, and many other national priorities.

When considering global, national, or local risks, food vulnerabilities must be considered because a safe food supply is necessary for the health, security, stability, sustainability, and resilience of the entire nation. The proactive protection of stockpiles, food supply chains, pharmaceuticals, water supply chains, processing plants, ports, and other transportation systems is therefore a national priority.

Intentional contamination of the food supply, of course, is not a new threat. In 1984, for example, 751 people in Wasco County, Oregon – 45 of whom had to be hospitalized – were poisoned with salmonella after eating at one of ten salad bars in that county. Followers of Bhagwan Shree Rajneesh had deliberately contaminated those salad bars in an attempt to make non-followers of the cult too sick to vote in the county elections.

Another example occurred in 1989, when a shipment of grapes – originating from Chile and bound for the United States – was laced with cyanide; that incident led to a suspension of trade and cost Chile \$200 million. More recently, 111 people, including 40 children, were sickened in Michigan in May 2003 when a supermarket employee intentionally tainted 200 pounds of ground beef with an insecticide.

To demonstrate the severity of a potential bioterrorism attack, [Stanford University](#) researchers modeled a “nightmare scenario” in 2005 in which the researchers described how strategically dropping only four grams of botulinum toxin into a U.S. milk production facility could cause serious illness and kill up to 400,000 people.

To raise awareness of potential and increasingly lethal danger on the dining-room table, the U.S. Department of Health and Human Services published a report in 2003, “[Risk Assessment for Food Terrorism and Other Food Safety Concerns](#),” that listed a broad range of “possible agents for food terrorism.” Included on the list were: biological and chemical agents; substances that are naturally occurring, antibiotic-resistant, and genetically engineered; agents that can be deadly and/or cause major gastrointestinal discomfort; agents that can be highly infectious or not communicable; substances that are readily available or are more difficult to acquire; and agents that are accessible either in an already usable form or first must be weaponized.

If hundreds of thousands of people can be killed by the malicious use of only a few grams of botulinum toxin at the “right place” in the U.S. milk production pipeline, food safety in general must become a high-priority emergency preparedness goal.

Major Milestone: The 2011 Food Safety Modernization Act

In the United States, the most recent and comprehensive legislation on food safety is the [Food Safety Modernization Act](#) of 2011, which gives the U.S. Food and Drug Administration (FDA) the authority to recall contaminated food – a power it did not previously possess. Prior to passage of that Act, the nation’s private-sector manufacturers, processors, and pharmaceuticals had exercised this responsibility. As a major overhaul of food safety laws and regulations, the Act’s stated purpose is to provide both a safer food supply and a more stable food industry, broadening the agency’s power to regulate all aspects of the nation’s food production and inspection activities.

The increasing need for food safety enhancements is a pressing concern to political leaders for numerous reasons, particularly considering the already high number of foodborne illness cases in the United States and the growing threat posed by terrorism. In the United States alone, the U.S. Centers for Disease Control and Prevention ([CDC](#)) estimates that 48 million people –

almost one out of every six citizens – suffer from some type of foodborne illness each year. Approximately 128,000 of them have to be hospitalized and about 3,000 die each year.

The Food Safety Modernization Act focuses primarily on five principal ways in which food safety can be improved:

- *Better and more frequent use of mitigation controls* – FDA’s food safety mission has shifted to preventing outbreaks rather than responding to them, and by holding food-production facilities accountable for implementing the safe and effective measures needed to prevent contamination;
- *Greater emphasis on inspection, assessment, and compliance* – The FDA modified its inspection strategies to become more proactive on behalf of the food industry;
- *More emphasis on international food safety* – The FDA now: (a) has stronger oversight of imported food products from other countries; (b) requires that U.S. importers verify supplier activities to ensure a safer food supply; (c) mandates the certification of and compliance with safety requirements; and (d) can block the admission of imported foods if foreign producers refuse FDA inspections;
- *Quicker response capabilities* – The FDA now has the authority to issue mandatory recalls for any and all food products; and
- *More effective preparedness partnerships* – Stronger collaboration between and among food safety agencies leads to improved interagency collaboration on food safety programs, as well as the more effective training of food safety personnel.

Food Safety & Inspection Service Survey

Since 2006, the U.S. Department of Agriculture’s Food Safety and Inspection Service has been measuring, via annual surveys, the status of the food industry’s voluntary adoption of food defense plans. The survey questions determine whether each establishment inspected by the Service actually has a food defense plan in place and, if so, whether that plan is fully functional. The latter objective is determined by: (a) ensuring that appropriate measures are in place to provide/improve outside and

inside security, personnel security, and acceptable incident response capabilities; (b) the plan has been tested in the past year; and (c) the establishment has reviewed its plan and, if necessary, upgraded it.

The seventh food defense plan survey was completed in August 2012. The universe of facilities surveyed was the same as it was in 2011, including meat and poultry slaughter and processing establishments, processed egg-product plants, and official import inspection stations. The 2012 survey showed that 77 percent of the establishments participating have a functional food defense plan in place (up from 75 percent in 2011). In 2010, the U.S. Department of Agriculture made the voluntary adoption of food defense plans an important performance objective. The compliance target is for 90 percent of establishments to have a functional food defense plan in place by 2015.

Private Sector – Food as Critical Infrastructure

The U.S. “Food and Agriculture” critical infrastructure sector (a designation determined by the U.S. Department of Homeland Security) includes an estimated 2.2 million farms, 900,000 restaurants, and more than 400,000 registered food manufacturing, processing, and storage facilities – almost all of them under private ownership. This sector accounts for roughly one-fifth of the nation’s entire economic activity.

DHS requires that each of the critical infrastructure sectors has a protection plan in place. The [Food and Agriculture Sector’s Plan](#) details the risk management framework of DHS’s National Infrastructure Protection Plan. In addition, the USDA and the U.S. Department of Health and Human Services work in close cooperation on food and agriculture issues.

A few examples of the private sector’s own efforts in food defense include the establishment of both a Food Safety Law Firm in Seattle, Washington, and a private global food safety and security firm launched by a distinguished professor of food engineering at Istanbul Technical University in Turkey. In addition, a significant number of U.S. universities – including Penn State, Michigan State, and North Carolina State – now offer degrees in food safety.

International Food Safety Issues & Objectives

[ISO 22000](#), a standard dealing with food safety that was developed by the International Organization for Standardization, is a general derivative of [ISO 9000](#) and specifies the requirements for an effective food safety management system that involves, among other intangibles, interactive communications, system management capabilities, and various Hazard Analysis Critical Control Points (HACCP) principles.

The HACCP principles offer a systematic and preventive approach to food safety and allergenic, chemical, and biological hazards in production processes that can cause the finished product to be unsafe, and designs measurements to reduce such risks to a safe level. In this manner, HACCP focuses on the prevention of hazards rather than the inspection of finished products. The principles apply in all stages of a food chain from food production and the preparation processes to packaging and distribution.

The FDA and USDA implement the mandatory HACCP programs for juice and meat as an effective approach to food safety and the protection of public health. HACCP systems for meat fall under the USDA; seafood and juices come under the FDA. The use of HACCP principles is currently voluntary in other food industries.

Certain incidents, potentially involving the deliberate contamination of food, can be considered of international significance and subject to various national and/or international rules and regulations. The International Food Safety Authorities Network ([INFOSAN](#)) of the World Health Organization (WHO) functions within this framework and is used to manage food safety events.

Ingesting unsafe food causes many acute and potentially life-long illnesses ranging from diarrheal diseases to various forms of cancer. The WHO estimates that foodborne and waterborne diarrheal diseases combined kill about 2.2 million people annually, including 1.9 million children. To address this problem, the World Health Assembly approved a new resolution on food safety in May 2010, and used it to update WHO's [Global Strategy for Food Safety](#). That [publication](#) became the first to be issued by the WHO Department of Food Safety since its incorporation into the WHO "Cluster on Health Security and Environment," which includes helpful information on the responsibility for managing emerging international threats to public health.

The annual World Health Report emphasizes that the new watchwords in this complicated field are diplomacy, cooperation, transparency, and preparedness. Moreover, WHO urges all stakeholders to consider implementation of the relevant sections of the guidelines now postulated as a matter of prudent public health policy. In addition, the United Nations food standards body has set more stringent residue limits in animal tissues for ractopamine, a veterinary drug mostly used to promote leanness in pigs raised for their meat. "This decision was made after a rigorous process of scientific assessment to ascertain that the proposed levels of residues have no impact on human health," spokespersons for the WHO and the United Nations' [Food and Agriculture Organization](#) said in a 6 July 2012 joint news release about the agreement reached by the Codex Alimentarius Commission, which has also published a number of other internationally recognized standards, codes of practice, policy guidelines, and other recommendations related to and/or involving foods, food production, and food safety.

A joint program of these two U.N. agencies, the Commission sets international food safety and quality standards designed: (a) to promote safer and more nutritious food for consumers worldwide – with Codex standards serving, in many cases, as a basis for national legislation; and (b) to serve as food safety benchmarks for international food trade.

Some 600 delegates, representing member states, the European Union, and a large number of intergovernmental and nongovernmental organizations, participate annually in the Codex Alimentarius Commission. As is true with many other areas of concern in the domestic preparedness field, there is considerable progress in making food products safer in all countries around the world. Nonetheless, much more remains to be done.

Kay C. Goss, CEM, is the founding president and CEO for World Disaster Management, president of the Foundation for Higher Education Accreditation in Emergency Management, first vice president of the International Network of Women in Emergency Management, and vice president of the Every Child Is Ours Foundation. She also founded the FEMA Higher Education Program and serves as adjunct faculty at Istanbul Technical University in Turkey and at the University of Nevada, Las Vegas. She previously served as Associate FEMA director in charge of national preparedness, training, and exercises for President William J. Clinton – and for 10 years was his Senior Assistant, in the Arkansas Governor's Office, for Intergovernmental Relations. She also served as a member of the Virginia Commonwealth Preparedness Panel under Governors Mark Warner and Tim Kaine, and as Chair of the International Association of Emergency Managers Committee on Training and Education.

Early Detection of Zoonotic Emerging Infectious Diseases

By Thomas Cotter & Earl Stoddard, Public Health



In 2009, the H1N1 pandemic strain of influenza served as a dramatic wake-up call for biosurveillance experts around the world. Despite major advances in domestic and global surveillance capabilities, H1N1 was spreading rapidly across the United States long before a vaccine could be developed, tested, and mass-produced in time to slow the pandemic. Today, the threats posed by the H7N9 influenza virus and the MERS (Middle East Respiratory Syndrome) Coronavirus are a significant concern to global health officials. Although it is far from clear how these two viruses are transmitted, it seems likely that animal-to-human spread could be playing a role in the evolution of one or both of the viruses.

That supposition should not be a surprise to anyone who knows the sheer number of zoonotic threats on a comprehensive list of the newly emerging (or re-emerging) infectious diseases. Given what was observed with the rapid introduction of H1N1 to humans and the subsequent unchecked spread of the disease, a closer and more detailed understanding of the existing strengths and weaknesses of global and domestic surveillance systems may be the key to impeding the spread of these and other emerging zoonotic threats – rabies, for example, is a disease that can easily be transmitted from animals to humans.

Animal Surveillance Systems in the United States

Within the United States, surveillance programs for infectious diseases are spread across a diverse array of federal, state, and local

agencies. Departments of health usually focus their greatest attention on human diseases; departments of agriculture give primary attention, though, to animals commonly classified as livestock; and departments of natural resources or wildlife are responsible for the tracking and surveillance of non-domesticated and wild animals.

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These understandably different priorities lead to some significant intrinsic breaks in continuity. In June 2010, the U.S. Government Accountability Office published an [analysis](#) of the federal government's own biosurveillance systems and found that the diverse array of programs assigned to various departments suffered from a severe lack of overarching leadership and complicated national strategic planning. As a follow-up, the White House published a [National Strategy for Biosurveillance](#) in July 2012 and, a few months later (November 2012), a [National Biosurveillance Integration Center Strategic Plan](#) for the U.S. Department of Homeland Security (DHS). The implementation of these new strategies is ongoing, so progress in the field of integrated biosurveillance will likely be an area of increasing scrutiny over the coming years.

Even within the animal surveillance system itself, a diverse array of data sources must be more closely aligned to provide an accurate nationwide understanding of zoonotic diseases. The National Animal Health Surveillance System (NAHSS) serves as an integrated framework for the federal and state as well as university and industry-based entities to collect, collate, and review animal health data throughout the United States.

The overarching goal of the NAHSS is multi-pronged. First, the program seeks to serve as an early detection and global surveillance system for both foreign animal and newly emerging diseases. Second, the NAHSS serves as a data collection system for existing "program diseases" and, in that respect, will help researchers understand the current status, the potential impact of various interventions, and/or changes in the dynamics of such diseases. Finally, NAHSS helps to monitor animal systems for diseases of high impact on both production and the nation's food markets.

Here it should be pointed out that the NAHSS has made significant progress in recent years and, among other things, has standardized the data collection processes used by all 50 states. However, work continues on the development of a U.S. National List of Reportable Animal Diseases, where the goal is to make the National List of Reportable Animal Diseases aligned with the

international efforts of the World Organization for Animal Health (OIE).

The Influence of Pandemic Influenza On Domestic Surveillance

The growing threat posed by a pandemic influenza, particularly Highly Pathogenic Avian Influenza (HPAI), has driven the enhanced domestic surveillance of non-human animals. The Veterinary Services unit of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service aims to partner with a broad spectrum of state and industry organizations to monitor and test the nation's domestic poultry and swine populations to ensure that foreign influenza strains are constantly observed. This enhanced surveillance effort has been significant, according to the [USDA](#), which reports that more than a combined 478,000 tests were conducted during the fourth quarter of 2012 and first quarter of 2013.

The USDA also is working actively to prevent the establishment of domestic reservoirs of HPAI. To begin with, the United States does not allow the importation of live birds, eggs, or hatchlings from countries where avian influenzas, such as the novel H7N9 strain, are prevalent. Products based on those types of poultry may be imported only if they are treated in a manner that would have destroyed the virus. Pet birds also are routinely tested before importation. The USDA's work in this area, combined with heightened border and port security, has been very effective in preventing the introduction of any HPAI strains of particular concern.

Unfortunately, as the 2009-2010 H1N1 pandemic seems to indicate, there is still room for improvement in the U.S. domestic surveillance of influenza, particularly in the swine population. Pigs are often an important intermediary between avian influenza and human-adapted strains. The H1N1 pandemic highlighted this risk. In the case of the 2009-2010 pandemic strain of H1N1, the ancestors of the virus had been [tracked](#) in pigs for several years, but a series of non-anticipated evolutionary changes led to the new strain. Preventing new outbreaks is a particularly difficult challenge in an environment in which thousands of novel [avian and swine influenza](#) sequences are identified every year.

The constant struggle is not simply to identify new strains of a particular disease in animals, but to determine which of the new strains poses an abnormally high risk to humans and/or other animals. This is an area where considerable work will be needed to reach a point of more effective intervention, if ever such a state could be achieved. Nonetheless, the effort must be made. In [May 2009](#), for example, in its response to the 2009 H1N1 pandemic, the U.S. Centers for Disease Control and Prevention called for “more systematic surveillance of influenza viruses in pigs.”

International Systems Of Surveillance: A Complex Network

Many diseases that threaten U.S. livestock originate overseas, particularly in nations where population densities, agricultural practices, and surveillance mechanisms differ significantly from U.S. domestic standards. Like most other international security measures, the methodical surveillance of diseases of any type is subject to local capabilities – and vulnerable to them as well, if the capabilities are limited. Largely for that reason, standards vary between locations, leaving participants in the international food trade system susceptible to exposure. Recognizing this problem, international agencies have developed rigorous surveillance and response guidelines to detect and at least ameliorate these international food safety vulnerabilities.

Perhaps of greater importance are the international community’s cooperative efforts between and among different agencies. In April 2010, in recognition of the growing threat posed by foodborne diseases, OIE, the Food and Agriculture Organization (FAO) of the United Nations, and the World Health Organization (WHO) developed a [collaborative strategy](#) spelling out their different, but complementary, missions in disease control and prevention. That strategy divides responsibilities along the various agencies’ areas of expertise and, where responsibilities overlap, encourages the free exchange of information.

Most people understand the need for a strong national-defense program capable of defeating any likely adversary. Very few, though, recognize and/or are prepared to counter the potentially devastating effects of a global pandemic.

One product of the FAO/OIE/WHO tripartite agreement, the Global Early Warning System ([GLEWS](#)), jointly consolidates epidemiological data for use by other international agencies, national authorities, nongovernmental organizations, and the global public. The extensive GLEWS database of disease events tracks the incidences of animal disease, including zoonoses, across the world, maintaining a level of situational awareness on all fronts. With some 70 HPAI incidents monitored by the FAO from July 2009 to January 2012, it is obvious that GLEWS already has improved the [interagency mobilization](#) needed to verify instances of various diseases. Although pandemics have certainly threatened both animal and human populations in the past, the FAO also noted that HPAI was the first pandemic to arrive with advance warning – thanks largely to the development and use of improved surveillance methods.

Responding to calls for international emergency responses, in addition to surveillance efforts, the OIE-FAO’s Crisis Management Center-Animal Health ([CMC-AH](#)) was established to provide additional help to local agencies in the form of technical assistance. The CMC-AH, housed in the FAO’s Rome headquarters, uses advanced surveillance technology to facilitate international responses to HPAI and other disease threats. Resource mobilization is needed in some cases,

but the CMC-AH acts primarily in an advisory role to local authorities. The international response to HPAI is nearly unprecedented in its scope. Most of the CMC-AH’s activation calls to combat the spread of HPAI during the 2006-2008 time frame were issued because the organization was monitoring the disease around the clock in 13 endemic countries.

The cooperation between and among the FAO, OIE, and WHO has provided significant multi-sectorial protection against foodborne diseases. By merging their operational tools, professional expertise, and material resources (when applicable), these international organizations

have prevented effort redundancies and multiplied the effectiveness of their surveillance and intervention actions.

As the threat of HPAI looms, the U.S. public health experts involved would be well advised to seek new methods to improve and expand national foodborne disease surveillance and intervention capabilities. The U.S. Department of Health and Human Services, the USDA, and other federal departments also should continue to foster additional collaboration not only among their own agencies but also with international partners. The consolidation of parallel efforts to detect, research, and treat foodborne diseases lends itself to greatly increased national food security actions.

Lessons to Be Learned: Improving Domestic Surveillance

One of the more important lessons to be learned from recent threats to global health is the overarching truth that zoonoses now constitute a major threat to all nations throughout the world. Although recognition of that fact certainly exists in the U.S. animal-surveillance community and among public health officials, many segments of the human public health infrastructure are almost wholly divorced from their animal surveillance counterparts in other agencies. Moreover, many do not participate in the joint information-sharing processes necessary to inform their global partners about the broad spectrum of new potential threats looming just over the horizon.

One model that may serve public health well is the development of fusion center-like collaborations with animal surveillance counterparts. Fusion centers allow for interdisciplinary information sharing and situational awareness, principally in the law enforcement and homeland security sectors, but it was their efforts to obliterate certain silos that produced improved understanding among critical partners.

In summary, the global animal surveillance community has moved into the collaboration business principally due to the necessity produced by divergent national surveillance programs. Domestic surveillance systems would be well served to further improve that same multi-agency integration. Hopefully, recent efforts at the

federal level to consolidate surveillance efforts and provide more centralized leadership will eventually lead to adoption of several additional changes in collaboration that are still needed.

Thomas Cotter is a senior policy analyst at the University of Maryland Center for Health and Homeland Security (CHHS). He has a background in international emergency response, recovery, and public health programs with a number of international organizations. In the Philippines, he worked on a World Health Organization team and with the national Department of Health to stop a leptospirosis outbreak following Typhoon Sendong in 2011. He also responded to the Haitian earthquake in 2010, and traveled to Panama to help strengthen healthcare capacity on remote islands. His work in the field led him to develop emergency management and risk mitigation plans for organizations in Tanzania. While earning his Bachelor's degree, he worked in the Emergency Medical Services in Rhode Island as an emergency medical technician. He earned his Master of Public Health degree from Boston University in International Health, specializing in Complex Humanitarian Emergency Management. He also coordinates the CHHS internship program with the University of Maryland School of Medicine Department of Epidemiology and Public Health.

Earl Stoddard (pictured) is the Public Health Program Manager for the University of Maryland Center for Health and Homeland Security (CHHS). In that post, his responsibilities include overseeing many of the Center's public health efforts, working with regional partners on public health preparedness efforts, and improving the interface between the public health and emergency management communities. He also assists several local governments, hospitals, and regional organizations in identifying shortfalls, improving planning, and strengthening their collaboration and communications efforts with their partners.

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Listeria – When Food Bites Back

By Dana Pitts, Public Health



Food safety is a top priority at the U.S. Centers for Disease Control and Prevention (CDC). As the only agency tasked with tracking human cases of foodborne illness at the national level, the CDC works – in collaboration with the [Food & Drug Administration \(FDA\)](#) and the [Food Safety & Inspection Service \(USDA/FSIS\)](#) – 24/7 to stop and prevent dangerous outbreaks. Stakeholders involved in the U.S. food system, from farmers to regulators to consumers, rely on the CDC for information to help keep the food supply safe.

The measures required to ensure food safety are unpredictable, largely due to: changes in food production and supply; environmental shifts leading to food contamination; changes in consumer practices and preferences; increases in outbreaks that cross state lines; and emerging germs, toxins, and antibiotic resistance. These challenges have spurred significant media interest about the CDC's food safety program. The CDC has seen more media and public interest in foodborne illness and outbreaks than in almost any other CDC program. In 2012, for example, there were more than 1,600 media requests for information on food safety issues – ranging from complex data releases to outbreak updates.

Connecting Human Illness To Food Contamination

The CDC, which manages more than 20 national surveillance networks that track over 30 pathogens known to cause foodborne illness, is a vital link between human illness and the food safety systems of government agencies and food producers. Historically, food safety communications at the CDC included annual surveillance summaries with data from the surveillance networks, scientific publications and presentations, and outbreak alerts. Today, the public demands more information, more frequently.

To address that demand, ongoing investigations of outbreaks and special studies reveal unsuspected hazards – for example, new food sources – and identify likely points of contamination where prevention can be improved. By merging science and communications, the CDC is working to build the public's trust before a crisis occurs.

By maintaining robust, stable, and flexible communication platforms that can reach all audiences – federal agency partners, such as FDA and USDA/FSIS, state and other policy makers, researchers, grocery shoppers, and the general public – the CDC is able to sustain progress in the area of food safety. The key is translating complex information into accurate, yet understandable content, and building partnerships to disseminate information.

Science & Communications – Targeting Food Safety

One way in which the CDC has been blending science and communications has been through its [Vital Signs program](#). Each month since June 2010, this campaign releases a call-to-action about an important public health topic that uses the latest available surveillance data. In June 2011, the first [Vital Signs devoted to food safety](#) focused on one of the most common germs found in food – [Salmonella](#). The June 2013 [Food Safety report](#) examines one of the most deadly germs spread by contaminated food – *Listeria monocytogenes* ([Listeria](#)) – including the high-risk populations and the actions that can be taken to protect those who are most at risk. It also highlights the importance of safety measures to prevent contamination of cheese and raw produce, such as those included in the 2011 Food Safety Modernization Act.

For people working in food safety communications, knowing who is at greatest risk for illness from foodborne pathogens is critical for effective public communications. *Listeria* is a foodborne pathogen that targets specific groups of people. One of the primary goals of the CDC's Vital Signs report is to make the science and data around *Listeria* practical and understandable to both food safety professionals and the public.

The 2013 report achieves that goal by providing a national snapshot of illnesses, infection rates, and foods associated with *Listeria* outbreaks that were reported to the CDC for the years 2009-2011. Three monitoring systems were used to collect data: the [Listeria Initiative](#), a national system for rapid response and reporting of *Listeria* cases; [FoodNet](#), an active surveillance network for tracking trends in nine foodborne infections; and,

[Foodborne Diseases Outbreak Surveillance](#), a unique system that captures outbreak data on agents, foods and settings. To better explain this pathogen and the people it strikes, here are some important facts to know in advance of a crisis:

- *Populations at risk:* *Listeria* targets older adults, pregnant women and their unborn babies, and those who have weakened immune systems. These hard-hit groups account for at least 90 percent of all reported infections.
- *Deadly consequences:* *Listeria* is the third leading cause of death from food poisoning. Most people who are infected require hospital care and about 1 in 5 of them die.
- *High-risk foods:* *Listeria* can hide unnoticed in food-processing equipment, which subsequently leads to food contamination. Foods identified with outbreaks vary over time. Outbreaks in the 1990s were primarily linked to deli meats and hot dogs. Now, *Listeria* outbreaks are mainly caused by soft Mexican-style cheeses like queso fresco and other soft cheeses that were: (a) made from unpasteurized milk; and/or (b) contaminated during the cheese-making process. Some outbreaks have also been caused by foods that people may not consider to be risky, such as celery, sprouts, and cantaloupe.
- *Stalled progress:* Data indicate that no progress in reducing the rate of *Listeria* infection has been made in more than a decade. New 2013 food safety [rules proposed](#) by the FDA may help together with the [USDA's 2003 guidance](#) on reducing *Listeria* contamination of ready-to-eat meat and poultry products.

A Platform for Action

There are few infections that better demonstrate the deadly effects of foodborne illnesses than *Listeria*. The CDC's new report blends science and communications, and also is supported by a strong interagency collaboration between CDC, FDA, and USDA/FSIS. The report calls for all partners – from the farm to the table – to build awareness and make food safer for everyone.



When it comes to foodborne illnesses, there are simple things all consumers and preparedness professionals can do to protect themselves and their communities:

- Know which foods are most likely to be contaminated;
- Avoid eating raw (unpasteurized) milk or soft cheeses made with raw milk;
- Follow good food safety practices of “clean, separate, cook, and chill”; and
- Be aware of any and all food recalls.

The CDC's new Vital Signs report points once again to a stubborn problem – that food can sometimes bite back. The bottom line is that foodborne bugs that have not seen recent progress, like *Listeria*, must be targeted in order to reduce the number of lives lost and improve the quality of life for survivors. More progress is still needed to protect vulnerable populations and drive down foodborne illnesses within the United States and around the world.

Dana Pitts, MPH, leads scientific communications for the [Division of Foodborne, Waterborne and Environmental Diseases](#) at the Centers for Disease Control and Prevention (CDC). She came to the CDC as a policy analyst in the Center for Global Health and later led communications for the CDC's Division of Global Disease Detection and Emergency Response. She began her career as a foreign service officer at the U.S. Department of State and has worked for more than 20 years building strategic communications in a variety of fields and settings, including academia and private industry. She completed a Master of Public Health (MPH) degree from the University of California, Los Angeles (UCLA) in policy and management.

Governmental Laboratories: Protecting the Public's Health

By Chris N. Mangal, Public Health



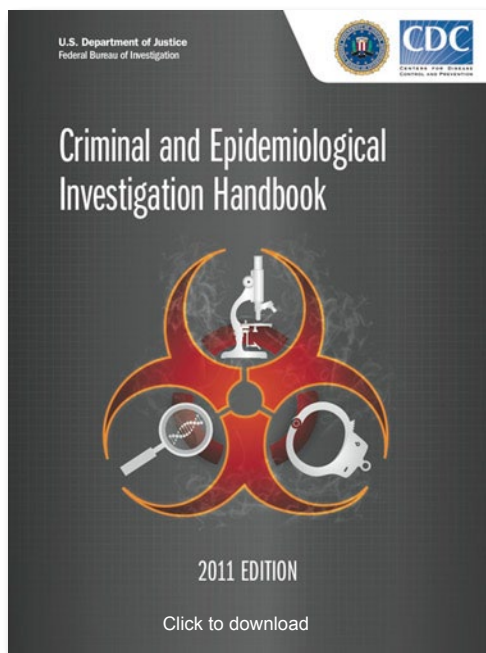
The Association of Public Health Laboratories (APHL), a nonprofit 501(c)(3) organization, has been working to safeguard the public's health for more than 50 years by strengthening public health laboratories in the United States and around the world. APHL advances the development of laboratory systems and practices, and promotes policies that support healthy communities. The association's members include state and local public health laboratories, state environmental and agricultural laboratories, and other government laboratories that conduct testing of public health significance, as well as those who have an interest in public health laboratory science and practice.

Building Laboratory Preparedness

On 2-5 June 2013, more than 500 participants attended the [2013 APHL Annual Meeting](#) and Seventh Government Environmental Laboratory Conference that was held in Raleigh, North Carolina. The four-day conference addressed elements specific to laboratory preparedness. In particular, sessions covered emerging threats and technologies, public health preparedness and response, influenza testing, environmental health, informatics, community building and laboratory leadership, biomonitoring, food safety, seafood testing, and global health accreditation.

In addition to discussing trends and technologies for preparedness and response, speakers shared new information on emerging viruses and challenges facing public health surveillance for foodborne diseases in light of the proliferation of culture independent diagnostics. Keynote speakers included William Roper, MD, MPH, University of North Carolina School of Medicine and Health Care System, and Harvey Fineberg, MD, Ph.D., president of the Institute of Medicine.

On 2 June, prior to the start of its Annual Meeting, APHL held a workshop focusing on how to conduct joint criminal and epidemiological investigations. Typically, workshops that have an epidemiological and law enforcement focus are co-facilitated by the Centers for Disease Control and Prevention (CDC) and the Federal Bureau of Investigation (FBI). In addition to epidemiological and law enforcement issues, APHL also addressed the role of laboratories in detecting threats and highlighted the importance of establishing and maintaining working relationships with key stakeholders prior to an event.



Threat Detection, Investigation & Training

Over 35 laboratorians, epidemiologists, and law enforcement officials participated in this workshop, which was moderated by Royden Saah, MS, coordinator of the Bioterrorism and Emerging Pathogens Unit at North Carolina State Laboratory of Public Health. Saah also provided the laboratory perspective, describing how the United States' Laboratory Response Network (LRN) detects various threats and serves as a key source of information for law enforcement officials and epidemiologists.

Julie Casani, MD, director of public health preparedness and response at North Carolina Department of Health and Human Services, described epidemiological investigational processes focusing on the public health and national security objectives to detect, respond to, and mitigate threats. She also emphasized the role of communications and timely notification to the appropriate officials, especially where medical interventions are needed.

Jill Sheets, FBI Weapons of Mass Destruction (WMD) Directorate of the Bioterrorism Countermeasures Unit, described the FBI's role in threat assessments. Sheets,

who provides this training on a nationwide basis, described criminal investigational procedures and methods for responding to a bioterrorism incident and other public health emergencies. Using specific scenarios, she elicited responses from participants, who provided their unique experiences with responding to biological threats such as *Clostridium botulinum* (Botulism), *Bacillus anthracis* (anthrax), and ricin. She also mentioned the law enforcement forensic and evidentiary needs and the significance of engaging the local FBI WMD coordinators at an early point in the suspected event.

Information Sharing Between Disciplines

The Joint Criminal and Epidemiological Workshop offered at the APHL Annual Meeting advanced interagency awareness and relationships by:

- Providing an overview of criminal, epidemiological, and laboratory investigational procedures and methodologies for a response to a bioterrorism incident;
- Identifying challenges to sharing information; and
- Offering potential solutions that may be adapted to meet the needs of the various agencies and jurisdictions throughout the United States.

To help break through the communication and information sharing barriers between law enforcement and public health officials, the FBI and CDC joined forces in 2011 to create a joint resource for responding to bioterrorism incidents. That resource, [Criminal and Epidemiological Investigation Handbook](#), addresses procedures and methodologies used during criminal and epidemiological investigations and suggests joint investigations model.

Efforts by the FBI, CDC, and APHL are helping to build stronger relationships and to organize national response efforts for all hazards events. As stated in

the Handbook, “By increasing information sharing, conducting joint threat assessments, and conducting joint investigation/joint interviews, law enforcement and public health can maximize their resources and achieve their individual and common goals during the response to a bioterrorism incident.”

To learn more about APHL’s Public Health Preparedness and Response Program, visit <http://www.aphl.org/aphlprograms/preparedness-and-response/Pages/default.aspx> or contact Chris Mangal at chris.mangal@aphl.org or 240-485-2769.

*Laboratorians,
epidemiologists, and
law enforcement
officials work together
to prepare for, detect,
investigate, and
mitigate potential
public health threats.*

Chris N. Mangal, MPH, is the director of public health preparedness and response at the Association of Public Health Laboratories (APHL). The recipient of a bachelor’s degree in microbiology from the University of Florida, and of a master of public health degree from the University of South Florida, she is responsible for providing programmatic and scientific leadership for preparedness activities for the benefit of APHL members, staff, and partner organizations, such as the Centers for Disease Control and Prevention (CDC). She has over ten years of experience working to improve laboratory practice in the detection of public health threats, and to expand and enhance the relationships between APHL member laboratories and CDC, other federal agencies, and private organizations involved in emergency preparedness and response, public health testing, policy, and training.

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Protecting the Milk Supply During a Foreign Animal Disease Outbreak

By Danelle Bickett-Weddle & Pamela Hullinger, Standards



According to the National Agricultural Statistical Service of the U.S. Department of Agriculture ([USDA](#)), approximately 65,000 dairy farms in the United States provide milk, cheese, yogurt, ice cream, and other dairy products to hundreds of millions of people around the world on a daily basis. Ensuring that the 9.2 million head of dairy cattle are healthy, well cared for, and able to produce high-quality milk is the primary focus of the nation's dairy producers and veterinarians. However, there is one disease – foot-and-mouth disease ([FMD](#)) – that threatens not only national animal health and the economic viability of U.S. agriculture but also the supply of milk and other dairy products available to the American people.

A Potential Outbreak Scenario

FMD is a foreign animal disease found in more than 100 countries throughout the world. Although it has not infected animals in the United States since 1929, this highly contagious viral disease affects food-producing, cloven-hooved animals such as cattle, pigs, sheep, and goats. Unlike the similarly named “hand, foot, and mouth disease,” FMD is not a public health concern but, rather, a strictly animal disease. If an outbreak of this disease were to occur now, a national animal health emergency would necessarily be declared.

To contain FMD, minimize spread of the virus to susceptible animals, and protect the food supply, a control area would be established, and not only farm quarantines but also other restrictions on animal movement would be implemented. Because the U.S. dairy industry operates using a just-in-time supply practice for milk movement, it would be significantly impacted by such control measures. The movement of raw milk to processing plants and to consumers could cease, resulting in significant milk disposal and animal welfare concerns for the nation's dairy farms.

Unfortunately, most U.S. dairy operations and processing plants do not have the capacity to store large quantities of milk for more than 48 hours; in fact, some have less than a 24-hour storage capacity. Since its inception in 2009, the Secure Milk Supply ([SMS](#)) Plan – funded by the USDA's Animal and Plant Health and Inspection Service – has been developing a number of new approaches to provide the safe, timely, and risk-based movement of animals and animal products for the dairy industry while at the same time controlling and containing FMD outbreaks.

In addition to detecting and containing potential foreign animal diseases, effective communications and public information sharing strategies will help protect the U.S. food supply chain and minimize perceived public health threats.

Preparedness and Response Planning

The USDA's Animal and Plant Health Inspection Service has developed the Foreign Animal Disease Preparedness and Response Plan's [FMD Response Plan](#) in the event the disease occurs within the United States. During an outbreak, the three most important as well as most immediate response goals would be to: (a) quickly detect, control, and contain the outbreak; (b) eradicate the outbreak through the use of strategies that not only stabilize animal agriculture, the food supply, and the economy but also protect public health; and (c) provide science- and risk-based approaches and systems that facilitate the continuity of operations for animals and animal prod-

ucts that are not contaminated.

Within this framework, the overall goals of the National SMS Plan are to: (a) maintain business continuity for dairy producers and processors during an FMD outbreak; (b) minimize spread of the disease; and (c) ensure a continuous supply of milk and milk products to consumers. Working groups consisting primarily of engaged stakeholders – including dairy industry representatives, state and federal personnel, and academia – have made significant progress toward accomplishing these goals.

Following is a brief summary of the most important components of the Secure Milk Supply Plan:

Biosecurity – Efforts to contain the highly contagious FMD virus will require strict adherence to biosecurity processes and procedures. National biosecurity performance standards have already been developed for implementation during an FMD outbreak. Compliance with these standards should significantly reduce the chance of spreading the virus during the movement of raw milk from the collection point on farms to facilities that process the milk for human consumption. Industry and animal health authorities are encouraged to focus special attention on biosecurity performance standards and to develop a more detailed description of what will be effective, achievable, and also acceptable in any given state or region – where local industry practices and the local climate are also factored in. Several states and regions throughout the nation have already started working toward this goal.

Active observational surveillance training materials – In the absence of a “cow-side” test to detect FMD, dairies within a control area will have to implement a formalized process for either a daily herd inspection, or active observational surveillance. The latter is defined in the SMS Plan as “an active process for the detection of foot-and-mouth disease on dairy premises, utilizing trained observers (herd managers or workers) who are routinely monitoring animals on a daily basis for abnormal or increased occurrence of clinical signs compatible with FMD, or changes in food or water consumption, or milk production.” The materials needed to carry out such pre-event training are now being pilot tested and, after being finalized, will be made available in both English and Spanish.

Draft recommendations – A set of recommendations – fortified with supporting scientific justification pertaining to raw-milk handling and processing from farms in an FMD control area – has been drafted for pre-event review, discussion, and eventual incorporation into dairy processor and local/regional/national response plans. Although FMD poses no threat to public health from dairy products, consumer reaction to this animal disease caused by a lack of awareness may decrease the willingness of many citizens to purchase dairy products and thereby create a perceived public health threat. The draft recommendations are intended to keep all parties informed



on ways to mitigate the risk of spreading the virus to food-producing animals, while at the same time maintaining a safe and wholesome food supply for consumers.

Proactive risk assessments – Risk assessments support the managed movement of animals and animal products during disease outbreaks. As an essential component of the SMS Plan, proactive risk assessments are being conducted to evaluate the risk that transporting raw milk from an FMD-infected, but undetected, dairy farm to later-stage processing facilities poses to the spread of the disease. The pathways identified in the risk assessments take into consideration current Grade A milk production practices as well as proposed mitigations, such as biosecurity performance standards. In the event of an outbreak, the results of the proactive risk assessments will help inform future movement and permitting decisions.

The Next Steps and Beyond

To ensure that all states and the dairy industry as a whole are working to establish effective business continuity plans, the national secure milk supply team continues to develop and refine the various preparedness components, and to facilitate both state and regional planning. Other critical daily movements within the dairy industry, such as the delivery of feed and the rearing of off-site calves and heifers, will be addressed in the future.

In the worst-case scenario, if FMD is diagnosed within the United States, it will become a national animal health emergency and severely impact the daily activities and

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economic viability of livestock producers, the industries that serve them, and the U.S. economy. Engaged preparedness planning and clear communications between industry and government prior to an FMD outbreak can help ensure significant improvements in the resiliency of the livestock industries and their ability to cope successfully with foreign animal diseases – and, by doing so, enhance the overall security of the nation’s livestock and food production systems. Outreach, awareness, and engagement plans and practices – all of which are critical for success – are ongoing.

Those involved in emergency preparedness planning at the state level should contact the National SMS Plan Development Team (smsinfo@iastate.edu) to learn more about this deadly disease and how to prevent it.

Danelle Bickett-Weddle (pictured), DVM, MPH, PhD, DACVPM, is the associate director at the Center for Food Security and Public Health (CFSPH) at Iowa State University (ISU) in Ames, Iowa. She previously practiced as a small-animal veterinarian in Sioux Falls, South Dakota, before joining Land O’ Lakes Farmland Feed in 2000 as a dairy field nutritionist and technical services manager. She joined the CFSPH in late 2002 and has been associate director since 2004. She teaches at both the College of Veterinary Medicine at ISU and the College of Public Health at the University of Iowa. She also represents the Iowa Veterinary Medical Association (IVMA) as its delegate to the American Veterinary Medical Association, and was recognized by the IVMA as the 2012 Veterinarian of the Year.

Pamela Hullinger, DVM, MPVM, DACVPM, is an epidemiologist at the Department of Medicine and Epidemiology of the University of California, Davis, School of Veterinary Medicine. She has spent 10 years as a veterinary medical officer with the California Department of Food and Agriculture and five years at Lawrence Livermore National Laboratory as the Director of Food and Agricultural Security. In addition to her clinical and epidemiological expertise, she has significant experience in foreign animal diseases, including work: (a) in the United Kingdom as part of the effort to control the foot-and-mouth disease epidemic of 2001; and (b) on the eradication of Exotic Newcastle disease from southern California in 2002-2003.

Protecting Water, Diluting Threats, Saving Lives

By Joseph Cahill, CIP-R



The logo of the District of Columbia Water and Sewer Authority includes the phrase “[Water is life](#)” – an appropriate way to emphasize the importance of water. In May 2013, a Massachusetts state trooper came upon seven people [trespassing](#) near the Quabbin Reservoir in Ware, which supplies drinking water to most of the Boston area. Although the members of that group were later cleared of charges of criminal activity, they unintentionally helped publicize a continuing concern about the potential vulnerability of local water supplies from not only natural disasters but also, particularly in recent years, terrorist attacks.

A Long Journey to the Nearest Faucet

The shoreline of the Quabbin is slightly longer than 118 miles, which encompass 24,529 acres of water, with another 115 miles of shoreline along its tributaries. There is no way to physically secure such a vast area because the manpower costs alone would be prohibitive. Additionally, the land surrounding the Quabbin, which is similar to that of many reservoirs across the nation, is a parkland used not only for fishing but also recreational activities. The managers of the local watershed must, therefore, balance the safety of the water supply with other valuable uses for the same area.

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The Boston water supply begins in the Quabbin, travels a “water highway” to several intermediate reservoirs, enters various treatment facilities, and finally pours from millions of faucets throughout the communities in and around Boston itself. The Massachusetts Water Resource Authority ([MWRA](#)), which is responsible for ensuring the safety of the water supply, meets that responsibility through the automated real-time monitoring of potential threats at every step along the route to identify the presence of possible threats.

The monitoring process is similar in many respects to the way in which a traffic camera follows the flow of cars and trucks on a continuing basis. Sampling the water by staff on foot at best would provide only a snapshot of conditions that might change very rapidly before any preventive action to stop a potential disruption could be taken.

A Winning Combination: Design, Hardening & Patrols

The Quabbin itself holds upward of 412 billion gallons of water, with an average flow of 158 million gallons per day. From a terrorist’s point of view, the sheer volume of contaminant needed to damage this amount of water makes simply pouring poison into a reservoir an impractical mode of attack. Those responsible for physical security of a reservoir, though, must still rely on a combination of design, hardening, and patrol.

The *design* of the system can improve security by keeping the local flow of water deep underground and out of the reach of those who may want to harm it. The *hardening* of various potential bottlenecks along the underground flow is another helpful way to provide greater security against sabotage. The final step is to carry out, by frequent but *random* patrols, unpredictable spot checks of the entire system – such as the one that interdicted the seven trespassers at the Quabbin.

The Quabbin is the largest manmade water reservoir in the United States, but even small reservoirs can have various operational and jurisdictional issues that must be addressed. The selection of the coordinating law enforcement agency and the structure of the response usually are determined by such factors as the ownership of the reservoir and/or the operational destination of the water. Whatever the criteria used, all stakeholders in the system must be involved, and must also be kept informed in the planning meetings, be provided applicable procedural information, and be notified of various changes that might occur. Without effective [collaboration](#) and open communications, the water supply could become vulnerable with only a patchwork of coverage and potential holes that may be exploited. As always, the security arrangements agreed upon should be in writing, and legally incorporated in a local plan, political agreement, or statute.

In short, the District of Columbia is right: Water is life. The U.S. water system as a whole has been designed with its filtration, [disinfection](#), and distribution processes necessarily being community-wide efforts and, therefore, both a major strength and potential weakness. Nonetheless, it is imperative, in every community throughout the nation, that this essential lifeline to good health, and to everyday life in general, be secure, clean, and available – in massive quantities.

Joseph Cahill is a medicolegal investigator for the Massachusetts Office of the Chief Medical Examiner. He previously served as exercise and training coordinator for the Massachusetts Department of Public Health and as emergency planner in the Westchester County (N.Y.) Office of Emergency Management. He also served for five years as citywide advanced life support (ALS) coordinator for the FDNY – Bureau of EMS. Prior to that, he was the department’s Division 6 ALS coordinator, covering the South Bronx and Harlem. He also served on the faculty of the Westchester County Community College’s Paramedic Program and has been a frequent guest lecturer for the U.S. Secret Service, the FDNY EMS Academy, and Montefiore Hospital.

Promoting Food Security in Disaster Relief Situations

By Scott McCallum, Private Sector



In 2011, 14.9 percent of U.S. households (17.9 million households) were “food insecure,” according to the U.S. Department of Agriculture’s study, [Household Food Security in the United States in 2011](#). Those numbers equate to slightly more than 50 million Americans living in food-insecure households: 33.5 million adults and almost 17 million children. Many of the families queried in the study rely on food provided by various charities to feed themselves. Unfortunately, the nation’s charitable food supply chain itself is one of the most complex nutrition delivery systems in the entire world.

These “supply chains of giving” are often the primary source of sustenance in the United States for more than 1 in 10 Americans and almost 1 in 4 children. This crucial food delivery supply chain, to many of the nation’s most vulnerable citizens, receives little financial investment, and today relies primarily on a combination of corporate philanthropy, nonprofit organizations, and dwindling government resources to ensure secure food delivery to those in need.

A Public-Private Effort – New Opportunities Available?

The U.S. network of food banks and their end-relief agency partners, such as soup kitchens and homeless shelters, receive food from many of the same sources – for example, corporate factories, distribution centers, etc. – patronized by large grocery stores. They also deal, though, with much more diverse supply sources; the U.S. Department of Agriculture is the prime example, but individual citizens also make some generous donations, and local food collection drives and store closeouts also help significantly. These charitable food banks and their partners do not, however, receive the same financial investments that their corporate counterparts do in terms of supply chain systems designed primarily to promote efficiency, security, and resiliency in their operations.

Experts from industry, government, and various charitable groups joined forces in 2001 to assess the supply chain network design. From these discussions, fortunately, a number of opportunities for improvement through the quick deployment and use of information systems were developed. As part of this effort, supply chain technologies are now

reaching the populations in the last stages of the charitable supply chain. The impact of these changes and the corresponding data developed as a result have had a favorable effect on efficiency, resiliency, ability to sample, rapid-response capabilities, and ability to meet the immediate and continuing needs of the nation’s most vulnerable populations.

Earlier, though, in response to the issues threatening the safety of the food chain, a team of for-profit and nonprofit players – led by Feeding America®, a longtime domestic hunger-relief charity, and The Aidmatrix Foundation – joined forces in 2002 to create a set of online hunger relief solutions: DonorExpress™, AgencyExpress™, the Choice™ System, and Virtual Aid Drive™. This public-private partnership took highly sophisticated state-of-the-art technologies and applied them, in a modified form, to help humanitarian efforts throughout the country. Since their inception, these hunger relief solutions have helped facilitate the distribution of an estimated five billion pounds of food to humanitarian organizations throughout the United States.

The Hunger Relief Process: Creating Two-Way Benefits

Starting at the beginning of this charitable relay race is [DonorExpress](#), a food supply donation system that manufacturers can use to make their product donations available to Feeding America online, sometimes integrated into their internal food manufacturing and distribution systems – and will receive tax benefits by doing so. Today, many of the nation’s largest food companies donate their excess products through DonorExpress, and all of Feeding America’s more than 200 food banks around the country have access to the donations.

After those offers are made, the [Choice System](#) – which was developed by Aidmatrix, Feeding America, and the University of Chicago – comes into play. Food banks have the opportunity to choose more wisely the foods they want to provide their agencies. This online auction system allocates each food bank a certain number of points, based on factors such as the number of people and the respective poverty levels they serve, with more points awarded to those with the greatest need. As the available food is posted online, each food bank is permitted, in a twice-daily online auction, to bid its points toward the foods it wants.

Finally, after those donations reach the local food bank, [AgencyExpress](#) – a hunger-relief program that uses an online shopping network to enable member food banks to list food inventories online – comes into play by providing hunger-relief agencies the opportunity to view and order food from their food banks in a simple and efficient manner. The technology used not only minimizes paperwork but also provides an updated inventory list, in real time, to local agencies. It also: (a) helps hunger-relief agencies place orders; (b) provides status updates; and (c) stores histories of the orders placed.

To date, more than 50 food banks use this online shopping system. Among them are some of the busiest food banks in the United States – for example, the Greater Chicago Food Depository and the North Texas Food Bank. Agencies nationwide are now placing more than 1,500 orders each day, and a total of almost 300 million pounds of food was shipped through the system in 2012.

Disaster Food Relief During & After Hurricane Sandy

Ensuring food security and food safety within the hunger relief supply chain is a major concern for all involved in the process. From large corporations to local soup kitchens, the technology must be in place to ensure that all food moving through the system is subjected to the same safety regulations that apply to foods being shipped to grocery stores. With the necessary automation tools and process controls in place, the system has the ability to track movements, identify irregularities, and – if and when needed – issue emergency recall orders.

Newer applications of the technology now available help improve operations and security in even more challenging sites on the charitable supply chain – the [National Donations Management Network™](#), for example, which supports 52 states and U.S. territories, as well as major metropolitan areas, in coordinating and protecting the chain in numerous disaster-giving operations. Thanks in large part to the significant government, nonprofit, and private-sector partnerships that have been developed, this system is helping to ensure that the right aid is being delivered at the right time during responses to disaster activities.

Not incidentally, such aid includes ensuring the scalability of the system in times of disaster. During Superstorm Sandy in 2012, for example, the food banks in both New

York and New Jersey were able to scale up their responses to meet the vastly increased needs of the storm-ravaged communities throughout the entire area. The food banks of the two states saw increases of four times the average monthly volume during the first month of the long-running disaster response efforts. Fortunately, because their supply chain systems empowered them to scale on-demand, both states also were able to mobilize assistance from across the nation and process additional requests.

Securing the ad hoc supply chains that come together in times of sudden disaster is an extremely daunting challenge, but having the right systems in place ahead of time is the essential linchpin to ensuring the security and effectiveness of the relief activities carried out. Today, as the financial support provided by the federal government for these activities continues to decline, the state and local governments now on the front lines of response must rely more often on distribution systems such as those mentioned above. In addition, such leading corporations as Fidelity, Microsoft, and UPS are taking the steps needed to help these systems continue to thrive in the face of uncertain funding climates.

In short, the charitable supply chain for food relief is a significant nutritional delivery mechanism within the United States. The public-private partnerships directly involved align their individual and collective interests, raise the overall effectiveness of the charitable food supply chain, and provide life-saving benefits to the more than 50 million Americans currently living in food-insecure households. The success of the supply chain is dependent on the continued investments of industry and charitable organizations using their extensive expertise to help create and expand the systems that provide safe and secure food supplies to the nation's most vulnerable populations.

Former Wisconsin Governor Scott McCallum has more than 30 years of executive experience leading organizations in the private, nonprofit, and government sectors. He was elected lieutenant governor four times before becoming one of the youngest state senators in Wisconsin history. He also has taught at the University of Wisconsin-Milwaukee, Northwestern University, Sun Yat-Sen University, and Hunan University in China, and is presently an adjunct professor in the School of Health and Medicine at the University of Wisconsin-Madison. He also serves as president and CEO of The Aidmatrix Foundation, a nonprofit organization that annually has mobilized and distributed more than \$1.5 billion in aid worldwide. With operations on six continents and more than 52,000 user organizations, Aidmatrix has been serving the humanitarian sector since 2000 by providing the humanitarian-relief supply chain technology and the internet information systems needed to connect private sector businesses, government agencies, and nonprofit organizations with one another to carry out their individual and collective missions more efficiently.

The Boston Bombings – Redefining Shelter in Place

By Rodrigo (Roddy) Moscoso, Law Enforcement



On 19 April 2013, in an effort to help in the manhunt for the Boston Marathon bombing suspects, the Boston Police Department (BPD) issued a shelter-in-place order for the entire city. The order originally was issued for only the Watertown and Cambridge areas, but the BPD quickly expanded the order citywide – and did not set a specific timeline.

All Boston transit lines were shut down for an indefinite period of time, therefore, effectively turning the city into a ghost town. This unprecedented move highlighted the use of shelter in place as a potentially “new” tool to aid in a criminal investigation related to at-large suspects. It also demonstrated the unique challenges that come with such an order imposed on the general population – hundreds of thousands of citizens who, without warning, suddenly found themselves trapped in their homes or, in many cases, businesses or other sites.

No Longer for Weather Events Only

Most Americans who do not live in areas affected by significant weather events, such as hurricanes, became quickly familiar with the term “shelter in place” following the 9/11 attacks. The aftermath of those attacks led to an almost palpable fear that a potential chemical, biological,

radiological, or nuclear attack could occur anywhere, and without notice. Many governmental and nongovernmental organizations recommended that citizens prepare for such events by purchasing and storing an assorted variety of food items, water, medical supplies, duct tape, and other essential supplies – in quantities sufficient to allow individuals and families to remain in their homes for an extended period of time (up to a week).

That was more than ten years ago. As time has passed and the fear of such attacks has waned, however, the post-9/11 stashes have long since been used, eaten, or tossed out. The Boston bombings provide yet another and much more timely reason, though, for maintaining a state of preparedness on the home front. Even today, coping with sudden disasters of any type would nonetheless present unique challenges never before considered likely. Meeting those challenges would be an extremely difficult task facing not only those who are ordered to remain in their homes, but also those who must enforce such an order.

Unlike an impending major weather event, which often provides hours or days of advance warnings with commensurate opportunities for planning, a public safety-initiated shelter-in-place order could be issued with little or no notice. Largely for that reason, private citizens

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must be ready, individually and collectively, to stay in their homes, schools, or offices for an extended period. In some cases, there may be no opportunity to pick up food or supplies from businesses that must also close down in compliance with the same order.

A natural disaster also generally allows for the free flow of essential personnel such as medical professionals, whereas a criminal investigation requires public safety officials to handle the task of checking the identification of authorized personnel. Doctors and nurses, for example, must be vetted by law enforcement and, in some cases, provided with transportation to reach their facilities if they rely on public transportation or if regular vehicle traffic is not permitted.

In addition, members of the general public who require special services, such as dialysis, must also be authorized and transported by public safety personnel to receive medical treatment away from their homes. Other special needs populations who rely on the delivery of life-saving supplies such as oxygen or certain types of medications also may require public safety assistance while sheltering in place. Finally, the homeless populations in urban areas present other challenges during a shelter-in-place order, primarily because their access to food and water may no longer be available.

A New Toolkit for Criminal Investigations

The Boston shelter-in-place order, although unprecedented, was relatively short-lived, thus lessening the burden on the general population as well as on emergency responders. In addition, most Bostonians recognized that, given the nature of the manhunt and the potential danger posed by the suspects, it was safer in any case to remain indoors.

Moreover, because it was a specifically targeted and somewhat limited criminal investigation event, Boston City utilities were not affected. Water, electric power, and access to the internet remained readily available throughout the search for the bombers, and social media outlets provided an unlimited mechanism for communications and information sharing.

The new challenge, therefore, comes down principally to advance planning and preparedness for the unique

requirements of similar events in the future – specifically including chemical, biological, radiological, and nuclear attacks. Fortunately, for individual citizens and businesses alike, the Federal Emergency Management Agency’s (FEMA) www.ready.gov website provides a wealth of information and access to many useful resources for the first responder community. The agency’s [Ready Responder Toolkit](#) includes preparedness planning templates, for example, that focus on individual and organizational preparedness.

In the same Toolkit, interestingly, FEMA cites several first responder surveys indicating a general sense that many of the organizations participating in the surveys were themselves not fully prepared for a disaster response lasting more than one or two days. Although the Boston shelter-in-place order lasted less than 24 hours, the information gathered in that brief period of time may be useful in assisting public safety and other first responder organizations in preparing for such incidents in the future. Given the success of the Boston investigation, shelter-in-place orders may become a more prevalent as well as increasingly useful law enforcement tool.

Although the Boston shelter-in-place order lasted less than 24 hours, this information may be useful in assisting public safety and other first responder organizations in preparing for these events in the future. Given the success of the Boston investigation, shelter-in-place orders may become a more prevalent law enforcement tool in the future. Adding these scenarios to new or existing preparedness plans appears to be warranted. Although the investigation was ultimately successful, the bombers also were able to achieve most of their goals. The impact of the bombing itself and the investigation that followed provide critical learning opportunities that should not be ignored by either citizens or the first responder community.

Rodrigo (Roddy) Moscoso currently serves as executive director of the Capital Wireless Information Net (CapWIN) Program at the University of Maryland, which provides software and mission-critical data access services to first responders across dozens of jurisdictions, disciplines, and levels of government. Formerly with IBM Business Consulting Services, he has more than 20 years of experience supporting large-scale IT implementation projects, and extensive experience in several related fields such as change management, business process reengineering, human resources, and communications.

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