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One Health Interprofessional Education Working Group
One Health Case Studies



Q Fever in the Suburbs: Zoonotic Disease Outbreak Tabletop Training Exercise

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Synopsis of Case Study

Efforts to prevent and control the spread of emerging/re-emerging zoonotic diseases require a coordinated interdisciplinary response by public health professionals. The following case is an interactive tabletop exercise describing a realistic zoonotic disease outbreak scenario. It focuses on the early stages of an outbreak in a suburban community involving a mysterious infectious agent of unknown origin. In this scenario, the agent will be identified as *Coxiella burnetii* (Q-Fever) from an agricultural source. Due to the classification of this biological agent as a Category-B Bioterrorism agent, as well as its multiple transmission pathways (e.g. aerosol, foodborne, waterborne, direct contact), a community outbreak response to this disease must involve multiple agencies and professionals. Therefore, as the scenario develops, participants will engage in group discussion and decision-making opportunities designed to simulate a multiagency response. Through this exercise, it is expected for participants to explore their potential role in a zoonotic outbreak as well as the roles of other professionals including public health, human and animal health, environmental health, law enforcement, and emergency management. This scenario was created in collaboration with a multi-disciplinary panel (DVMs, MDs, nurses, EMS, epidemiologists) from different public health and agricultural/veterinary agencies as well as academia. This interactive exercise has two distinct formats that can be used independently: a Face-to-Face format for small groups and in-depth discussion (workshop style), or a conference format for large classes. Throughout the scenario, participants will learn how to apply One Health principles to manage and prevent zoonotic transmission of agricultural related agents to the community.

Case Classification Based on the National Center for Case Study Teaching in Science

This Zoonotic Disease Outbreak Tabletop Training Exercise could be classified as a hybrid between Dilemma/Decision Case and Case Discussion. Participants will be presented with a specific scenario narrating the progression of an unknown outbreak (problem) that must be investigated and contained (solving). As they go through the scenario, day by day and hour by hour, the participants (decision-maker) will be introduced to new information in short paragraphs or section that provide valuable clues and information about the outbreak progression at the moment of crisis. When needed, necessary background information will be provided in grey boxes during the scenario. As the outbreak unfolds, the participants will be required to answer specific questions or to make important decisions at key conjunctural points of the scenario. During this time, the facilitators and instructor(s) will encourage participants to discuss the issue presented to them from their points of view, expertise and/or experience. The instructors and facilitators will help the participants to examine the facts, analyze the situation and provide the best possible answers/solutions to the problem stated, including their likely consequences (for both the community and agriculture). Then, before proceeding to the next point in the timeline, the facilitators will provide the ideal answer/decision based on expert opinions, the law or major recommendations from official agencies. Such answers are provided in the facilitators' version.

Case Background and Development

This scenario was loosely based on a large Q-Fever outbreak, which occurred in the Netherlands, where 4,026 human cases were identified. From 2007 to 2010 this outbreak was associated with the windborne spread of contaminated dust into nearby communities from

affected dairy goat farms. The outbreak was finally brought under control by removing (culling) all pregnant goats on the affected farms (>50,000), restricting movement of goats and human visitors to such farms, vaccination of goats, and requiring all manure be plowed into soil immediately after it was spread. *This outbreak took 3 years to bring under control due in large part to the fact that human public health officials were not aware of the ongoing Q-Fever outbreak on the dairy goat farms due to limited communication with veterinary public health officials.*

In the hypothetical scenario presented here, a farmer applied untreated manure contaminated with *C. burnetii* to crop fields surrounding the affected community. The manure, which also contained birthing materials, was sprayed during a windy (> 10 miles/hour) afternoon, sixteen days before the initial detection of human cases in the nearby community. As in the Netherlands, the wind carried the contaminated dust to the local community exposing the population, where the most susceptible individuals manifested the clinical disease that triggered this outbreak investigation. *C. burnetii* has been shown to survive in untreated (non-composted) manure and desiccated birthing material (fetus, placenta, and fluids) for several weeks or longer. It has also been shown to be aerosolized in contaminated dust, traveling several miles from the source of origin. Only a few (1-30) colony forming units of *C. burnetii* is needed to produce infection. In addition to the public health and agricultural response (from local to federal), this scenario also illustrates the appropriate response to a potential bioterrorism attack (as *C. burnetii* can be used as a biological agent). Approximately 70% of all bioterrorism agents are zoonotic in nature and many occur naturally in the United States. Determining a true bioterrorism attack involves understanding the appropriate investigative steps to quickly identify the agent, scope, and criminal intent of the outbreak so that appropriate medical countermeasures can be administered to save and protect human lives. Some of these elements are incorporated into this exercise.

This tabletop exercise starts with an opening paragraph to set the scene for the scenario and suggests important questions for the participants to think about as they work through the exercise. Then the scenario will continue with a series of paragraphs providing information about the outbreak following a specific time sequence. The scenario is arranged sequentially from the moment that the local public health office is first contacted concerning a potential infectious disease outbreak through the eventual conclusion of the local investigation. After presenting each new piece of information in the scenario, a question or series of questions pertaining to the appropriate public health response will be posed to the participants. The ideal answers to these questions are provided within a box in the facilitator's version of the scenario while the reader's version contains a blank box where participants are encouraged to capture their and the group's thoughts. Throughout the scenario, background information on the disease and regulatory and legal information pertaining to the situation are provided in boxes that are shaded grey to distinguish them from the rest of the scenario. Then, the scenario will conclude with a wrap-up paragraph detailing the real outbreak from which this exercise was created. A graphic timeline is also provided for the scenario. The timeline is organized showing the actions of public health authorities along the upper portion of the timeline and the actions of animal health authorities along the bottom. The timeline will help to highlight how the actions of public and animal health officials occurred in tandem throughout the outbreak investigation.

The development of this zoonotic outbreak scenario involved a series of planning meetings and consultations by a panel of experts in public health and veterinary regulatory medicine from various agencies (from local to federal). Among the professionals involved in creating this scenario were: the Public Health Veterinarian from the Zoonotic Disease program at the Ohio Department of Health (ODH), the Emergency Coordinator for the United States Department of Agriculture, Animal and Plant Health Inspection Service, Veterinary Services (USDA-APHIS-VS) covering Ohio, Indiana, Kentucky and Michigan; a representative from the Outbreak Response and Bioterrorism Investigation Team at the Ohio Department of Health (ORBIT); an Epidemiological Investigative Service officer from the Centers for Disease Control and Prevention (CDC-EIS) stationed at the ODH; the regional coordinator of the USDA-APHIS-VS; a veterinary medical officer from the Division of Animal Health at the Ohio Department of Agriculture (ODA); a representative from US Air Force School of Aerospace Medicine (USAFSAM); the public health commissioner from Auglaize County Health Department; the Director of the Veterinary Public Health Program at the Ohio State University (OSU-VPH); and several faculty from the Veterinary Preventive Medicine Department at The Ohio State University (OSU). The overall goal was to develop a scenario that could demonstrate how public health, animal health, law enforcement and emergency management should work together when investigating an outbreak of zoonotic disease in a local community. The outbreak scenario and proposed questions were explicitly developed, discussed, and reviewed by this group in order to obtain consensus on the plausibility of the proposed outbreak and response in “real-life” circumstances. After multiple revisions, the final scenario was further refined using focus groups composed of professional and graduate students at the College of Veterinary Medicine at OSU. Their feedback about this exercise has been incorporated in the current version presented here.

In conclusion, this scenario was developed to illustrate the importance of cooperation between human and veterinary health officials to uncover the source of an outbreak of a zoonotic disease in humans in a local community.

Learning Objectives

It is expected that the participants at the end of this exercise will be able to:

- Identify the initial steps (early detection) and sequence of events of an outbreak investigation and response to a disease of unknown origin in a local community.
- Recognize the professionals and organizations involved during an interprofessional and multiagency outbreak investigation and response involving a potential zoonotic disease of agricultural origin (Q-Fever).
- Identify the different mechanisms of disease transmission that could allow a zoonotic pathogen of agricultural origin (such as *Coxiella burnetii*) to reach a community.
- Ascertain the potential impact on human health (as well as agriculture) that an outbreak associated with this type of pathogen could have under the circumstances described in the scenario.
- Recognize One Health principles to manage and prevent the zoonotic transmission of agricultural related agents to the community.

Targeted Audience(s)

This type of case scenario methodology was developed to be used by health professional and graduate students pursuing degrees in dentistry, law, medicine, nursing, pharmacy, public health, optometry, social work and veterinary medicine, among others. However this exercise is also “flexible” enough that it could be used with other audiences including professionals from different fields such as physicians, nurses, epidemiologists, infection diseases specialists, emergency responders, agricultural professionals, veterinarians, etc. This exercise can be included in elective and capstone courses that are part of the professional curriculum as well as in different graduate level courses. It can also be used as stand-alone continuing education training for public health and agricultural officials and other professionals.

This interactive exercise has two distinct formats that can be used independently from each other with these audiences: **a Face-to-Face Format** for small groups (workshop style), or **a Conference Format** for large audiences.

The Face-to-Face format is ideal for a smaller number of participants (<80) that can be divided into groups of 6 to 10, each with a facilitator. This packet provides a detailed written scenario with a **Participant/Reader’s Version**, as well as a **Facilitator’s Version**. This 2 hour long format allows a detailed and in-depth discussion among the participants distributed into small groups with the direct and real time interaction of a facilitator. An **Instructor’s Guide** and power point is also provided for this scenario containing detailed directions and class management procedures for the activity.

The Conference format is a blended scenario targeting larger audiences (>80 participants). This format contains the same information as the Face-to-Face exercise, but is summarized and organized in a Power Point presentation that allows presenting and discussing the different key points with minimum logistics and preparation. The full Power Point with the **Scenario Presentation** and an **Instructor’s Guide** is also provided for this scenario containing directions and description of the logistics and class management to be followed by the instructor. Additional instructions and background information is provided in the notes section of each slide.

Logistics and Group Dynamics

Detailed instructions for both formats are provided in attached documents (see Instructor’s Guides). These instructions include any background information that the trainer will need to effectively facilitate this exercise in either of the two formats.

Evaluation and assessment

The type of assessment to be used to determine if the established learning objectives were accomplished should be correlated with the purpose of the course. For example, if the scenario is incorporated into a graduate or professional course, then a “high stakes” assessment such as a paper or exam could be used. On the other hand, if this scenario is used as a continuing education course for professionals, then a “low stakes” assessment such as a written reflection, use of a classroom response systems or pooling systems (i.e. clicker®) could be used to answer questions such as: what is the most important thing you learned?, how will you apply these concepts to

your position? Will you change any of your investigation protocols/procedures to include zoonotic disease components/questions? Similar information could be obtained by using an open wrap-up activity with a set of reflective questions that the participants can answer in the group setting.

If desired, the instructor can either perform a traditional exam. Example questions that can be directly connected to the scenario objectives in a traditional examination format include:

- List or discuss the initial steps of an outbreak investigation.
- List the professionals and organizations and their function that are involved during and outbreak investigation involving a zoonotic disease of agricultural origin.
- List or describe the different mechanisms of disease transmission that could allow a zoonotic pathogen of agricultural origin to reach a community, as well as how it could be prevented.

or

The instructor can pursue different assignments and activities that could be used to determine if the established learning objectives were accomplished, as well as to deepen the learning experience. Among the different suggested activities could be:

- Ask the students to prepare a report about reportable diseases in their state (both human and animal), and the proper reporting mechanisms.
- Ask the students to prepare a report describing the organizational structure of the Public Health and Agricultural system in their state.
- Ask the students to determine if their state is a home-rule or Dillon's Rule, and how that would affect the outbreak investigation and response.
- Ask the students to research the regulations involving manure spread in their states and access the potential risk of Q-Fever transmission as described in the scenario.

Finally, an additional evaluation tool that could be used is a pre- and post-training test. This would allow the instructor to obtain some measure of the participants' knowledge on the issue, before and after the exercise, which in time will create the ability to assess the knowledge and learning accomplished with this scenario.

Materials included

This package includes the following documents:

- For the Face-to-Face Format:
 - Instructor's Guide
 - Instructor's Slides
 - Facilitator's version
 - Reader's version
- For the Conference Format:
 - Instructors Guide
 - Scenario Presentation

About the authors

Armando Hoet



Dr. Hoet has a DVM degree (1991) from Zulia University, Maracaibo, Venezuela; a PhD in Veterinary Preventive Medicine from The Ohio State University (2002), and is a Diplomat in the American College of Veterinary Preventive Medicine (currently serving as a counselor for the College). Dr Hoet serves as the Director of the Veterinary Public Health program at OSU (<http://vet.osu.edu/vph-mph>), where he is currently an associate professor with a shared appointment in the Department of Preventive Veterinary Medicine at the College of Veterinary Medicine and the Division of Epidemiology at the College of Public Health. The educational program he leads is one of only two ACVPM accredited programs in the USA, and the second largest in the country with >60 graduate students. Dr. Hoet has been teaching and performing research in infectious diseases since 1993, publishing over 66 research articles and book chapters on infectious diseases. His current research interest is on the epidemiology of zoonotic and foodborne pathogens such as MRSA, *E. coli*, and Salmonella; as well as the molecular epidemiology of antimicrobial resistance associated with these pathogens in humans, animals, and the environment.

Joanne Midla



Dr. Midla graduated from the University of Pennsylvania in 1991. Following graduation, she completed an internship in large animal medicine and surgery at the University of Georgia. Dr. Midla practiced small animal medicine in Maryland, Pennsylvania and Ohio until August of 2013 when she joined the Ohio Department of Health as a public health veterinarian. She received her MPH-VPH degree from the Ohio State University in August of 2015.

Jeanette O'Quin



Dr. O'Quin has a DVM degree (1993) from the Ohio State University and an MPH degree with a specialization in Veterinary Public Health (2011). Following more than a decade of practice in Animal Shelters and five years as a state public health veterinarian with the Ohio Department of Health, she joined the faculty at the OSU College of Veterinary Medicine. Her instruction and research focus on population health and wellness, zoonotic disease prevention, and animal associated occupational health risks. Internationally she is involved in efforts to reduce rabies in humans through the control of canine rabies.

Jason Stull



Dr. Stull is a veterinary epidemiologist, holding a VMD (2001) from the University of Pennsylvania, Masters in Preventive Veterinary Medicine (2004) from the University of California at Davis, and PhD in veterinary infectious disease (2013) from the University of Guelph, Canada. He is a Diplomat of the American College of Veterinary Preventive Medicine. From 2004-2009 he served as a State public health veterinarian for California and New Hampshire. During the past 15 years he has researched and taught on veterinary infectious disease, with numerous research articles and book chapters in the area. He is currently an assistant professor in the Department of Preventive Veterinary Medicine at The Ohio State University. His research focuses on the role of animals in the transmission of zoonotic pathogens and infection control in the veterinary hospital, farm, and household environments.

Suzanne Tomasi



Dr. Tomasi is a 2005 graduate of The Ohio State University College of Veterinary Medicine. She spent the first 5 years after graduation working as a small animal practitioner. During this time, she also volunteered her veterinary services to her local animal shelter. In 2010, she accepted a veterinary technician faculty position at a local community college, where she oversaw the animal use protocols and developed curricula and laboratory safety protocols for veterinary technician students. Her experience in academics and shelter medicine is what led her to pursue a Master of Public Health with a specialization in veterinary public health. She furthered her credentials by becoming a Diplomate of the American College of Veterinary Preventive Medicine. She is currently continuing her veterinary public health training as the veterinary public health resident at OSU where she is coordinating the World Organization for Animal Health (OIE) University of Gondar, Ethiopia and OSU Twinning Project.

Wendy Lehman



Dr. Lehman has a degree in veterinary medicine from Michigan State University (1997) and is a Diplomate in the American College of Veterinary Preventive Medicine (2013). After spending three years in private practice in Michigan, she became a field veterinarian for the Michigan Department of Agriculture and Rural Development, working with stakeholders to eradicate Bovine Tuberculosis from the Michigan cattle population, and from there took a position as Program Manager for Livestock Marketing and Privately Owned Cervids. While there she worked with federal partners to gain Michigan's approval in the Federal Chronic Wasting Disease Program and also partnered with Michigan Farm Bureau and other industry partners to update Michigan's outdated Licensing of Livestock Dealers Act. Currently she is working in collaboration with Ohio State University and Federal and State agencies on an Ohio One Health Alliance, and also serves as a volunteer adjunct faculty member at Wright State University Center for Global Health.

Ohio One Health Alliance



The Ohio One Health Alliance is a networking group comprised of division heads and institutional leaders of major organizations like Ohio Department of Agriculture, Division of Animal Health, United States Department of Agriculture, Animal and Plant Health Inspection Services, Veterinary Services, USAF School of Aerospace Medicine, Wright State University, and The Ohio State University. The mission of this group is to enhance the development of the future and existing workforces to implement the One Health Approach. This mission can be achieved by creating and sustaining a network of governmental, academic and private organizations and other stakeholders to promote and apply the One Health approach for improving and protecting human health, animal health, and environmental quality.