Case Study of Enteric Illness in Responder associated with 2015 HPAI Carcass Disposal Response

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Abstract. *A composting Subject Matter Expert (SME) was assigned to work with an HPAI positive turkey flock for composting of turkey carcasses and contaminated bedding, feed and other materials. The SME developed enteric illness after working with responders to construct compost windrows. The SME was wearing the recommended PPE for the expected response activities. Exposure to an enteric pathogen may have occurred by skin contact with contaminated fluids. The related presentation will review the PPE used by the patient during the response, possible exposure routes, the current APHIS VS PPE guidance document and possible recommendations for prevention of exposure during future animal disease responses. The presentation will also include an overview of Campylobacter, Salmonella, SARS and Ebola Virus associated with occupational exposure.*

Keywords. Highly Pathogenic Avian Influenza (HPAI), composting, Personal Protective Equipment (PPE), donning PPE, doffing PPE, Enteric illness*, Campylobacter*, *Salmonella*

Case History:

The case patient was a composting Subject Matter Expert (SME) responding to a Highly Pathogenic Avian Influenza (HPAI) positive turkey grow out premises. The patient was working in the poultry houses providing technical information during construction of composting windrows for turkey carcass management. The patient was wearing Tyvek coveralls without hood, nitrile gloves (two pairs taped with duct tape at wrist to coveralls), a fitted half face respirator, rubber boots, boot covers (two pairs taped at top of boot covers with duct tape to coveralls), and goggles. The PPE followed the FY2016 HPAI Response Interim Recommendations for expected exposure (See FY2016 HPAI Response, Interim Recommendations on PPE for Selected Activities, April 25, 2016) [1]

The case patient reported a splash to the exposed skin on their face with tissue from turkey carcasses during movement to construct windrows. The patient was unable to rapidly take off the PPE to clean contaminated skin because their gloves were covered with fluid from handling the turkey carcasses. Assistance for responders while donning (putting on) and doffing (taking off) PPE was dependent on staffing and not always available.

Hand sanitizer was provided during doffing of PPE, however running water for hand washing was not usually available. Exposure to an enteric pathogen may have occurred by contamination of hands, eyes or mucous membranes during doffing of PPE or sweating which could spread contamination to eyes or mucous membranes.

The case patient reported clinical signs of abdominal cramping, severe diarrhea, blood in stool, nausea, and weakness that occurred after an incubation period of approximately 12 hours. The patient left the response to seek medical care and was treated symptomatically with antibiotics and supportive care for dehydration and enteritis. The physician's diagnosis was probable *Campylobacter* enteritis based on poultry exposure history and clinical signs. Diagnostic testing for *Campylobacter* was not available at the time of the medical examination and treatment.

The case patient recovered after approximately 10 days and was able to resume HPAI composting response activities.

Discussion:

Campylobacter is a gram negative bacteria in the genus *Campylobacteriacae, Campylobacter jejuni* is the species most commonly identified in human infections. Exposure is often associated with eating undercooked poultry or foods contaminated by raw poultry. The incubation period is usually 2-4 days and clinical signs include fever, diarrhea, abdominal pain, nausea and vomiting. In some cases more severe disease such as septicemia, Guillain-Barre syndrome, irritable bowel syndrome or arthritis may develop. Diagnosis is confirmed by isolation of *Campylobacter spp*. from a clinical specimen and a probable case by detection of *Campylobacter spp*. by PCR. [2]

Salmonella spp. are gram negative facultative anaerobic rod bacteria in the family Enterobacteriaceae. They are classified into over 2500 known serovars or serotypes. *Salmonella* serotype Typhimurium and *Salmonella* serotype Enteridis are the serotypes that most often cause human disease. Salmonella is the most common cause of foodborne illness worldwide. Exposure can be associated with eating incompletely cooked eggs, poultry, other foods contaminated with the bacteria and contact with live poultry, reptiles, etc. In 2012, USDA-FSIS conducted a nationwide Microbiological survey of raw chicken parts and found an estimated 24% prevalence of *Salmonella* and 21.4% *Campylobacter* contamination. The incubation period for *Salmonella* infection is usually 12-72 hours. *Salmonella* infection causes diarrhea, fever, abdominal cramps and in rare cases septicemia. Clinical signs last 4-7 days and patients usually recover without treatment. [3,4,5]

From 2008-2011, 29 workers at a poultry processing plant were diagnosed with *Campylobacter* infection. A plant health hazard evaluation was completed and the majority of cases occurred in employees working in the live hang area. The plant instituted engineering controls including improving ventilation, sanitation and training in English and Spanish related to hand hygiene and use of PPE (specific plant worker PPE was not provided in article). [6]

During the 2013-2015 Ebola Virus outbreak response in West Africa, more than 23,000 cases of Ebola were diagnosed. Over 880 of the Ebola cases were in health care workers and of these 512 died. There were shortages of PPE and difficult working conditions that contributed to exposure of health care workers. Many of the medical responders who became infected with Ebola were using PPE recommended by Medecins Sans Frontieres (MSF) including coverall or gown, hood to cover the head, mask covering nose and mouth (N95), goggles, double layer of gloves, rubber boots, and plastic apron. Studies of routes of Ebola virus exposure in health care workers showed that one of the main exposure routes was accidental exposure during doffing of PPE. CDC and other response agencies implemented changes in PPE and infection control including assignment of a trained observer to supervise each step of donning and doffing PPE, providing an assistant for responder during donning and doffing, designating a separate area for donning and doffing PPE, disinfecting gloves and contaminated surfaces during doffing and other control measures. [7,8,9]

During the 2003 SARS outbreak in Hong Kong, 25% of the SARS cases occurred in healthcare workers. After March 2003, infection control measures for treatment of SARS patients were mandatory and included training on transmission of SARS and the use of N95 mask, cap, gown, gloves, and goggles. However health care workers continued to become infected. Lau et al conducted a case control study to determine risk factors for transmission of SARS to health care workers. Significant risk factors associated with SARS infection were perceived shortage of PPE, less than 2 hours of infection control and PPE training, and inconsistent use of PPE.[10]

In a study by Tomas et al of the frequency and locations of the contamination of skin and clothing of health care workers during PPE doffing using fluorescent lotion as a marker, the author found that

contamination occurred in 46% of doffing simulations. After training and practice in PPE doffing and use of fluorescent lotion for visual feedback, the contamination during glove and gown removal decreased to 18.9%. The most common sites of contamination were palms of hands, wrists and fingers during removal of contaminated gloves and neck, chest, and hands during removal of contaminated gowns. [11]

Possible future preventive steps to limit exposure of responders to pathogens:

1) Utilize Face shields along with goggles and N95 mask or whole face respirators during high risk activities such as movement of animal carcasses, construction of windrows, and turning of windrows where responder could be exposed to splashing or aerosolization of contaminated liquids. If splashing or exposure to fluids may occur during carcass disposal, avoid the use of N95 masks that can become ineffective for filtration of particulates when wet.

2) Ensure the composting SME's role is only to provide technical information during compost windrow construction, windrow temperature monitoring and turning and not actively assisting with handling carcasses and moving composting materials.

3) During carcass disposal activities, provide responders assistance with donning and doffing PPE by assigning a dedicated safety officer or personnel trained in the use of PPE. Safety personnel can also assist responders with onsite guidance and training on PPE use, PPE supplies, communications, and assistance with PPE during water/rest breaks to prevent exposure of responders to pathogens. It is important that those assisting are also wearing the appropriate PPE.

4) Increase training and practice sessions for donning and doffing PPE. Recommend periodic outreach and practice sessions in District and area offices through webinars, hands on training and exercises by safety and health personnel, safety officers and field staff who routinely use PPE. Include the use of fluorescent lotion as a marker for contamination during training and practice sessions.

5) When possible during disease outbreak response, provide running water and soap for hand washing and cleaning skin that may have been contaminated during the response activities and doffing of PPE. If running water is not available provide disinfecting wipes and hand sanitizer.

Conclusions

During an animal disease outbreak, responders can be exposed to endemic zoonotic diseases such as *Campylobacter*, and *Salmonella* as well as foreign animal diseases such as HPAI. Providing regular PPE training and exercises, assistance with donning and doffing PPE during responses, and regular review of PPE guidance may decrease the risk of responder exposure and possible spread of pathogens to other animal premises.

References

1. USDA, APHIS, Veterinary Services, FY2016 HPAI Response, Interim Recommendations on PPE for Selected Activities, April 25, 2016.

2. CDC 2018. Centers for Disease Control Campylobacter Information for Health Professionals. https://www.cdc.gov/campylobacter/technical.html, Accessed 5 May 2018.

3. The Center for Food Safety and Public Health, Salmonellosis Fact Sheet. 2005-2013. http://www.cfsph.iastate.edu/Factsheets/pdfs/nontyphoidal_salmonellosis.pdf, Accessed 5 May 2018.

4. CDC Information for Health Care Professionals and Laboratories. https://www.cdc.gov/features/salmonella-food/index.html, https://www.cdc.gov/salmonella/general/technical.html, https://www.cdc.gov/salmonella/pdf/enteritidis-508c.pdf, Accessed 6 May 2018.

5. US Department of Agriculture, Food Safety and Inspection Service. The Nationwide Microbiological Baseline Data Collection Program: Raw Chicken Parts Survey, January 2012–August 2012. Washington, DC: US Department of Agriculture, Food Safety and Inspection Service; 2013. https://www.fsis.usda.gov/shared/PDF/Baseline_Data_Raw_Chicken_Parts.pdf

6. Perio, MA. Campylobacter Infection in Poultry-Processing Workers, Virginia, USA, 2008-2011. Emerg Infect Dis.2013; 286-288.

7. CDC. Ebola (Ebola Virus Disease), U.S. Healthcare workers and Settings, PPE. 2015. https://www.cdc.gov/vhf/ebola/healthcare-us/ppe/guidance.html, Accessed 9 May 2018.

8. Glancey, M. Design Improvements for Personal Protective Equipment Used in Ebola and Other Epidemic Outbreaks. Global Health: Science and Practice. 2017; 325-329.

9. Fischer, WA. Protecting Health Care Workers from Ebola: Personal Protective Equipment Is Critical but is Not Enough. Annals of Internal Medicine. 2014; 753-754.

10. Lau, J. SARS Transmission among Hospital Workers in Hong Kong, Emerg Inf Dis, 2004; 280-286.

11. Tomas, ME. Contamination of Health Care Personnel During Removal of Personal Protective Equipment. 2015; 1904-1910.