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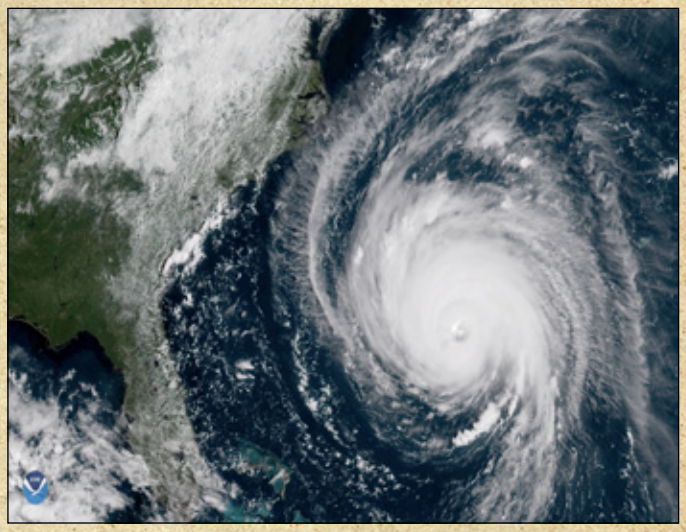

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Vertical Collaboration for Widespread Health Threats

By Catherine L. Feinman

From infectious diseases to terrorist attacks, state and federal agencies must collaborate to provide the most effective responses for large-scale public health events. New types of threats continually emerge, terrorist tactics evolve, and environmental conditions change. Each of these factors contributes to the complexities that emergency preparedness professionals must consider when preparing for, mitigating, or responding to any threat.

At the federal level, the Strategic National Stockpile continues to be at the ready to rapidly deploy resources and medical countermeasures to affected communities. However, in order to better align these resources with complex incidents and local response efforts, the U.S. Department of Health and Human Services has shifted oversight and operational control from the Centers for Disease Control and Prevention to the Office of the Assistant Secretary for Preparedness and Response. This shift will improve emergency response efforts and supply chain logistics for medical countermeasures.

At the state level, some best practices have already been developed through public-private partnerships to address medical countermeasure distribution and disaster response to public health threats. In Maryland, one agency discovered that the annual Girl Scout cookie distribution process provides a low-cost, full-scale opportunity to exercise emergency response plans. The process also can be adapted for dispensing medical countermeasures through open and closed points of dispensing. In North Carolina, lessons learned from previous animal disease outbreaks and severe weather events have been used to improve animal disease response tools for future disasters.

Learning from the past and looking toward the future have been critical factors for successful response efforts. This is true for federal and state agencies as well as for individual emergency preparedness professionals. With the growing complexity of potential threats and disasters, these professionals also must evolve to ensure they maintain the traits and capabilities required for successful emergency management. From local emergency managers to the largest federal agencies, vertical collaboration ensures that resources are readily available, supply chains are effectively managed, and communities quickly recover from whatever potential threats arise.

Strengthening & Streamlining Federal Response Efforts

By Greg Burel

In a world of increasingly complex and dangerous threats facing the United States – threats such as emerging infectious diseases, terrorist organizations, state actors, and extreme weather events – the Strategic National Stockpile (SNS) stands tall as a robust and reliable federal resource ready to respond. On 1 October 2018, in an effort to better align the stockpile with other federal medical countermeasure response efforts, the U.S. Department of Health and Human Services (HHS) shifted oversight and operational control of the SNS from the Centers for Disease Control and Prevention (CDC) to the HHS Assistant Secretary for Preparedness and Response (ASPR).

This shift has positive implications for stockpile operations. Shifting control to ASPR better positions the nation for the future by improving the efficiency of emergency responses, strengthening the government's medical countermeasure procurement processes, and leveraging efficiencies in supply chain logistics.

The Evolution of the Strategic National Stockpile

To truly understand the importance of this organizational shift, it is critical to know first how the SNS got to where it is. The SNS was established 20 years ago with just a small staff and a stockpiling operation configured to respond within 12 hours to an unknown threat, such as how an anthrax event would have presented at the time. The idea was that this unknown threat would most likely be the result of a bioterrorist event. The 11 September 2001 terrorist attacks prompted federal legislation and directives as well as expanded funding for stockpiling capabilities to strengthen public health emergency readiness.

Since its founding in 1999, the organization has evolved to serve as the nation's $7 billion federal repository of lifesaving vaccines, antibiotics and other medications, chemical nerve agent antidotes, modular Federal Medical Stations, and medical supplies for a public health emergency severe enough to cause local supplies to run out. Organized for rapid, scalable response to a variety of public health threats, the SNS today contains enough supplies to respond to multiple large-scale emergencies, simultaneously. Its warehouses and transportation partners across the country also can distribute anywhere in the United States with unmatched speed and efficiency.

SNS medical logistics operations consist of three main components: procuring medicines and supplies; managing and maintaining the SNS inventory; and deploying products to any public health emergency. The SNS holds medical material in strict compliance with 21 CFR ensuring safety and efficacy when called upon to respond. The stockpile has responded to more than 60 emergencies, including incidents as large as the 2009 H1N1 pandemic influenza response to an individual life-saving mission to treat someone who contracted anthrax naturally while visiting a national park in Montana.

The SNS has grown from just a few employees 20 years ago to a highly accomplished and dedicated staff of approximately 200 federal employees and contractors who serve as the federal government's medical supply chain experts. To execute this awesome responsibility, SNS staff engage with state, local, tribal, territorial, and private sector partners every day. All these professionals coordinate across sectors to ensure that communities are prepared to use the supplies during public health emergencies. The material held is important but without the dedicated professionals who commit to the mission, that material would just be a useless collection of "stuff."

SNS4: In an emergency, the Strategic National Stockpile can rapidly deliver medicines and supplies anywhere in the United States in less than 12 hours (*Source:* Strategic National Stockpile, date unknown).

Improving the Efficiencies of Emergency Responses

One of the primary responsibilities of ASPR is to lead and coordinate the public health and medical response for the federal government under the National Response Framework, Emergency Support Function #8. In this capacity, ASPR is on the frontline of helping communities prepare for, respond to, and recover from some of the most devastating threats to the public health and medical infrastructure of the United States. Partners from across the healthcare and medical supply chain sectors as well as state, local, tribal, and territorial governments collaborate with ASPR to improve readiness and response capabilities for the country.

Aligning the SNS with ASPR to improve emergency medical responses makes sense because much of what the stockpile does falls in line with ASPR's role of preparing for and responding to infectious diseases, natural disasters, pandemics, and bioterrorism incidents. The work of the SNS intersects with a number of different federal agencies outside of ASPR and CDC, including the Department of Homeland Security, the Food and Drug Administration, the Department of Defense, the Department of Veterans Administration, and others. These agencies offer input to what is held in the stockpile, but having the SNS organizationally reside with ASPR – the coordinating entity for federal medical responses – promotes greater efficiency in making decisions on what to hold, how to prepare, and when to deploy.

Strengthening Federal Procurement Processes

Strategic procurement and stockpiling of medical countermeasures are necessary to protect Americans' health and save lives. These FDA-regulated products (biologics, drugs, and devices) can be used to diagnose, prevent, protect from, or treat conditions associated with chemical, biological, radiological, or nuclear threats or emerging infectious diseases.

For many years, the stockpile has leveraged relationships with other federal entities to achieve better pricing and access to a variety of products. By working together with other parts of the government that need and procure the same material, significant savings are realized by increasing federal negotiating power. Combining collective needs can help the SNS enter into longer-term contracts and use more creative contracting mechanisms. For instance, this organizational shift will strengthen and streamline HHS's national security vaccine and drug development and procurement enterprise, leading to better integration with other product development and procurement activities under ASPR.

Leveraging Efficiencies in Supply Chain Logistics

The stockpile represents a robust operation with billions of federal dollars invested in medicines and medical supplies and approximately 900 separate line items composing the SNS formulary. The total volume of stockpile products equates to more than 1.6 million square feet – racked six levels high. Many inventory items are kitted in unique configurations designed by the stockpile with other subject matter expert input. These products are stored in strategic locations to ensure their security and the SNS's ability with its partners to deliver the right material at the right time to secure the nation's health.

SNS3: The Strategic National Stockpile contains >$7 billion of medical countermeasures strategically located in warehouses across the United States (*Source:* Strategic National Stockpile, 2010).

Likewise, ASPR has a strong medical logistics capability that supports the National Disaster Medical System (NDMS) and moves medical personnel, equipment, and supplies across the nation within hours. The NDMS supplements health and medical systems during an emergency, and its medical professionals provide patient care, patient movement, and definitive care; contribute veterinary services; furnish fatality management support; and more.

Moving the SNS under ASPR's management enables HHS to take advantage of synergies in supply chain logistics. ASPR can create contracting, logistics, and cost efficiencies and eliminate duplication. Just one example of an opportunity to leverage efficiencies is underway to decrease the warehouse footprint by combining NDMS medical supplies and equipment with SNS holdings.

Looking Ahead to the Next 20 Years

Since its inception, the stockpile has expanded and evolved to include an increasing number of products to protect more Americans from priority threats. The formulary also has expanded to cover emerging threats and include medical countermeasures to address those threats.

An example of this expansion is the addition of pandemic influenza countermeasures acquired through supplemental appropriated funds. There also are forward-placed medical countermeasures through the development of the CHEMPACK program. Federal Medical Stations are part of the stockpile, as well, and include equipment and supplies for rapid deployment and set up to care for non-acute patients in areas of need, such as those affected by natural disasters.

FMS Setup GRB Convention Center: During a natural disaster, such as Hurricane Harvey in 2017, the Strategic National Stockpile can deliver Federal Medical Station to help areas in need. These caches of beds and supplies can serve up to 250 non-acute patients for 3 days before resupply is needed (Source: Strategic National Stockpile, Houston, TX, 2017).

A large part of the work SNS does is to remain flexible and scalable in order to respond to any need that arises. The alignment with ASPR only strengthens this resolve by positioning the stockpile with those federal responders at the forefront of health emergencies. The SNS will continue to work closely with governmental and nongovernmental partners to upgrade the ability to respond to a national public health emergency, ensuring that federal, state, and local agencies are ready to receive, distribute, and dispense products to those in need. With the support of ASPR and the improved access SNS has to medical response personnel in the field, the nation is more ready than ever to ensure the right material gets to the right place at the right time to protect people and save lives in an emergency.

Greg Burel is the Director of the Strategic National Stockpile managed by the Department of Health and Human Services' Assistant Secretary for Preparedness and Response. As head of the nation's largest stockpile of medicines and supplies available for emergency use, he is a leading expert on medical supply chain management in the United States. With more than 35 years of civil service, he has risen through the ranks of the federal government, beginning his career at the Internal Revenue Service and serving in leadership roles in both the General Services Administration and the Federal Emergency Management Agency. In 2006, he assumed the helm of Strategic National Stockpile operations. He was awarded the Samuel J. Heyman Service to America Medal for Management Excellence and selected as a National Academy of Public Administration fellow in 2016.

Significant contributions to this article were made by Stephanie M. Bialek, Communications Section Chief, Division of Strategic National Stockpile, Office of the Assistant Secretary for Preparedness and Response, U.S. Department of Health and Human Services. She has 20 years of public relations and communications experience in government, academia, and health care and joined the federal government in 2010 to provide communications expertise and strategy for the Strategic National Stockpile. She holds both a bachelor's and master's degree in journalism and mass communications from the University of Georgia.

Best Practices – From Cookies to Countermeasures

By Terry Sapp

The anthrax attacks in October 2001 were a wakeup call nationwide of America's weakness to respond to a widespread biological terrorist incident. Since that time, local, state, and federal agencies have worked together to improve public health readiness to mass dispense medical countermeasures (MCM) at points-of-dispensing (PODs). Providing bulk dispensing to non-public (or "closed") PODs is one methodology employed to expedite the distribution of MCM to the private sector. However, exercising bulk dispensing in a realistic environment can present numerous challenges. Finding non-traditional partners, such as the Girl Scouts of Central Maryland, provides a cost-effective and simple solution to reducing the artificialities of a functional exercise.

Despite current age of sophisticated technology, the mass dispensing of medical countermeasures – namely oral antibiotics for widespread post-exposure to aerosolized Anthrax – remains a fairly uncomplicated and rudimentary concept: *get the pills into as many people as possible, as quickly as possible*. For almost two decades since 2001, local health departments have repeatedly practiced mass dispensing drills using seasonal vaccinations and other forms of MCM simulations to test the throughput of their public PODs.

Closed PODs serve specific areas and designated populations such as the private sector, critical infrastructure, first responders, healthcare facilities, and campuses and/or structures where large clusters of people reside. Closed PODs are designed so that these pre-identified locations distribute countermeasures to their own respective populations. This process reduces the overall numbers of populace who would otherwise have to report to a public POD to receive medications for themselves and their households and, therefore, reduces the number of hours necessary to reach an entire county or region.

Although it is the responsibility of the state to ensure secure and safe delivery of federal assets such as MCM to local level PODs, a bulk POD – referred to in Maryland as a local bulk shipment site (LBSS) – must be established so that closed PODs can rapidly pick up their allotment of medications. They then return to their campuses and structures to dispense to their specific populations while the simultaneous public POD operation gets underway with the general public. With potentially thousands of closed PODs identified as well as the planning obstacle of traffic congestion during a public health emergency, the LBSS allows for just one drop shipment for smaller sized closed PODs per county.

How the Local Bulk Shipment Site (LBSS) Functions

Baltimore County, Maryland, is geographically the largest and third most populated county in the state, with hundreds of potential closed POD sites, including over 300 nursing homes

and assisted living facilities. Instead of pushing small to medium size shipments of MCM to these facilities, which would logistically tax the limited trucking resources available, facilities would be notified via an automated call-down and text alert system of the LBSS location. Facilities and pre-identified organizations would then send an appropriate sized vehicle and staff to the LBSS, sign for the medical materiel, and quickly return to their facilities to begin immediate internal dispensing.

Exercising the LBSS

In concept, the LBSS is remarkably simple: *Drive up. Sign for MCM. Return to facility to dispense. Re-supply as necessary*.

Exercising the LBSS to accurately measure up to federal benchmarks proves to be slightly more difficult due to the artificialities created by the exercise environment. To realistically exercise the LBSS, a local jurisdiction would need the following:

- Thousands of cases of simulated medical countermeasures;
- Numerous vehicles of different sizes and capacities; and
- Hundreds of volunteers or players representing closed PODs.

Those receiving federal grant dollars to prepare for biological attacks are required to demonstrate competency and efficiency in all aspects of dispensing and distribution. Although seasonal flu clinics provide an environment to use a live scenario and actual patients to test POD layouts and throughput, there are few opportunities to exercise a bulk POD and/or a closed POD. To effectively test bulk and closed PODs, exercise coordinators would require significant amounts of exercise participants, vehicles, and supplies as well as an enormous block of time. For a county such as Baltimore County, the LBSS exercise required hundreds of people and vehicles to portray the closed POD representatives and thousands of boxes of simulated countermeasures. To truly determine full operational capability, the exercise should be conducted over the course of several days to several weeks, as an anthrax response could require POD operations for up to two months.

A case of Thin Mints on top of a case of Doxycyline shows the similarity in case size (*Source:* Baltimore County Department of Health and Human Services, 2015).

Obtaining this volume of supplies and staff – even volunteers – could result in significant costs to departments already strained by small staff and shrinking budgets. Using only a few staff with vehicles and supplies repeatedly to simulate crowds is an exercise artificiality that may result in flawed throughput

Truckloads of simulated medical countermeasures (MCM) in the form of Girl Scout Cookies arrive weekly to be placed into inventory and split into orders (*Source:* Baltimore County Department of Health and Human Services, 2015).

numbers and a false confidence in the true operational capability of an LBSS or bulk/closed POD.

The Centers for Disease Control and Prevention (CDC) performs an annual Operational Readiness Review (ORR) that requires testing the local ability to perform materiel management and distribution. This capability includes a demonstrated ability to perform receipt, staging, and storing of materiel as well as other key functions such as order picking, inventory management, and chain-of-custody maintenance. However, this review places a strain on both public health and emergency management programs, which must find ways to exercise in a cost-effective fashion without an overabundance artificiality.

The Solution: A Perfect Partnership With the Girl Scouts of Central Maryland

Sometimes the best solutions are the simplest ones: in this case, the Girl Scouts of Central Maryland annual cookie drive. Baltimore County Department of Health and Human Services partnered with Girl Scouts of Central Maryland to perform a fully functional, 45-day exercise that fully tested every operational component of the county's LBSS/bulk POD plan. The Girl Scout's annual cookie drive requires distribution of more than 7,000 cases across the region over the course of just under two months. Remarkably similar to the bulk dispensing to closed POD partners, Girl Scouts of Central Maryland utilize central warehouses as "depots" for the initial receipt and distribution of orders. To ensure fairness (cookie sales are highly competitive between troops), all troops receive their initial troop orders on the same day and then return to their troops to distribute the individual boxes to the scouts for cookie sales. After this initial push, "cupboards" are

Girl Scout Troops (simulating closed POD partners) queue up using a drive-thru method to receive orders of Girl Scout Cookies. They were stopped at a checkpoint to verify their "cookie credentials" to proceed (*Source:* Baltimore County Department of Health and Human Services, 2015).

established, and all resupply and additional orders of cookies by the case are arranged and picked up at these locations.

In comparison, a bulk POD or LBSS would require all closed POD partners such as nursing homes, colleges, hotels, etc. to pick up medical countermeasures, by the case, within an extremely short window of time and return to their respective facilities and communities to dispense the countermeasures. If additional amounts are needed or if the impacted population must continue taking antibiotics for a full 60-day treatment (such as the case with aerosolized anthrax), then the bulk POD/LBSS will handle the resupply effort as well for up to 50 days.

For this exercise, a memorandum of understanding was signed between Girl Scouts of Central Maryland and Baltimore County Department of Health and Human Services. More than 2,000 cases were received by truck delivery at the LBSS, where they were placed into electronic inventory, split into orders, and prepared for bulk distribution. Girl Scout Troop leaders displayed their "cookie passport" to be allowed entry into the queue. They then queued in a drive-thru at the LBSS, where they signed chain-of-custody documents and had their vehicle loaded with cases. A quality assurance check was performed and inventory was maintained electronically. Deliveries of several thousand cases followed each week for the resupply efforts, which occurred during regular business hours each week. Overall, more than 7,100 cases of simulated medical countermeasures were distributed to over 500 volunteers over the course of a 45-day period. This was accomplished while maintaining all other critical departmental functions and without additional staff, allowing for a real-time test of the division's continuity of operations plans (COOP).

Quality assurance checks were performed prior to order fulfillment and a chain-of-custody document was signed at every step to ensure proper accountability for the cookies (*Source:* Baltimore County Department of Health and Human Services, 2015).

Real Results at Almost No-Cost

This public-private partnership was a "win-win" for both parties. The Girl Scouts of Central Maryland were able to utilize free warehouse space for the purposes of cookie distribution and resupply. Based on feedback from the troops, the methodology utilized at the

Privately owned vehicles were filled with cookie orders, simulating the pickup of medical countermeasures by closed POD partners that could potentially arrive at the LBSS with any variety of public and privately owned vehicle (*Source:* Baltimore County Department of Health and Human Services, 2015).

LBSS was well received due its speed, efficiency, and accuracy. Almost a third of the Central Maryland region's cookies were handled by the LBSS. Based on time studies and staff after-action meetings, the LBSS could have handled four times that volume if necessary. For the Baltimore County Department of Health and Human Services, this provided an opportunity to exercise every aspect of the LBSS/bulk POD operation without the need for significant artificialities. This resulted in real-time data for throughput numbers and other logistical lessons learned. The sometimes hectic and competitive nature of cookie sales added the element of emotional stress to volunteers, providing staff a taste of realism that will be amplified during a public health emergency.

Even more beneficial were the costs involved. Because the exercise was predominantly limited to daytime, normal business hours and Public Health Emergency Preparedness and Operations Bureau staff were utilized, there were minimal additional costs involved to perform the exercise other than some limited overtime for the depot day. All exercise supplies, materials, volunteer cookie recipients and vehicles were provided by the Girl Scouts. There was no cost to the Girl Scouts of Central Maryland to utilize the space or service.

Countermeasure-to-Cookie Comparison

Remarkably, a case of Girl Scout Cookies was virtually identical to a standard case of antibiotics in both dimension and weight (see Table 1). Additionally, virtually every component of LBSS operation had a Girl Scout equivalent, including a chain-of-custody form and the duration of cookie operations.

Conclusion

The public-private partnership between Baltimore County Department of Health and Human Services and Girl Scouts of Central Maryland provided a strikingly realistic training environment to simulate the bulk distribution of MCM to closed POD partners. More than 760,200 simulated courses of medication were distributed from the LBSS, which represents

MEDICAL COUNTERMEASURES	GIRL SCOUT COOKIES
Truck delivery 18-36 pallets	Truck delivery 18 pallets
Electronic inventory system to generate picklist w/Excel and paper backup	Electronic inventory system to generate picklist w/Excel and paper backup
Must sign for countermeasures using chain-of-custody form	Must sign for cookies – cookie "Passport" and transfer forms designate fiscal responsibility
All closed POD partners pick up in one day	All Girl Scout troops pick up on "Depot Day"
Partners return for resupply over a 50-day period	Troops return for resupply over 45-day period
Unused portion returned to state warehouse	Unused cookies returned to Girl Scouts of Central Maryland Warehouse
Pickups can be 1-300 cases	Pickups can be 1-300 cases
Case of Antibiotics: 12" x 8.5 "x 8.5" dim wt. 29" 7.0 lbs.	Case of Girl Scout Cookies: (average) 12" x 7" x 9" dim wt. 28" 7.8 lbs.

So here's how it works: 1 case = 100 bottles of antibiotic tables (each bottle is a 10-day course for 1 person); 7,602 cases distributed x 100 bottles = 760,200 courses of medication. The U.S. Census for Baltimore County population estimate for 2017 is 832,468 and number of households estimate for 2017 is 336,824 (*Source:* Baltimore County Department of Health and Human Services, 2015).

at least two course of medication for every household in Baltimore County. It afforded an opportunity to exercise every aspect of the LBSS over a 45-day period, while sustaining normal daily operations in accordance with the continuity of operations plans and having minimal impact on daily operations. After the first exercise in 2015, subsequent exercises increased the volume of cookies distributed and expanded to become a regional exercise in 2017 and 2018. The most significant aspect was the minimal funding and staff involved for an exercise of this scope and magnitude. As public health emergency preparedness funding continues to decrease across the country, health departments and emergency management must find creative and innovative partnerships to test operational capability in a live environment.

Terry Sapp, EMT, CHEP, is the emergency operations coordinator for Baltimore County Health and Human Services where he serves as the program director of the Public Health Emergency Preparedness (PHEP) Division. He was formerly the State of Maryland Cities Readiness Initiative (CRI) coordinator and previously served as the New Mexico bioterrorism training coordinator. He has presented on mass dispensing tactics and public health readiness at numerous national conferences across the United States, including multiple presentations at the National Preparedness Summit, the Maryland Association of County Officials Conference, and the Maryland Emergency Management Association Symposium. He has served as a guest instructor for the Centers for Disease Control and Prevention (CDC) Strategic National Stockpile (SNS) course and a recent presenter for the CDC's national "Wednesday Webinar." He has 15 years of public health emergency management experience at the state and local levels and over 23 years of combined experience as a volunteer with organizations including the national Disaster Medical Assistance Team (DMAT), National Medical Response Team (NMRT), American Red Cross, Radio Auxiliary Communications Emergency Service (RACES), and the Pikesville Volunteer Fire Company. In his spare time, he is a tour/production assistant and a "roadie" in the rock music industry.

The Seven and a Half Traits of the Ultimate Emergency Manager

By Chas Eby

Emergency management is an evolving discipline ***that requires a progressive emergency manager to fulfill new and expanding requirements for success. Successful leaders in this field follow a systematic problem-solving process and excel at coordinating multiple agencies and information sources rather than simply being experts in one subject matter. The seven and a half traits discussed here describe the ultimate emergency manager.***

The Federal Emergency Management Agency's (FEMA) 2018-2022 Strategic Plan provides an updated "framework for supporting the United States before, during, and after disasters" and highlights new focal points for emergency management. The three strategic goals are as follows: to build a culture of preparedness; to ready the nation for catastrophic disasters; and to reduce the complexity of FEMA. Each of these goals requires different skillsets, capabilities, and objectives in order to be completed. Changing a collective culture requires social listening, understanding, and teaching. Readying a workforce to "enhance a collective readiness," as FEMA states, requires facilitation and coordination skills and focusing on common problem solving across organizations within the emergency management system. Reducing complexity requires FEMA to be mission-focused and carry out processes in a simpler, systematic way.

The emergency management workforce must also adapt to meet changing strategies and requirements. The workforce may already be changing organically. Terry Hastings noted in a 2017 DomPrep article:

> *The discipline of emergency management is poised to benefit from three converging factors: an increasing number of millennials joining the workforce; the proliferation of emergency management related degree programs; and greater visibility and relevance of the discipline itself.*

As both the field and the workforce evolve, the traits, characteristics, and capabilities of successful emergency managers also have changed. The following seven and a half traits encompass the best characteristics of the ultimate emergency manager:

1. Recognize problems before they become disasters;
2. Operate proactively;
3. Focus on enabling;
4. Differentiate between simple, complicated, and complex problems, and act accordingly;

5. Know the audience;

6. Understand the importance of messaging;

7. Identify and seek the best people; and

7.5. Perhaps have direct experience in emergency management.

Recognize Problems Before They Become Disasters

If risk is a function of threat, vulnerability, and consequence, disasters are a function of incident magnitude, capability/capacity, and resilience. Good emergency managers reduce the negative impacts of incidents in order to avoid a disaster – or at least decrease the effects of a disaster. This is accomplished through recognizing problems before or as they occur and then identifying solutions. The best emergency managers do not necessarily know all of the answers. Rather, they enthusiastically ask questions and relay concerns to partner agencies while using emergency management's coordination role to identify the most efficient, multidisciplinary response.

As both the field and the workforce evolve, the traits, characteristics, and capabilities of successful emergency managers also have changed.

Operate Proactively

In a 1799 letter, U.S. President George Washington wrote that "offensive operations, often times, is the surest, if not the only (in some cases) means of defence [sic]." State and local emergency management agencies typically have few physical resources to conduct tactical response operations. Emergency managers' "offense" is being proactive. Specifically, facilitating resource support and information needs based on a given circumstance in order to ensure that first responders and tactical operators can continue to function. Anticipating future needs and conducting future planning, while difficult, is an excellent trait for an emergency manager.

Focus on Enabling

Strong emergency managers focus on enabling personnel and partner organizations, even at the cost of strictly following plans and processes. Following Hurricane Katrina, Colonel Terry Ebert determined that the most effective organizations and people were those that were mission-driven versus compliance-driven. He wrote in a 2014 opinion article, "mission-driven organizations can be given an assignment in two or three sentences and then can deploy millions of dollars of equipment and thousands of people" based on the understanding of the overarching mission. Pre-disaster planning is essential for formulating relationships, outlining roles and responsibilities, and developing a general playbook. The best emergency managers may use plans as a guide, but also are driven by agency mission in order to find methods to meet incident objectives.

Differentiate Between Simple, Complicated, and Complex Problems, and Act Accordingly

David Snowden (chief scientific officer of Cognitive Edge) and Mary Boone (president of Boone Associates) authored a 2007 article in the *Harvard Business Review* on the Cynefin leadership framework, which was developed to "allow executives to see things from new viewpoints, assimilate complex concepts, and address real-world problems and opportunities." The framework usually places problems in four domains: simple, complicated, complex, and chaotic. The problems within each domain necessitate a different approach to solving them.

Strong emergency managers intuitively understand which incidents, emergencies, or problems can be solved using a simple solution versus which ones require a complicated or complex-style solution. Within the disaster realm, a simple solution may be a checklist that dictates actions that would mitigate an incident. A complicated solution usually entails identifying good practice based on known best practices. According to Snowden and Boone "complicated context calls for investigating several options – many of which may be excellent – good practice, as opposed to best practice, is more appropriate." Complex problems are unpredictable and constantly changing, and usually involve multiple, intertwined systems. Emergency managers take a set of given circumstances, understand what resources they have at hand, can identify a complex situation, and then work together and with other disciplines to identify the best solution.

Know the Audience

Identifying solutions to complicated and complex problems that occur during disasters usually necessitates a multidisciplinary approach. Each involved agency and organization would have different, and perhaps even competing, motivations and priorities. Emergency managers must be able to understand their audience and empathize with their partners. Although consensus among different agencies may be beneficial, often the best actions are not simple compromises. Instead, they are multifaceted solutions that address all partners' priorities.

Understand the Importance of Messaging

The best emergency managers understand that effectively communicating to and with the public are important components of any disaster response. All emergency managers, not

solely public information officers, should understand how their activities and operations during an emergency relate to effective risk communications to the public. A 2014 study from Sara Rubin et al. of the National Association of County & City Health Officials found that "local health departments' ability to more quickly communicate preparedness information to their communities could minimize adverse effects of disasters." One of the government's most essential roles during a disaster is to relay transparent information and direction to the public. Working with the traditional media and interacting directly with the public through social media and other platforms is an essential function and is at the forefront of the ultimate emergency manager's mind.

Identify and Seeks the Best People

Emergency management is a discipline that requires both external and internal collaboration. The best emergency managers identify colleagues who can excel in high-pressure situations and have many of the traits listed above. Furthermore, they empower and promote the best people in order to enable them to solve problems before, during, and after disasters.

Perhaps Have Direct Experience in Emergency Management

Experience in emergency management and related disciplines can be useful, especially for senior leadership positions. However, it is not essential for most staff-level positions. Agencies and organizations should focus on capability-based hiring practices. New staff can be trained and learn emergency management. Other capabilities, such as project management, problem solving, and active facilitation, are paramount for burgeoning emergency managers.

Conclusion

Emergency management is an evolving discipline with a broadening scope. In order to be successful, strong emergency managers must follow systematic processes and excel at coordinating multiple agencies and information sources while interacting well with partner organizations and the public. Anyone who exhibits most or all of the traits outlined in this article would likely be an excellent emergency manager.

This article is dedicated to Donald "Doc" Lumpkins, who exhibited the traits outlined above.

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Animal Disease Response Tools for Disaster Recovery Efforts

By Gary Flory and Joe Hudyncia

Florence, the first major hurricane of the 2018 Atlantic hurricane season, made landfall as a Category 1 hurricane early on the morning of 14 September 2018 at Wrightsville Beach in the vicinity of Wilmington, North Carolina with wind gusts of up to 105 mph. As the forecasted path of Florence indicated direct impacts to North Carolina – and a declaration of emergency was issued 7 days before landfall – the animal agriculture industry and the North Carolina Department of Agriculture and Consumer Services (NCDA&CS) began implementing emergency plans before the rain began. The NCDA&CS hurricane response structure was based on lessons learned during response to foreign animal disease outbreaks in the United States over the past several years, and was fine-tuned from experiences with Hurricane Matthew just two years prior.

By 17 September 2018, heavy rains had caused flooding throughout much of the state. More than 35 inches of rain fell on Elizabethtown, North Carolina, and 15 to 30 inches of rain across a number of coastal plain counties. Hundreds of square miles in central and eastern North Carolina were inundated with prolonged rainfall that resulted in "catastrophic and life-threatening flooding" (National Weather Service). More than 2,000 roads were closed, 900,000 people lost power, and thousands of homes were destroyed by floodwaters. Twenty-seven North Carolinians lost their lives.

Florence's Impact on Agriculture

Many farmers in North Carolina did not escape the storm's path of destruction. Because of the storm, more than half of the state's 100 counties were included in a Presidential Disaster Declaration. Estimates of crop and livestock losses exceed $1.1 billion (https://www.ncagr.gov/paffairs/release/2018/aglosseswithcrops.htm). These losses include $23 million for livestock, poultry, and aquaculture growers.

Fortunately, hog farmers were able to take aggressive actions before the storm to minimize impact, such as moving susceptible animals to higher ground or to other locations and procuring generators, fuel, and feed. Mitigation strategies implemented following Hurricane Floyd (1999) also resulted in over 100 swine lagoons in vulnerable flood plain areas of eastern North Carolina being closed through a state government buyout program. As a result of the storm's path and mitigation strategies deployed before and during the storm's impact, only 5,500 hogs died in the storm. At any given time, North Carolina's hog farmers are raising approximately 9 million hogs on 2,100 farms (https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=NORTH CAROLINA).

Although also committed to aggressive actions before Florence's arrival, the poultry sector did not fare as well, as there are more than twice as many poultry farms as there are swine farms with nearly 255 million poultry in the state. In the aftermath of Hurricane Florence, NCDA&CS responded to requests for assistance from 62 poultry farms with a total

of 238 flooded poultry houses. Losses on these 62 farms included 4,052,740 chickens and 118,970 turkeys (NCDA&CS Poultry Veterinary Division Internal Database). One of the many challenges NCDA&CS faced was how to help these farmers dispose of poultry carcasses and saturated manure in a manner that would protect public health and the environment and would quickly get the farms back into operation. NCDA&CS needed to accomplish this monumental task while simultaneously completing other critical response activities in support of the agricultural sector.

Lessons Learned From Hurricane Matthew & the Highly Pathogenic Avian Influenza Outbreak of 2015

Just 2 years before Florence, Hurricane Matthew struck the North Carolina coastline and caused significant flooding, which killed 1.8 million chickens and turkeys (https://www.ncagr.gov/paffairs/release/2016/10-16-Hurricane-Matthew-inflicts-significant-ag-damage.htm). To respond to this disaster, the NCDA&CS adopted practices previously developed to manage mortality during the Highly Pathogenic Avian Influenza (HPAI) outbreak in the Midwestern United States in 2015.

That outbreak in 2015 was the largest animal disease outbreak in U.S. history. It tested the limits of state and federal disease response capabilities, while clearly demonstrating that composting poultry mortality on a massive scale is feasible, effective, and environmentally protective.

The predominant method for the management of poultry mortality during the HPAI outbreak was composting. Composting had not been implemented at this scale during previous avian influenza outbreaks, although it had been proven effective during smaller outbreaks in Maryland, Virginia, and West Virginia. Of the 50 million birds that died during the outbreak, more than 75% were composted (USA Experience and Lessons Learned from HPAI Outbreak in 2014/15) on the farm either inside the poultry houses or outside in windrows – long rows of compost about 12 feet wide and 6 feet tall (see Figures 1-2). Composting is a natural, biological process that inactivates most pathogens, including the avian influenza virus, and breaks down the carcasses into a stable organic material that can be utilized as a soil amendment. Composting on this scale, however, requires significant expertise to oversee proper construction and monitoring of the windrows to ensure pathogens are inactivated and the end product is safe for farmers to use.

Fig. 1. Compost windrows inside a poultry house (*Source:* Gary Flory, 2018).

The U.S. Department of Agriculture Animal Plant Health Inspection Service (USDA-APHIS) called on mortality management subject matter experts (SMEs) from around the United States to oversee the composting activities. To ensure

Fig. 2. Outside compost windrows (*Source:* Joe Hudyncia, 2018).

this process was implemented consistently from farm to farm, USDA established a Composting Technical Committee comprised of SMEs who developed protocols for composting both poultry and livestock during previous disease outbreaks and natural disasters.

During the Hurricane Matthew recovery effort, NCDA&CS modified the HPAI composting protocols to account for the flooded conditions. The Federal Emergency Management Agency (FEMA) provided financial assistance for purchase of wood shavings and other carbon materials needed for the composting process by way of a first of its kind public assistance grant for the protection of public health and the environment. The protocol was implemented by NCDA&CS staff, as well as staff from other state agencies, who were trained on the composting protocol. Though effective, this prolonged effort took NCDA&CS and other agency staff away from other critical recovery operations, as well as from normal job functions. As a result of an after action review done following the Matthew response, NCDA&CS considered contracting out portions of the response activities for future natural disaster events.

Hurricane Florence 2018

With Hurricane Matthew still fresh on North Carolinian's minds, Hurricane Florence arrived in September 2018 (see Figure 3). The devastating storm killed more than twice as many birds as Hurricane Matthew and impacted many more poultry farms. In the immediate aftermath of Florence, NCDA&CS chose to contract out the main elements of the response and recovery effort for flooded poultry houses. By doing so, their staff was able to manage other aspects of the entire agricultural recovery effort and focus efforts on the oversight of the contractors to ensure a rapid and efficient response. NCDA&CS developed and executed contracts for the three main components of recovery operations: subject matter expertise for composting, equipment operations for moving materials and compost windrow construction, and carbon materials sourcing and delivery.

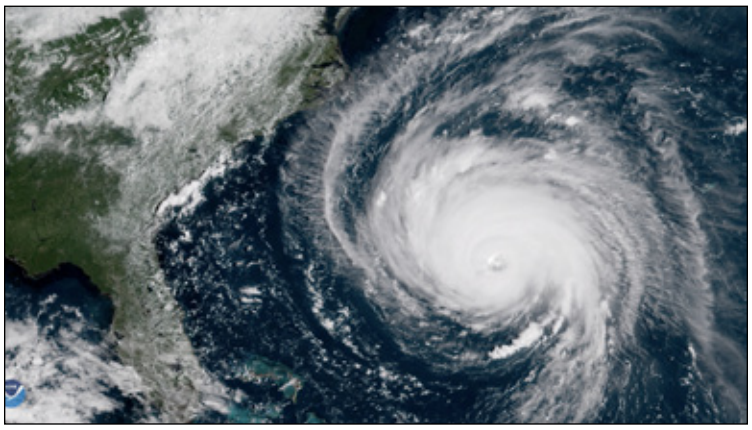

Fig. 3. Hurricane Florence (*Source:* NOAA, 2018).

Contractors with natural disaster experience were available for both equipment operation and the procurement and delivery of carbon material. Equipment operators with significant experience working in and around poultry houses brought critical safety and efficiency to response operations. An environmental services firm with experience moving debris during numerous hurricane events provided carbon materials sourcing and delivery at the scale necessary for a timely response. A USDA-APHIS model for deploying and managing critical compost subject matter expertise proved very effective for the Florence response. During previous disease outbreaks, composting oversight was provided by individual SMEs contracting independently with USDA. Although effective, the process of contracting with individual SMEs was cumbersome for USDA. Following recent outbreaks, USDA chose to contract with a single entity that could provide continuous composting oversight with multiple SME personnel. This same model worked well for NCDA&CS by streamlining the contracting process and eliminating the need to coordinate the deployment of individual SMEs for the Florence response.

Poultry Farm Recovery After Hurricane Florence

The Florence response framework was built on a series of interrelated steps requiring highly coordinated interaction among NCDA&CS, specialized contractors, and farms. The response strategy operated as follows: a poultry grower needing assistance with a flooded poultry farm contacts NCDA&CS through a publicized hotline established for the emergency. Once the grower requests assistance, an SME contacts the grower to schedule a site visit to assess damages. This assessment includes site-specific information: number of birds killed, size of the poultry houses, amount of litter present, depth of water remaining, safety and structural integrity of buildings, composting locations, and other site-specific information. Additionally, the SME calculates the volume and type of carbon material needed to compost the mortality and/or poultry litter, which varies depending on site-specific impacts of flooding at the location.

During the assessment, the grower is able to choose the level of assistance desired to solve the emergency needs identified on his/her farm: carbon material for composting, equipment and operators, composting oversight, or any combination of these resources. Once the assessments are complete, farms are prioritized for recovery operations. For example, farms with large birds are given higher priority than farms with smaller or no birds. Other factors considered include the electrical safety of the building, if feeders and waterers have been raised, and if floodwaters have receded sufficiently to allow access to the site.

Once a farm is scheduled for recovery operations, all components are coordinated through the response team, including the delivery of carbon, movement of equipment and operators to the site, and the deployment of a composting SME. The SME confirms the volume and type of carbon needed, the location of composting operations, and site-specific considerations such as the amount of water remaining in the building, ceiling height, and availability of land for composting.

The use of composting for mitigating potential negative impacts of flood damaged poultry farms requires large amounts of carbon materials, the majority of which needs to be relatively dry. Although mulch materials and wood chips are abundant in North Carolina, locating dry, fine, and absorbent materials in reasonable proximity to impacted farms proved difficult in the

Fig. 4. Monitoring compost temperatures (*Source:* Joe Hudyncia, 2018).

Fig. 5. Level of floodwater seen on a poultry house door (*Source:* Gary Flory, 2018).

first weeks following Florence's landfall. The compost SMEs evaluated a number of materials from a variety of source sites to find suitable materials in sufficient quantity, and then worked with those suppliers and the transportation team to achieve the scale of daily product movement required to meet the resource needs of field operations.

One of the primary roles of the composting SMEs is to oversee the windrow composting process. The first part of that process is to remove excess water from the poultry houses by either pumping it into a tank for direct land application, or incrementally adding carbon to absorb the excess water. If the composting operations occur in the house, then a center aisle is cleared of birds and litter and a base of clean carbon is added to the aisle. A mixture of carbon, birds, and litter from the rest of the house is placed on the base to create a windrow in the center of the house. A cap of clean carbon is then added on top of the windrow.

If composting is conducted outside, the carbon base is formed in an appropriate location and the mixture of carbon, birds, and litter are transported to the composting site and placed on top. Finally, a cap of clean carbon is placed on top the windrow.

Regardless of the location, windrow temperatures are monitored daily to confirm that the windrow construction is sufficient to decompose the carcasses and inactivate harmful pathogens (see Figure 4-6). After the satisfactory completion of the composting process is approved by the SME, the material is released for land application as a soil amendment, or for temporary stockpiling and later land application.

Using This Experience to Respond to Future Natural Disasters

As demonstrated during the Hurricane Florence response, composting has the potential to be a valuable waste management tool during natural disasters. Composting can help solve the immediate needs of protecting public and the environment, provide the basis for a rapid agricultural recovery, and create a safe product for beneficial reuse in agricultural systems.

Not only can it be used with animal carcasses and manure, but composting can also be used to manage a wide variety of waste streams generated during natural disasters. For example, hurricanes generate millions of tons of trees and tree limbs. Burning this wood debris can generate smoke and odors in areas already experiencing significant environmental damage. Alternatively, composting this debris can produce a beneficial soil amendment that can be used in impacted communities to remediate eroded soils. Another common disposal method – burying woody debris at landfills – occupies costly landfill space that could be used for the disposal of inorganic materials like household waste following a natural disaster.

Fig. 6. Temperature probe in windrow (*Source:* Gary Flory, 2018).

Implementing composting more broadly during future natural disasters will require prior planning at a state or federal level to ensure the resources and expertise are available to manage a large-scale composting operation. The NCDA&CS's thoughtful planning before Hurricane Florence, which incorporated lessons learned from disease and disaster events across the United States, is a successful model of the effort needed to execute composting on a large scale in the agricultural sector for disaster response.

Gary Flory [pictured above] is agricultural program manager for the Virginia Department of Environmental Quality. He also founded G.A. Flory Consulting, a global consulting firm, to help clients with a range of services including animal disease and natural disaster response, agricultural emergency planning, and emergency response training.

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