TESTING BIOLOGICAL TEAM RESPONSE DURING A FULL-SCALE MULTI-AGENCY BIOTERRORISM EXERCISE ON BOARD A CARGO SHIP

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BACKGROUND

In June 2011, the Los Angeles County (LAC) Department of Public Health (DPH) participated in a full-scale multi-agency bioterrorism response exercise. The exercise was sponsored by the California National Guard 9th Civil Support Team and took place on board a military cargo vessel docked at a LAC Port. A core group was involved in the discussion and planning of the scenario leading to the event to simulate a response of a potential bioterrorism threat in LAC. The exercise scenario implicated a release of weaponized smallpox virus. Smallpox has been declared eradicated by the World Health Organization since 1980 and the immunity of the population to the virus has declined. A potential release and exposure to the smallpox virus would certainly create a public health emergency response. The scenario of the exercise implicated terrorists taking over a cargo civilian ship in the Middle East, posing as crew members, accidently releasing the virus on the ship during their travels across the ocean, and infecting themselves and crew members. The agencies that participated in the exercise included public health, law enforcement, port authorities, coroner, fire departments, and HazMat agencies. These agencies worked together to assess and mitigate the theat.

The exercise offered the opportunity for the LAC DPH biological response team to conduct the following: test their operational capabilities to respond to a biological agent release with affected ill victims; collect clinical samples while in personal protective equipment (PPE) and respirators; and coordinate response with other responding agencies onsite. Participation in this type of exercise provided staff an opportunity to practice their response skills in a heightened threat environment and prepare the workforce to respond to potential public health related emergency incidents. In addition, participation in this type of bioterrorism exercise definitely incorporated elements of the ten essential public health services and aligned with the strategic planning goals set forth by LAC DPH.

METHODS

In preparation, Acute Communicable Disease Control Program (ACDC) Training and Response Unit provided an online competency-based training on suspected smallpox case investigation, specimen collection procedure, and process for donning and doffing of PPE. The training reviewed transmission of smallpox, the diagnostic criteria, infection control precautions and practices, and the role of the team member in the initial evaluation of a suspected smallpox case. Successful completion of the course was measured by a minimum passing score of 80% on the post-course 20-question multiple choice exam.

To supplement the online course, the bio-response team members completed a practicum session to review and perform a return demonstration of various methods of specimen sample collection for suspected smallpox, packaging of specimens, and completion of laboratory requisition forms for laboratory analysis. A demonstration of the appropriate techniques for donning and doffing of PPE and the use of a new type of Powered Air Purifying Respirators (PAPR) were offered. This training provided the opportunity for the members to perform return demonstration, test the equipment, and familiarize themselves with the components and assembly process of the PAPR.

RESULTS

On the day of the exercise, DPH staff were pre-staged and met in a designated area near the exercise incident. The team was briefed and informed of the situation (a potential act of bioterrorism) and given instructions for response. The bio-response team waited for clearance to enter the vessel once law enforcement and the fire department deemed the vessel safe and clear for entry. The initial notification to DPH described the scenario as a ship arriving from Yemen with many people, both passengers and crew

members, seriously ill with fever, generalized lesions on bodies, and an unknown number of deceased individuals upon arrival to the LAC port.

Once cleared safe for entry, a DPH specialized response team deployed on board the ship first along with the Fire HazMat unit to conduct an initial health threat assessment, perform field sampling testing and determine the extent of the situation from a public health standpoint. Members of the ACDC training and response unit briefed a second bio-response team of the health risk situation on board, reviewed the necessary steps for donning PPE, use of the partner system for safety measures, procedures for collection of clinical specimens of victims, and packaging of specimens for delivery to the public health laboratory.

The bio-response team prepared and gathered their necessary equipment at the staging area for entry on board the vessel once deemed safe to enter. Equipment consisted of supplies such as particulate resistant coveralls, chemical resistant gloves and boot covers, duck tape for sealing seams on coveralls, PAPR, specimen collection laboratory supplies, and radio. Use of the partner-system concept was crucial to ensure proper fitting and positioning of their partner's PPE/PAPR and early recognition of potential emergencies on board the ship.

The team members donned their PPE with the assistance of their partner and consultation from an environmental hygienist on site as needed. They were deployed to respond on-board the vessel, along with some of the DPH specialized team members and external partners such as law enforcement, coroner, and fire HazMat agencies. The goal was to rapidly assess, interview and collect samples of skin lesions on affected victims (both ill and deceased) on board the ship. In a real incident, the specimens would be transported under chain of custody for immediate analysis by the DPH Laboratory Response Network.

The ten bio-response team members consisted primarily of public health nurses and one public health investigator. They worked extremely well together considering all members came together from different programs within DPH and the majority of them were participating in their first bioterrorism response exercise. They quickly established methods for communication with their assigned partner while wearing a PAPR. The scenario and turn of events during the exercise changed unexpectedly throughout the drill, however, the team was flexible and able to adjust to the situations as they presented without problems. The most challenging task for the team was responding in an unfamiliar environment such as a cargo ship, while climbing steep and narrow ladders between decks, assessing victims on the floor in tight quarters while in PPE and kneeling or bending over for prolonged periods, establishing clean and dirty work boundaries and maintaining aseptic technique during the specimen collection process.

Upon successful mission of assessing victims and completing tasks on board the vessel, the bio-response team departed the ship and was directed to a decontamination area and instructed by Fire HazMat on methods to appropriately decontaminate and remove their PPE.

EVALUATION

Five DPH members were assigned to evaluate and closely observe the bio-response team member's actions during the entire response process. Evaluators were instructed to rate the quality of the following areas: overall exercise, PPE donning and doffing process, specimen collection process, team work, and communication between team members. Table 1 summarizes the ratings of assessment areas ranging: poor, fair, good, very good and excellent.

Table 1: Evaluator's Rating Table (n=5)

Evaluator's Ratings	N/A	Poor	Fair	Good	Very Good	Excellent
Overall exercise (team response)	1				1	3
PPE donning and doffing process				1		4
Specimen collection process	1			1	1	2
Team work					1	4
Communication between team members				1		4

The bio-response team members were given an opportunity to provide feedback on their participation after the exercise. Table 2 illustrates the bio-response team responses related to their participation.

Table 2: Bio-response Team Evaluation (n=12)

	Yes	No	N/A
1. The orientation given onsite prepared me to effectively complete my duties.	12		
2. My Job Action Resource Guide (JARG) was helpful in preparing me for my role at the exercise.	11		1
3. Equipment and materials were available for me to do my job effectively.	11	1	
4. My team partner and I were able to communicate and work together well without problems during the exercise.	10	2	
5. The PAPR used during the exercise was comfortable to wear for a prolonged period.	9	3	
6. I feel better prepared to respond to a suspected smallpox case investigation call after this exercise.	10	2	
7. After today's exercise, I could benefit from more smallpox collection exercises and refresher trainings.	12		

Overall, six bio-response team members rated their overall exercise experience as "excellent," four rated their experience as "good," one rated it as "fair," and one did not respond.

DISCUSSION AND LESSONS LEARNED

Recommendations from team members for improvement for future exercise included:

- developing a cheat sheet for collection kits,
- including a small flashlight in kits,
- better organization of supplies prior to specimen collection,
- more practice in drills of this nature,
- improve communications with agencies such as Fire HazMat, and
- improving radio communication.

Recommendations from the team also included continuous on-going skills competency and refresher training sessions. Increasing opportunities to practice responding to biological incidents through multi-agency full-scale exercises is crucial and necessary to ensure a well-prepared and confident workforce capable of responding to potential public health emergency incidents. The ability to measure performance and identify areas of improvement after each exercise is important to ensuring a well-prepared health department (Gebbie, Valas, Merrill and Morse, 2006). According to Gebbie (2006), public health agencies must be able to measure performance and identify areas for improvement. This can be done through ongoing training and emergency response exercising, and through the use of response exercises that include plans for evaluation.

CONCLUSION

Each year, LAC DPH participates in table-top exercises, full-scale exercises and functional exercises. The 2008 National Profile of Local Health Departments reported that 86% of local health departments participated in a tabletop exercise, 72% participated in a functional exercise, and 49% in a full-scale exercise (Biddinger, Savoia, Massin-Short, Preston & Stoto, 2010). Preparedness exercises are effective in familiarizing personnel with emergency plans, allowing different agencies to practice working together, and identifying gaps and shortcomings in emergency planning (Biddinger et al., 2010). Participation in this full-time bioterrorism exercise reinforced the departments need to continue participating in exercises such as these. The Harvard School of Public Health Center for Public Health Preparedness evaluated 38 public health emergency preparedness exercises employing realistic scenarios, and reported usefulness of the exercises in clarifying public health workers' role and responsibilities, facilitating knowledge transfer among these individuals and organizations, and identifying specific public health systems-level challenges (Biddinger et al., 2010).

Participating in full-scale multi-agency bioterrorism exercises provides a realistic simulation of the highly stressful and threatened environment that a possible bioterrorism threat causes. Coordination and communication with multiple external agencies can be challenging in the field, as experienced during this exercise. Despite the challenges, it's extremely important for LAC DPH to continue participation in full-scale bioterrorism exercises and continue testing their skills capabilities, and improve workforce competence and confidence in their response to potential public health emergency events and incidents.

REFERENCES

Biddinger, P.D., Savoia, E., Massin-Short, S.B., Preston, J. & Stoto, M.A. (2010). Public Health Emergency Preparedness Exercises: Lessons Learned. 2010 Supplement 5, volume 125. Public Health Reports. Boston, MA. Association of Schools of Public Health.

Gebbie, K.M., Valas, J., Merril, J. & Morse, S. (May-June 2006). Role of exercises and drills in the evaluation of public health in emergency response. Prehospital and Disaster Medicine. New York, NY. Center for Health Policy, Columbia University School of Nursing and National Center for Disaster Preparedness. http://pdm.medicine.wisc.edu

RESOURCES

National Association of County and City Health Officials at http://www.naccho.org/

National Center for Disaster Preparedness at http://www.ncdp.mailman.columbia.edu/

Harvard School of Public Health Center for Public Health Preparedness at
http://www.hsph.harvard.edu/hperlc/