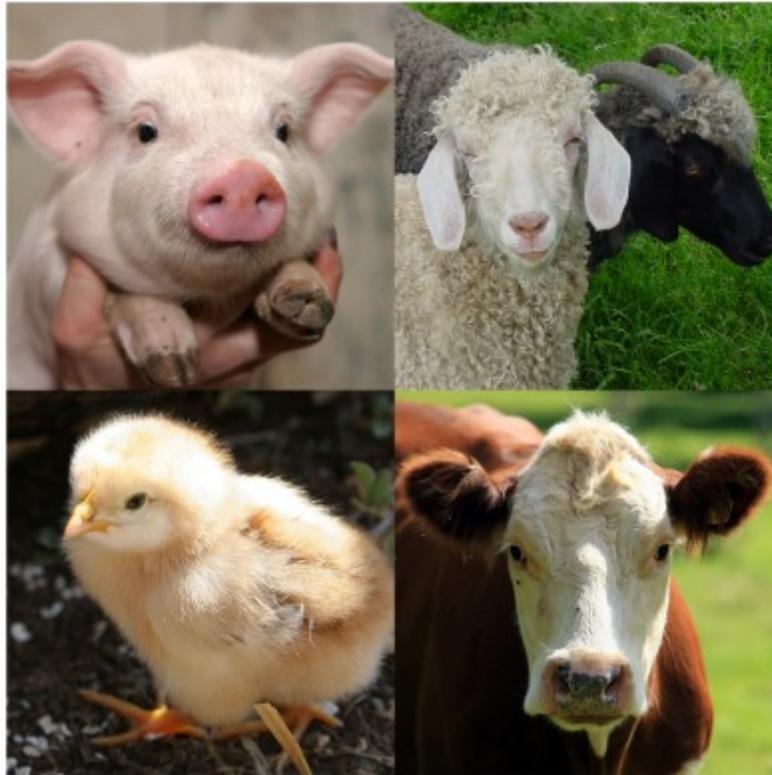


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Arizona Department of Health Services Zoonotic/Foodborne Outbreak Investigation 2016



Situation Manual (SITMAN)
Player's Version
July 26, 2016



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Preface

The Zoonotic/Foodborne Outbreak Investigation (TTX) 2016 is sponsored by the Arizona Department of Health Services (ADHS). This Situation Manual (SITMAN) was produced with input, advice, and assistance from the Infectious Diseases Epidemiology TTX 2016 Exercise Planning Team, which followed the guidance set forth in the Federal Emergency Management Agency (FEMA), Homeland Security Exercise and Evaluation Program (HSEEP).

The SITMAN gives officials, observers, and players from participating organizations the information necessary to observe or participate in a healthcare exercise focusing on participants' emergency response plans, policies, and procedures as they pertain to their preparedness and response capabilities. The information in this document is current as of the date of publication, **July 26, 2016**, and is subject to change as determined by the Infectious Diseases Epidemiology TTX 2016 Exercise Planning Team.

The Zoonotic/Foodborne Outbreak Investigation TTX 2016 is an *unclassified exercise*. The control of information is based more on public sensitivity regarding the nature of the exercise than on the actual exercise content. Some exercise material is intended for the exclusive use of exercise planners, facilitators, and evaluators, but players may view other materials deemed necessary to their performance. The SITMAN may be viewed by all exercise participants.

All exercise participants should use appropriate guidelines to ensure the proper control of information within their areas of expertise and to protect this material in accordance with current jurisdictional directives. Public release of exercise materials to third parties is at the discretion of ADHS.

This SITMAN and TTX were supported by the U.S. Department of Health and Human Services (HHS), Office of the Assistant Secretary for Preparedness and Response (ASPR), Office of Preparedness and Emergency Operations (OPEO), Division of National Healthcare Preparedness Programs (NHPP) HPP Cooperative Agreement Catalog of Federal Domestic Assistance (CFDA) number 93.889. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of HHS.

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3. At a minimum, the attached materials will be disseminated only on a need-to-know basis and when unattended, will be stored in a locked container or area offering sufficient protection against theft, compromise, inadvertent access, and unauthorized disclosure.
4. For more information, please consult the following point of contact (POC):
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Agenda

0800 – 0900 **Registration**
0900 – 0930 **Welcoming Remarks & Exercise Overview and Briefing**
 Hayley Yaglom, ADHS

Modules 1 & 2 (Assigned Breakout Room)

0935 – 0945 Introductions
0945 – 1005 Module 1: Part I Discussion
1005 – 1025 Module 1: Part II Discussion
1025 – 1055 Module 2: Part I Discussion

1055 – 1105 **Break (10 minutes)**

1105 – 1130 Module 2: Part II Discussion
1130 – 1155 Module 2: Part III Discussion

1155 – 1245 **Lunch (1 hour)**

1245 – 1330 **Large Group Brief Back and Questions/Comments**

Module 3 (Assigned Breakout Room)

1330 – 1400 Module 3: Part I Discussion
1400 – 1425 Module 3: Part II Discussion
1425 – 1450 Module 3: Part III Discussion

1450– 1500 **Break (10 minutes)**

Modules 4 & 5 (Assigned Breakout Room)

1500 – 1520 Module 4: Part I Discussion
1520 – 1540 Module 4: Part II Discussion
1540 – 1600 Module 5: Part I Discussion

1600 – 1700 **Large Group Brief Back and Questions/Comments/Evaluation**

1700 **Adjourn**

*Subject to change if necessary

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Introduction

Background

The Infectious Disease Epidemiology and Preparedness (IDEP) Zoonotic/Foodborne Tabletop Exercise (TTX) 2016 is designed to establish a learning environment for local health departments and community partner participants to exercise their outbreak plans, policies, and procedures. To conduct an effective exercise local representatives from numerous agencies have taken part in the planning process and will take part in exercise conduct and evaluation. This Situation Manual (SITMAN) was produced at the direction of the Arizona Department of Health Services (ADHS) with the input, advice, and assistance of the Infectious Diseases Epidemiology TTX 2016 Exercise Planning Team.

Purpose

The purpose of this exercise is to provide participants an opportunity to evaluate current response concepts, plans, and capabilities for a response to an outbreak in YOUR jurisdiction. The exercise will focus on communication within your agency as well as with other counties, state, and federal partners and will also focus on the epidemiological and environmental investigation and response required for the event. The exercise also looks at what assets and resources may be needed to deal with the incident, as well as the role of public information to the overall response effort.

Scope

This tabletop exercise will involve county health departments, county environmental health services programs, hospital infection control programs, other local partners, and state and federal agencies, and will include discussions for response to a health emergency caused by a Zoonotic/Foodborne disease.

Target Capabilities

The National Planning Scenarios and the establishment of the National Preparedness Priorities have steered the focus of homeland security toward a capabilities-based planning approach. Capabilities-based planning focuses on planning under uncertainty, since the next threat or disaster can never be forecast with complete accuracy. Therefore, capabilities-based planning takes an all-hazards approach to planning and preparation which builds capabilities that can be applied to a wide variety of incidents. States and Urban Areas use capabilities-based planning to identify a baseline assessment of their homeland security efforts by comparing their current capabilities against the Target Capabilities List (TCL) and the critical tasks of the Universal Task List (UTL). This approach identifies gaps in current capabilities and focuses efforts on identifying and developing

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priority capabilities and tasks for the jurisdiction. These priority capabilities are articulated in the jurisdiction's homeland security strategy and Multi-Year Training and Exercise Plan.

The target capabilities listed below have been selected by the Exercise Planning Team and correspond with the priority capabilities identified in the ADHS Multi-Year Training and Exercise Plan. These capabilities provide the foundation for development of the exercise objectives and scenario, as the purpose of this exercise is to measure and validate performance of these capabilities and their associated critical tasks.

Capability 1: Community Preparedness

Capability 4: Emergency Public Information and Warning

Capability 6: Information Sharing

Capability 11: Non-Pharmaceutical Interventions

Capability 12: Public Health Laboratory Testing

Capability 13: Public Health Surveillance and Epidemiological Investigation

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Exercise Objectives

The exercise will focus on the following exercise objectives selected by the exercise planning team.

Learning Objectives

After completing this exercise, participants should be able to

Capability 1: Community Preparedness

- Build community partnerships to foster public health

Capability 4: Emergency Public Information and Warning

- Determine when to issue public information alerts, warnings, and notifications.

Capability 6: Information Sharing

- Identify which stakeholders should be incorporated into information flow.
- Determine communication needs during a Zoonotic/Foodborne disease outbreak.

Capability 11: Non-Pharmaceutical Interventions

- Determine the infection control measures that should be implemented.
- Determine the precautionary protective measures associated with this zoonotic or foodborne outbreak that should be communicated to the public.

Capability 12: Public Health Laboratory Testing

- Describe collection of appropriate specimens and proper handling of specimens.
- Obtain and conduct confirmatory testing and analysis of clinical specimens at Arizona State Public Health Laboratory.

Capability 13: Public Health Surveillance and Epidemiological Investigation

- Discuss epidemiologic clues indicative of a zoonotic or foodborne disease outbreak.
- Determine the source of an outbreak.
- Discuss prevention measures to be implemented to protect the public.
- Describe the clinical features, epidemiology, and control.
- Discuss how to determine the prevalence of a zoonotic or foodborne disease in an area.

Participants

Players will respond to the situation presented based on their knowledge of response procedures, current plans and procedures, and insights derived from training.

Observers support the group in developing responses to the situation during the discussion; however, they are not participants in the moderated discussion period.

Facilitators/Evaluators provide situation updates, moderate discussions, and evaluate the discussions. They also provide additional information or resolve questions as required.

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Subject Matter Experts are resources of expert information on medical or technical issues.

Each module begins with an update that summarizes the key events occurring within that time period. Following the updates, participants review the situation and engage in group discussions in their respective breakout groups. Injects will add information to the scenario.

Following these discussions, participants then enter into a plenary brief back in which a spokesperson from each table presents a synopsis of the group's discussion based on the scenario and questions. There will also be a group of panelists to provide subject matter expertise.

Exercise Guidelines

- This is an open, low-stress, no-fault environment. Varying viewpoints, even disagreements, are expected.
- Respond based on your knowledge of current plans and capabilities (i.e., you may use only existing assets) and insights derived from training.
- Decisions are not precedent setting and may not reflect your organization's final position on a given issue. This is an opportunity to discuss and present multiple options and possible solutions.
- Issue identification is not as valuable as suggestions and recommended actions that could improve response and preparedness efforts.

Assumptions and Artificialities

- In any exercise a number of assumptions and artificialities may be necessary to complete play in the time allotted. During this exercise, the following assumptions apply:
 - The scenario is plausible, and events occur as they are presented.
 - There is no "hidden agenda", nor any trick questions.
 - All players receive information at the same time.

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Module 1:

Part I: Initial Case Detection

It is the first week of February and the student health center at a local university is seeing an increase in students presenting with influenza-like-illness (ILI). Currently, influenza activity in the state is widespread (CDC defines “widespread” activity as outbreaks of influenza or increases in ILI cases and recent laboratory-confirmed influenza in at least half the regions of the state).

Dr. Wallace at the student health center examines seven students between February 4th and February 7th with chief complaints of fever, chills, joint and muscle pain, loss of appetite, and fatigue. Dr. Wallace collects a nasopharyngeal swab sample for influenza testing on each student and runs a rapid influenza test. To her surprise, six of the seven tests are negative for influenza. In reviewing available literature, she learns that when influenza activity is high in the community, the test can produce false negative results.

Dr. Wallace advises each patient to stay home until fever-free for at least 24 hours and to call the student health center if symptoms become worse. She decides to have samples sent to the Arizona State Laboratory for a respiratory viral panel and influenza testing by PCR for all seven students. It is a Friday afternoon and samples may not be tested until the following week.

Question 1: What questions would a healthcare provider want to ask at this time to consider other possible diagnoses for these seven students?

Question 2: What should Dr. Wallace do next and who should she notify?

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Over the next three days, the student health center receives multiple calls from the students reporting that their symptoms are getting worse—four are now experiencing significant joint and muscle pain and the fever is not going away. Two of the students have developed a rash and conjunctivitis. One of the students is coughing and having shortness of breath. Dr. Wallace is concerned that something else might be affecting some of the students. She tells them to come back to the student health center for a blood draw.

Question 3: Are the seven illnesses cause of public health concern? Why or why not?

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Part II: Contact with County Health Department

Dr. Wallace calls the county health department because she is concerned about the severity of the clinical presentation of the otherwise healthy adults. The county health department recommends gathering a thorough history from the students to narrow down a differential diagnosis. Dr. Wallace and the county epidemiologist compile a line list of the information they have available and use this to gather additional information.

ID	NAME	AGE	GENDER	DATE OF ONSET	SYMPTOMS
16-401	PATIENT A	23	MALE	2/1/16	FEVER, CHILLS, SWEATS, ARTHRALGIA
16-402	PATIENT B	27	FEMALE	1/30/16	FEVER, FATIGUE, MYALGIA, ARTHRALGIA
16-403	PATIENT C	30	MALE	2/2/16	FEVER, CHILLS, FATIGUE, MYALGIA
16-404	PATIENT D	25	MALE	2/5/16	FEVER, CHILLS, FATIGUE, MYALGIA, ARTHRALGIA
16-405	PATIENT E	24	FEMALE	1/28/16	FEVER, MYALGIA, RASH, CONJUNCTIVITIS
16-406	PATIENT F	25	FEMALE	1/29/16	FEVER, FATIGUE, RASH, CONJUNCTIVITIS
16-407	PATIENT G	22	MALE	2/4/16	FEVER, CHILLS, FATIGUE, COUGH, SHORTNESS OF BREATH

Question 4: What additional information do you need to know at the county health department for your line list or to consider other possible diagnoses for these students?

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Question 5: If you are a school nurse in this situation, what information would you need Dr. Wallace to communicate to you? What about if you are a hospital infection preventionist?

Question 6: Who else would you notify about this issue and what infection control measures would you implement?

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Module 2

Part I: Investigation Begins

Dr. Wallace and the county epidemiologist ask the students about travel history, occupation, recent recreational activities and exposures. The students are asked about animal and foodborne exposures. The line list is completed. All the students live off campus.

ID	NAME	OCCUPATION	TRAVEL	ANIMAL EXPOSURES	FOOD/WATER EXPOSURES
16-401	PATIENT A	VETERINARY STUDENT	NO	DOGS, CATS, PIGS, COWS, GOATS, SHEEP	MILK, YOGURT, FRUIT
16-402	PATIENT B	VETERINARY STUDENT	NO	CATS, HORSES, COWS, GOATS, SHEEP, CHICKENS	YOGURT, CHEESE, VEGETABLES
16-403	PATIENT C	VETERINARY STUDENT	NO	DOGS, COWS, SHEEP, PIGS, LLAMAS	NO DAIRY PRODUCTS, FRUITS, VEGETABLES
16-404	PATIENT D	VETERINARY STUDENT	NO	PIGS, COWS, GOATS, SHEEP	MILK, CHEESE, MEAT
16-405	PATIENT E	GRADUATE STUDENT	YES	MOSQUITOS, DOGS	FRUIT, YOGURT
16-406	PATIENT F	GRADUATE STUDENT	YES	MOSQUITOS, DOGS, HORSES	FRUIT, VEGETABLES
16-407	PATIENT G	NURSING STUDENT	NO	DOGS, CATS	VEGETABLES, MEAT

Results for the respiratory viral panel and influenza testing come back from the Arizona State Laboratory. One student tests positive for Influenza A. The remaining results are all negative.

Four of the students that are in the veterinary medical program reported a clinical rotation experience at local farms in the area at which they had close contact with the animals listed in the table above. The students report rotating between three farms (Farm A, Farm B, and Farm C). Patient C works with two professors in the college of veterinary medicine and oversees aspects of the clinical rotation program, performing visits while students are at

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clinical sites and assists as needed. Patient D is aware of at least one other person ill (names Patient A as being in his clinical rotation group).

The two graduate students are best friends and roommates that traveled to Puerto Rico on winter break during the third week of January. They were bitten by a lot of mosquitos during their trip.

The seventh student who tested positive for influenza reported working at a daycare with toddlers during his time off from nursing school. He said the toddlers were coughing and sneezing all over him. The county health department closes the case and rules him as not being part of this cluster.

Question 7: What are the exposures of interest at this time for the six remaining students?

Question 8: What types of diseases should be considered in the differential diagnosis given the exposure information provided by the ill students?

Given the commonalities among the four veterinary medical students (similar onset of symptoms and attend the same university), the county health department initiates an investigation to determine the etiology of the infection responsible for making the students sick. Additional testing is ordered on the four patients, including viral and bacterial cultures to identify possible infections such as novel influenza, Q fever, tularemia, and brucellosis. Dr. Wallace discusses Zika, Chikungunya, and dengue testing with the public health department for the additional two graduate students.

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Question 9: What illnesses would be the **highest** on your differential for the four veterinary medical students?

Question 10: What additional samples should be collected?

Question 11: Would the laboratory performing the testing need prior notification of the specimens arriving? Why or why not?

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Question 12: (If not already done so), who should be contacted?

Question 13: What type of public health and communication actions would need to be taken at this point?

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Part II: What About The animals?

Mr. Brown is the owner of Farm A, and during the interview, he tells the county health department that this is his first year working with university students in their clinical rotations. The Brown Farm houses approximately 100 animals (10 horses, 25 cows, 25 goats, 20 sheep, and 20 chickens). Mr. Brown keeps his animals in good health and consults with a local veterinarian, Dr. Fernandez as needed.

However, Mr. Brown does recall that one of his pregnant sheep was ill a few weeks ago. He cared for the sheep for a while and reported that several veterinary students assisted in the delivery of an aborted fetus over the course of several hours from the sheep during their visit on January 20th. The veterinary students also assisted with other duties on the farm.

Question 14: What is the likely cause of the students' illness?

Question 15: What additional questions do you have for Mr. Brown?

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Question 16: What recommendations would you make for Mr. Brown?

Question 17: Would you like to do any additional testing of human or animal specimens? If so, what would you like to do? Who would you notify?

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Part III: Community Case Detection, 1 week later

On February 11th, two individuals from the same household (51 yr. old male and 49 yr. old female) in a neighboring county visit their local emergency department with complaints of fever, sweats, and general malaise for three days. These individuals already visited their primary care physician and tested negative for influenza. According to the couple's report, there has been no recent travel or unusual activities. The emergency physician orders several tests, including a blood culture. These specimens go to the hospital's microbiology laboratory. The physician suggests rest and also prescribes a course of antibiotics.

Question 18: Should the emergency department physician have communicated any concerns about these patients with the infection preventionists? Why or why not?

Question 19: What would be your initial hypothesis about these illnesses?

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Question 20: Would you consider this to be an outbreak? What type of information would you need to make that decision?

Question 21: If you were an infection preventionist at the hospital, what is your responsibility at this point? Who are you communicating with?

Question 22: Would you want to follow-up with the hospital laboratory that completed the testing? If yes, what type of questions would you ask them?

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Module 3

Part I: The Farmers Market

Mr. Brown reports that the sick sheep and other sheep living in the same pen produced milk that was shared with five friends about a month ago—one couple lives in another county. When asked if the milk was pasteurized, Mr. Brown said that his friends preferred raw milk so no pasteurization process was performed. Mr. Brown also said that his children have a stand at the local Farmers Market and sell products from his farm on a weekly basis. This includes milk from his cows, sheep, and goats.

Question 23: What information should be collected next? What specific actions need to be initiated at the Farmers Market?

Question 24: How do you determine who bought and consumed the dairy products, including milk from Mr. Brown's stand at the Farmers Market?

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Question 25: What additional agencies or groups of people should be involved?

Question 26: What recommendations should be made to Mr. Brown regarding his livestock and the farm?

Question 27: Would you ask where he obtained his sheep or other animals, or if he sold any animals recently? How would this information be helpful?

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Question 28: What additional samples should be collected? What are there any recommendations for personal protective equipment?

Question 29: Who would you contact to help collect these samples?

Question 30: Do you have a mechanism in place to get samples to the Arizona State Public Health Laboratory or CDC?

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Part II: Laboratory Results are in

Meanwhile, on February 16th, test results finally come back for the four ill veterinary medical students. *Brucella melitensis* has been identified in blood cultures. The Arizona State Laboratory reports to the state health department, who contacts the county investigators. The county health department is considering this an outbreak of brucellosis.

(Reminder: The other three students had alternative diagnoses: influenza and Zika virus.)

Question 31: How would you define a case in this outbreak?

Question 32: Would you activate the Emergency Operations Center? Why or why not? Does the nature of the causative agent influence your decision?

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*Inject: In reviewing the epidemiology of brucellosis, investigators learn that *B. melitensis* can be used as a bioterrorism agent due to its ability to undergo aerosolization. Brucellosis is highly pathogenic to humans and persons at high risk of infection include veterinarians, farmers, dog breeders, and lab workers. Transmission occurs from contact with the bacteria through mucous membranes or broken skin after exposure to contaminated animal birthing products (e.g. placenta, fetal fluids, aborted fetuses, or fluids during abortion). Brucella can also be aerosolized in animal pens or microbiology laboratories. Consumption of unpasteurized dairy products from infected animals is also a known source of human infection.*

Question 33: Are you concerned this is a bioterrorism event?

Question 34: What would be the concerns for the Brown Farm?

Question 35: Who would you want to contact once you have this diagnosis?

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Part III: Laboratory Exposures, 2 weeks later

Through your investigation with the hospital that experienced an increase in patients presenting with similar illnesses, you find out that two of the microbiologists at the hospital laboratory called out of work on February 20th with high fevers, loss of appetite, and severe body aches. They have not been able to return to work.

Question 36: Is evidence for brucellosis laboratory exposure?

Question 37: What additional information needs to be gathered from the laboratory workers at the hospital laboratory?

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Question 38: What type of notification/communication is needed at this point? Who at the hospital do you need to speak with?

Question 39: What steps need to be taken with laboratory personnel?

Question 40: What are the key messages and who is your audience?

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Module 4

Part I: Investigation at the Farm

The county health department completes their investigation regarding laboratory exposures, but is still concerned that there may be many other people who were exposed to the ill sheep or who consumed the raw milk products. They contact Dr. Fernandez and their partners at the Department of Agriculture to assist with the farm investigation. The investigators also contacted and worked with the Farmers Market coordinator to place signs at the market informing consumers to contact the health department if they consumed milk purchased from Mr. Brown's Farm and became ill, with encouragement to visit with their physician for testing and treatment.

Question 41: What procedures could have been in place at the Farmers Market to prevent exposures to consumers?

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Meanwhile, milk from the ill sheep is collected by the Department of Agriculture and sent to the lab for testing. The investigators also learn that three groups of four students visited the Brown Farm over a two-day period and assisted with caring for the sheep, including the ill one that aborted its fetus. Four of the individuals are the laboratory-confirmed cases that presented to the student health center in early February. The investigators follow up with the other eight individuals to conduct an exposure risk assessment.

The county health department begins contact tracing to determine others in the veterinary clinical rotation group that may have been exposed to the sheep during the delivery of the aborted fetus, or had visited the Brown Farm and had contact with any animals in the pen while the sheep was ill.

Question 42: What specific questions should be asked of all the students during the risk assessment interview?

Question 43: What are the recommendations for the eight students? Would the recommendations be different for the students that used PPE versus those that did not?

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Question 44: Are you concerned about any secondary farm-to-farm transmission, especially since the three groups of students had clinical rotations at three community farms?

Question 45: Are you concerned about any secondary person-to-person transmission, especially for family members of the ill patients? Members of the general public?

Question 46: What are your communications needs with partners (i.e. hospitals, clinics, laboratories, local public health, ADHS, and CDC)? What are some communications concerns? How can these concerns be addressed?

Question 47: How will you handle communication with the media? Who will you coordinate with? What types of information should be included in this type of messaging? Give examples.

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Part II: Sharing with Friends

Mr. Brown saw a health care provider to get tested for brucellosis since investigators determined that he may have been exposed to contaminated fluids while caring for the sheep without wearing PPE. Mr. Brown also shared the names of the five friends with whom he directly shared the raw sheep milk. Mr. Brown said he thinks two or three of his friends were recently sick.

Question 48: What questions should you ask the individuals who drank the raw milk?

Question 49: Do you have enough evidence for these individuals to be linked to the students' and Mr. Brown's illness?

Question 50: What would be your next step after you learn the above information?

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Module 5

Part I: Recommendations and Recovery, 4 weeks later

The milk from the ill sheep tests positive for *B. melitensis*. There are now a total of 22 confirmed cases (4 veterinary medical students, Mr. Brown, three of his friends, twelve farmers' market customers who consumed the raw sheep milk, and the two hospital laboratory workers exposed while processing the samples).

Question 51: Do you think the available evidence implicates the sheep as the source of the outbreak? Explain.

Question 52: Would a press release be issued at this point, if not previously done? If you have put out messaging, what additional communication would you be doing at this point?

Question 53: If cases were identified on tribal lands, what additional steps would have needed to be taken? How do you and to whom would you communicate?

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Both county health departments, the Arizona Department of Health Services and the Department of Agriculture come together to review the investigation findings and make recommendations to stakeholders.

Question 54: Which of the following would you recommend and what are the pros/cons of each?

- a. Provide regular and ongoing education on safe animal handling practices and PPE to veterinary medical students and staff at the university.
- b. Work with partner farms that host veterinary students to ensure they are aware of the safe animal handling practices and PPE recommendations.
- c. Conduct community health education on the risks associated with consuming unpasteurized dairy products.
- d. Recommend that Mr. Brown no longer sell products at the Farmers Market.
- e. Recommend that Mr. Brown test all of his animals for brucellosis and treat that ones that test positive.
- f. Recommend that Mr. Brown check the vaccination records on his animals to ensure they are protected against brucellosis and if unvaccinated, get them vaccinated as soon as possible.

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Question 55: Who might you consult in developing actions/policies for safe animal handling practices to prevent a recurrence of this problem in the future?

Question 56: What are the long-term recommendations for Mr. Brown and his farm? Local university and the veterinary students? Laboratories? General public?

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Additional Resources

- CDC Brucellosis Webpage:
<http://www.cdc.gov/brucellosis/>
- CDC Assessing Laboratory Risk Level and PEP: <http://www.cdc.gov/brucellosis/laboratories/risk-level.html>
- World Health Organization:
<http://www.who.int/zoonoses/diseases/brucellosis/en/> <http://www.who.int/csr/resources/publications/Brucellosis.pdf>
- The Center for Food Security & Public Health: <http://www.cfsph.iastate.edu/Factsheets/pdfs/brucellosis.pdf>

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Appendix: Investigation Protocol

Epidemiology

A. Agent:

Brucella species are small, non-motile, Gram-negative coccobacilli. The species that commonly infect humans are *B. abortus*, *B. melitensis*, *B. suis*, and rarely, *B. canis*, however these are all biovars of *Brucella melitensis*, which are genetically identical by DNA sequencing. Other *Brucella* spp such as *B. ceti*, and novel *B. pinnipedialis* can also cause human infection. *Brucella* spp. will grow only in aerobic blood culture bottles after 2- 4 days; followed by isolation as typical colonies on BAP and CHOC within 48 hours. Presumptively identified as a small, gram-negative coccobacilli that is oxidase, catalase and urea positive.

B. Clinical Description:

In the acute form (less than 8 weeks from illness onset), nonspecific and "flu-like" symptoms including fever, sweats, malaise, anorexia, headache, myalgia, and back pain. In the undulant form (less than 1 year from illness onset), symptoms include undulant fevers, arthritis, and epididymo-orchitis in males. Neurologic symptoms may occur acutely in up to 5% of cases. In the chronic form (more than 1 year from onset), symptoms may include chronic fatigue syndrome, depression, and arthritis. Mortality is low (less than 2%), and is usually associated with endocarditis.

Sequelae are variable, including granulomatous hepatitis, peripheral arthritis, spondylitis, anemia, leukopenia, thrombocytopenia, meningitis, uveitis, optic neuritis, papilledema, and endocarditis.

▪ Differential Diagnosis:

Due to the non-specific presentation and numerous, varied complications of brucellosis in humans, the differential diagnosis is vast and will not be addressed in detail here. A high index of suspicion is necessary to diagnose brucellosis, due both to the non-specific presentation and to the relatively long latency period between inoculation and the development of symptoms.

(www.sfcddcp.org/document.html?id=69)

C. Reservoirs:

The main reservoir for *Brucella* species is animals. The most common species are usually associated with the following animals: *B. abortus* (cattle), *B. melitensis*, *B. ovis* (sheep, and goats), *B. suis* (pigs), rarely *B. canis* (dogs). Other animals that have been associated with *Brucella* infections include: camels, elk, deer, moose, wild pigs and several other animals.

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D. Mode of Transmission:

By contact with tissues, blood, urine, vaginal discharges, aborted fetuses and especially placentas, and by ingestion of raw, unpasteurized milk and dairy products from infected animals. Airborne infection of animals occurs in pens and stables, and of humans in laboratories and abattoirs. *Brucella* is rarely transmitted from person-to-person. Mothers may transmit the infection to their infants congenitally or through breast-feeding. Sexual transmission has also been reported. For both sexual and breast-feeding transmission, if the infant or person at risk is treated for brucellosis, their risk of becoming infected will probably be eliminated within 3 days. Although uncommon, transmission may also occur via contaminated tissue transplantation.

E. Incubation Period:

Highly variable and difficult to ascertain; usually 5 to 60 days, 1 to 2 months is commonplace, occasionally several months. Incubation period may last for years if the case is not diagnosed and does not receive treatment.

F. Period of Communicability:

Rare person-to-person communicability. Risk may exist for medical personnel in endemic regions participating in activities characterized by gross exposure to contaminated fomites or tissue or massive bleeding, such as certain obstetric procedures.

G. Susceptibility and Resistance:

Severity and duration of clinical illness will vary. Duration of acquired immunity is uncertain.

H. Treatment:

Treatment can be difficult. Doctors can prescribe effective antibiotics. Usually, doxycycline and rifampin are used in combination for 6 weeks to prevent reoccurring infection. Depending on the timing of treatment and severity of illness, recovery may take a few weeks to several months.

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Disease Management

I. Clinical Case Definition:

An illness characterized by acute or insidious onset of fever and one or more of the following: night sweats, arthralgia, headache, fatigue, anorexia, myalgia, weight loss, arthritis/spondylitis, meningitis, or focal organ involvement (endocarditis, orchitis/epididymitis, hepatomegaly, splenomegaly).

J. Laboratory Criteria for Diagnosis:

Definitive:

- Culture and identification of *Brucella* spp. from clinical specimens.
- Evidence of a fourfold or greater rise in *Brucella* antibody titer between acute- and convalescent-phase serum specimens obtained greater than or equal to 2 weeks apart.

Presumptive:

- *Brucella* total antibody titer of greater than or equal to 160 by standard tube agglutination test (SAT) or *Brucella* microagglutination test (BMAT) in one or more serum specimens obtained after onset of symptoms.
- Detection of *Brucella* DNA in a clinical specimen by PCR assay.

Case Classification

Confirmed	A clinically compatible illness with confirmatory laboratory evidence of <i>Brucella</i> infection.
Probable	A clinically compatible illness with at least one of the following: <ul style="list-style-type: none"> • Epidemiologically linked to a confirmed human or animal brucellosis case • Presumptive laboratory evidence, but without definitive laboratory evidence, or <i>Brucella</i> infection

K. Classification of Import Status:

A case is considered imported if the person became infected outside the US. This should be considered when there is opportunity for exposure and epidemiologic evidence more suggestive of infection elsewhere. A case may also be imported from one state into another or one local jurisdiction to another. All opportunities for exposure and epidemiologic evidence should be documented for assessment of import status. If the exposure is thought to occur in Mexico/Canada, mark as *bi-national* in MEDSIS.

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L. Laboratory Testing:

Gold Standard: Culture or paired serum.

NOTE: Reference isolates may be submitted on agar slants.

TEST	SPECIMEN & TRANSPORT	AVAILABILITY
PCR	Whole blood with EDTA or liquid or plated isolate. Keep refrigerated.	ASPHL
Culture (isolation)	Blood, bone marrow, spleen, liver, tissue aspirate and/ or abscess in standard bacterial transport media. Keep and send refrigerated.	ASPHL
Serology (tube agglutination)	Single or paired sera*. Keep and send at refrigerated temperature.	ASPHL

*Note on single or paired sera: 10 to 15 ml of whole blood should be collected aseptically in a red top vacutainer tube. For pediatric patients, smaller volumes of blood may be collected in pediatric tubes. After collection, the red top tube may be transported directly to the State Laboratory or the tube may be centrifuged and the serum poured off into a separate vial. The optimal volume of serum for routine submissions is 2 - 3 ml. Acute and convalescent serums should be collected at least 2 weeks apart.

M. Assessing Laboratory Results:

Blood culture is the diagnostic gold standard, but is not always positive. If blood or bone marrow culture is used, the laboratory must be informed that Brucella is suspected, so that they will process the sample for a longer period of time and protect laboratory personnel. A serum agglutination test is the most common serologic approach, but other serology, ELISA, and PCR have been used to make a diagnosis. <http://wwwnc.cdc.gov/travel/yellowbook/2014/chapter-3-infectious-diseases-related-to-travel/brucellosis>

N. Outbreak Definition:

There are no formal outbreak definitions; however, the investigator may consider the possibility of an outbreak when there is an unusual clustering of cases in time and/or space.

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Investigation Guidelines

O. Time Frame:

Submit a report to the local county health department within 1 working day after a case or suspect case is diagnosed, treated, or detected.

P. Forms:

- ADHS Brucellosis Investigation Form:
<http://www.azdhs.gov/documents/preparedness/epidemiology-disease-control/disease-investigation-resources/Brucellosis-Case-Investigation-form.pdf>

Q. Investigation Steps:

▪ Confirm Diagnosis

- i. Confirm diagnosis using case definition.
- ii. Identify any symptoms of brucellosis.
- iii. Collect demographic data
 - Birth date, county, sex, race/ethnicity.
- iv. If case was hospitalized obtain medical records including admission notes, progress notes, lab report, discharge summary, and outcome (recovered or date of death).

Per A.A.C. R9-6-310, ensure that an isolate is submitted to ASPHL for confirmation.

▪ Conduct Case Investigation

- i. All confirmed and probable cases of *Brucellosis* will immediately be investigated.
- ii. Using the ADHS Brucellosis Investigation Form, investigator will attempt to collect as much data from the patient as well as from medical records. The investigator will attempt to contact patient with three phone calls before sending letter to patient's address.
 - Record onset date (if a reoccurrence – record the earliest onset date).
 - Record the duration of the current illness in weeks.
 - Examine and record the therapy that the case received.
- iii. Focus within up to 6 months prior to onset (incubation period) on potential sources of infection:
 - Travel: occurs worldwide, especially in Mediterranean Basin (Portugal, Spain, Southern France, Italy, Greece, Turkey, North Africa), Eastern Europe, the Middle East, Africa, central Asia, central and South America, the Caribbean.
 - Occupation: farming, ranching, veterinary medicine, abattoir/slaughterhouse workers, meat processing plant workers, butchers, meat inspectors, laboratory personnel.
 - Animal exposures: particularly farm animals or wild game, petting zoo, around birthing or aborting animals, exposure to blood, semen, or placenta or other animal body fluid.
 - Vaccine exposure: administering vaccine, or working with vaccine strains in laboratory.

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- Exposure to or consumption of raw milk or unpasteurized dairy products: milk, cheese (such as Queso Fresco), ice cream, where and when purchased, other persons who consumed or were exposed to same product.
 - Hunting: cleaning an animal for meat consumption.
- iv. Examine all potential exposures based on possible source and potential modes of transmission, including inoculations, sprays into eyes, nose or mouth, or direct skin contact with substances containing *Brucella spp.*
 - v. Identify sick contacts.
- **Conduct Contact Investigation**
- i. Contacts are those with possible exposure to the same source of infection as the case. Contacts are not persons in close proximity to a case only. Consider acquaintances, household members, associates, co-workers and others.
 - ii. Identify persons who participated with the case in any of the at-risk activities and contact them to identify if they are experiencing any symptoms.
 - iii. Contacts showing symptoms and with same exposures may be interviewed. A detailed contact and environmental investigation will be completed if a particular source is considered highly likely to be the cause of illness among groups of people.
- **Initiate Control and Prevention Measures**
- All laboratories handling specimens with confirmed *Brucella* should be contacted and investigated to identify possible contacts to *Brucella* isolates.
- **Isolation, Work and Child Care Restrictions**
- In addition to standard precautions, contacts precautions are indicated for patients with draining wounds. Since person to person transmission is rare, exclusion or quarantine is not applicable.
- **Case Management**
- None required.
- **Contact Management**
- i. Symptomatic contacts should be strongly urged to contact their physician for a medical evaluation.
 - ii. Persons who are not ill but who were potentially exposed to the same source should begin a fever watch. From their last exposure, temperature should be actively monitored for fever for four weeks.
 - iii. Broader symptoms of brucellosis should be passively monitored for six months from the last exposure. Broader symptoms include:
 - Acute: fever, chills, headache, low back pain, joint pain, malaise, diarrhea
 - Sub-Acute: malaise, muscle pain, headache, neck pain, fever, sweats

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- Chronic: anorexia, weight loss, abdominal pain, joint pain, depression, constipation
- iv. For laboratory personnel, refer to managing special situations.
- v. For vaccine exposure, refer to managing special situations.

▪ **Notifications**

- i. Organize, collect and report data utilizing the ADHS Brucellosis Investigation Form.
- ii. Report data electronically via MEDSIS or by fax if necessary, include:
 - All essential data that was collected during the investigation, especially data that helps to confirm or classify a case.
 - Remember to verify all key Disease Specific Observation fields are filled out in MEDSIS.
- iii. For epi-linked cases, include the MEDSIS ID of the related case in the case notes section.

R. Outbreak Guidelines:

Report within 24 hours of detecting a possible outbreak via Outbreak Module in MEDSIS. There are no formal outbreak definitions; however, the investigator may consider the possibility of an outbreak when there is an unusual clustering of cases in time and/or space.

Special Situations

Intentional Contamination:

Brucellosis is a potential bioterrorism weapon—as little as 10-100 organisms will cause disease. If the case has no known exposures or is not employed in an occupation that is prone to exposure, then consider a bioterrorist event. An attack may take the form of dissemination of an aerosol among a large gathering of people or by the contamination of food or water. Because the laboratory confirmation could be delayed, specific epidemiological, clinical, and microbiological findings that suggest an intentional release of *Brucella* should result in the issue of a health alert.

- If suspected:
 - Notify the Program Manager/Supervisor, Office Chief, Bureau Chief, Preparedness manager (and ADHS epidemiologists if local jurisdiction) immediately.
 - If samples are collected they will be considered evidence in a criminal investigation. Implement Chain of Custody procedures for all samples.
 - Through investigation, define population at risk to help guide response activities. Public health authorities will play the lead role in this effort, but must consult with law enforcement, emergency response and other professionals in the process. The definition may have to be re-evaluated and redefined at various steps in the investigation and response.
 - Once the mechanism and scope of delivery has been defined, identify symptomatic and asymptomatic individuals among the exposed and recommend treatment and/or chemoprophylaxis.
 - Establish and maintain a detailed line listing of all cases and contacts with accurate identifying and locating information.

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- Safety Considerations: Risks to public health, health care and emergency response personnel are not significant.
- Diagnosis: Physicians who suspect brucellosis should promptly collect specimens for culture, serology, or PCR. Liver, spleen, joint fluid and abscesses can also be cultured. See laboratory diagnosis table above.

IMPORTANT: Alert the laboratory to the possibility of *Brucella* and need for special safety procedures. Level A laboratories should consult with state public health laboratory director (or designate) prior to or concurrent with testing if *Brucella* species is suspected by the physician.

- Treatment: Drug-resistant organisms might be used as a weapon, conduct antimicrobial susceptibility testing quickly and alter treatments as needed.
- Antibiotics for treating patients infected with brucellosis in a bioterrorist event are included in the national pharmaceutical stockpile maintained by CDC, as are ventilators and other emergency equipment.
- Post-exposure prophylaxis (PEP): In most brucellosis threat situations PEP is not recommended. However, if the level of suspicion is high, exposed individuals may begin antimicrobial therapy if a definitive determination cannot be made within 5 days. The recommended treatment is: rifampin (600 mg/day) and doxycycline (100 mg twice daily) for 6 weeks. PEP of close contacts of brucellosis patients is not recommended because person-to-person transmission is rare.
- Surveillance: Arrange for active surveillance for 4 weeks for the development of febrile illness and 6 months of passive monitoring for other signs and symptoms of brucellosis among all individuals exposed.

Exposure to *Brucella* containing Vaccine:

- Exposure is defined as a needle stick, splash of vaccine onto broken skin, open wounds, or in the eyes.
- Identify the strain contained in the vaccine. There are three vaccine strains: strain 19, RB51, and REV-1.
- Exposed person should see a health care provider. A baseline blood sample should be collected for testing for antibodies. CDC recommends the exposed person take antibiotics (see below). At the end of that time they should be rechecked and a second blood sample should be collected. The sample can also be collected at 2 weeks.

NOTE: Exposure to RB51 does not induce a measurable antibody response. Monitoring serum specimens in those exposed to RB51 will not provide a useful indicator of infection.

- Post-exposure prophylaxis should be considered in an exposed person:
 - Doxycycline and rifampin for strain 19 and REV-1, for 3 weeks
 - Doxycycline alone for RB-51 for 3 weeks.
 - 6 weeks of treatment if sprayed vaccine in eyes or onto open wounds on the skin.

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Laboratory exposure to *Brucella* isolates:

Refer to CDC: Recommendations for Risk Assessment, Post-Exposure Prophylaxis, and Follow-up of Laboratory Personnel Exposed to Pathogenic *Brucella* Species.

- Determine number of workers exposed to *Brucella* isolates and classify exposures into high- and low-risk.
 - High-risk exposure: Performing a specifically implicated practice such as sniffing bacteriological cultures, manipulating cultures while on an open bench, or mouth pipetting; being within 5 feet of work with cultures on an open bench, or being present in the lab during an aerosol-generating event.
 - Low-risk exposure: In lab at time of manipulation on an open bench but no other high-risk exposures.
- Recommend PEP for workers with high-risk exposures to *Brucella*:
 - Doxycycline 100 mg twice daily and rifampin 600 mg once daily for 3 weeks. (Note: High risk contacts to RB-51 in animal vaccine should receive doxycycline only. The spraying of any *Brucella* containing vaccine in the eyes may require 6 weeks of treatment.
 - Trimethoprim-sulfamethoxazole as an alternative for patients with contraindications to doxycycline.
 - Pregnant contacts with high-risk exposure should consider PEP in consultation with their obstetricians.
- Discuss PEP with workers with only low-risk exposures.
- Obtain baseline serum samples from all workers as soon as possible after potential *Brucella* exposure is recognized. (If available, obtain pre-exposure stored specimens.)
- Arrange for serologic testing on all workers exposed at 2, 4, 6, and 24 weeks post exposure using agglutination test at the CDC.

NOTE: Exposure to RB51 (vaccine strain of *B. abortus*) does not induce a measurable antibody response. Monitoring serum specimens in those exposed to RB51 will not provide a useful indicator of infection.

- Arrange for regular active surveillance for the development of febrile illness (for 4 weeks) or other signs and symptoms of brucellosis (for 6 months).

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Assessing Laboratory Risk Level and PEP

Risk Level = High

Persons at Risk	Exposure Activities	PEP Recommendations	Follow up/Monitoring
Person performing activity and any person within a 5 ft. radius	<ul style="list-style-type: none"> • Work with a <i>Brucella</i> isolate • Sniffed or opened culture plate • Mouth pipetted specimen material • Worked in Class II biosafety cabinet or on open bench without using BSL-3 precautions 	<ul style="list-style-type: none"> • Doxycycline 100mg twice daily and rifampin 600mg once daily for 3 weeks • TMP-SMZ should be considered for patients with contraindications to doxycycline • Persons with contraindications to rifampin should consult with their HCP 	<ul style="list-style-type: none"> • Sequential serologic testing at 0, 6, 12, 18 and 24 weeks post exposure • Symptom watch (e.g. weekly) and daily self-fever check for 24 weeks • No serological monitoring available for RB51 and <i>B. canis</i> exposures
All persons present in lab room	Occurrence of widespread aerosol generating procedures*	<ul style="list-style-type: none"> • Pregnant women should consult with obstetrician 	

Risk Level = Low

Persons at Risk	Exposure Activities	PEP Recommendations	Follow up/Monitoring
All persons present in laboratory room at distance greater than 5 ft. from activity	Present in the lab at the time of manipulation of <i>Brucella</i> isolate on an open bench, but who do not have high risk exposures as defined above	<ul style="list-style-type: none"> • Discuss with HCP • May consider if immunocompromised or pregnant 	<ul style="list-style-type: none"> • Sequential serologic testing at 0, 6, 12, 18 and 24 weeks post exposure • Symptom watch (e.g. weekly) and daily self-fever check for 24 weeks • No serological monitoring available for RB51 and <i>B. canis</i> exposures

Risk Level = None

Persons at Risk	Exposure Activities	PEP Recommendations	Follow up/Monitoring
None	Handling and testing of <i>Brucella</i> isolate in a Class II biosafety cabinet using BSL-3 precautions	None	N/A

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Recommendations for Lab Exposure Surveillance

1. Determine number of workers exposed to *Brucella* isolates and classify exposures into high- and low-risk (using above chart)
2. For high-risk exposures, recommend PEP:
 - doxycycline 100mg twice daily and rifampin 600mg once daily for 3 weeks
 - trimethoprim-sulfamethoxazole should be considered for those patients with contraindications to doxycycline
 - pregnant workers with high-risk exposures should consider PEP in consultation with their obstetricians
 - persons with contraindications to rifampin should consult with their health care provider for alternative PEP
3. For low-risk exposures, consider PEP and discuss with affected workers
4. Obtain baseline serum samples from all workers as soon as possible after a potential *Brucella* exposure is recognized. If available, obtain pre-exposure stored specimens.
5. Arrange for sequential serologic testing on all workers exposed to *Brucella* (e.g. 0, 6, 12, 18 and 24 weeks post exposure) using agglutination tests at state public health laboratory or CDC.
6. Arrange for regular (e.g. weekly) symptom watch and daily self-fever checks for persons with high- and low-risk exposures for 6 months following last exposure.

*Widespread aerosol generating procedures include, but are not limited to:

- centrifuging without sealed carriers
- vortexing
- sonicating
- accidents resulting in spillage or splashes (i.e. breakage of tube containing specimen).

Other manipulations may require further investigation. These may include:

- automated pipetting of a suspension containing the organism
- grinding the specimen
- blending the specimen
- shaking the specimen
- other procedures for suspension in liquid to produce standard concentration for identification (i.e. inclusion of steps that could be considered major aerosol generating activities).