az2136

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Science Creates Real Understanding of Biosecurity

SCRUB Mini Kit Instructor Guide

Elizabeth A. Greene and Deborah LH Reed

Introduction

This SCRUB Mini Kit Instructor Guide was created as a part of a Mini Kit which adapted and expanded 3 activities from the original SCRUB: Science Creates Real Understanding of Biosecurity curriculum developed through a collaboration between Dr. Betsy Greene, University of Arizona, and Dr. Kris Hiney, Oklahoma State University.

This new variation combines existing activities with new scenarios related to emerging livestock diseases in the United States including two disease scenario examples involving the ongoing issues related to High Path Avian Influenza (HPAI) in both cattle and poultry operations. The full curriculum is available for any species of interest (livestock, small stock, horses, etc.). To access the full SCRUB curriculum go to https://extension.arizona.edu/SCRUB.

Additionally, the Mini Kit contains almost everything needed to conduct three of the most popular and easy-to-do activities from the original curriculum, for up to 10 participants, or teams (SCRUB Mini Kit Contents, page 12). All materials/items, directions, activities, and a copy of any hand outs are self-contained in a small, portable, zippered lunch style bag. This gives instructors an opportunity to try out activities from the larger complete curriculum.

SCRUB Lesson: Direct and Indirect Disease Transfer

Educator Steps

1. Review Direct and Indirect Disease Transfer introduction and goals and learning objectives
2. Complete A: Dairy Disease Investigation - Part 1
3. Conduct SCRUB Activity 1: Disease Transfer Lab
4. Complete A: Dairy Disease Investigation - Part 2

Significant diseases that impact animal agriculture can often spread quickly, with no visible signs. Animals can be exposed through both direct (nose to nose, skin contact, etc.) and indirect contact (shared grooming tools or tack, contaminated water buckets, etc.). Often the humans will not realize their animal has been exposed until several days later after the disease has gone through the incubation time period. By this time, the animal may have returned home and infected other healthy animals if precautions are not taken. Veterinarians and animal health officials may need to backtrack to find the animal of origin. This activity will explore the dynamics of disease transmission, and how a highly contagious disease can spread quickly.

Key Concepts

Disease: a condition of the living animal or plant body or of one of its parts that impairs normal functioning and is typically manifested by distinguishing signs and symptoms

Disease transmission: the process by which an infectious agent or pathogen moves from an infected individual or source to a susceptible host. This transfer can happen through various routes, including direct contact, indirect contact, and even through vectors like insects.

Zoonotic disease: an infectious disease that can be transmitted between animals and humans. These diseases can be caused by various pathogens like viruses, bacteria, parasites, and fungi.

Impact of disease on society: encompasses the broad consequences of illness, affecting individuals, families, and communities. This includes not only the immediate health impact on humans and/or animals but also the long-term effects on social structures, economic productivity, and overall well-being.

Pathogen: disease causing organism, such as a virus, bacteria, protozoa, or fungus.

Vector: an organism that carries pathogens from one animal to another (e.g., biting flies, mosquitos, ticks, rabid animals, etc.).

Vaccine: a substance used to stimulate immunity to a particular infectious disease or pathogen

Acknowledgments

This work was adapted and expanded from portions of University of Arizona Cooperative Extension publication az2043-2023 Science Creates Real Understanding of Biosecurity Curriculum. https://extension.arizona.edu/SCRUB.

Goals & Learning Objectives

Your goal is to help participants understand what a disease is, how it can be transmitted, and why we should be concerned with them. Using the example disease scenario:

1. Define the disease characteristics, disease type, and how transmission occurs.
2. Compare transmission of the disease between animal species and/or people.
3. Analyze animal susceptibility to the disease and how to minimize risk.
4. Recommend animal biosecurity measures to limit spread of the disease.
5. Discuss how this disease impacts society and it's economic implications.

A: Dairy Disease Investigation - Part 1

Instructors should initiate the exercise by going through the dairy disease scenario provided in A: Dairy Disease Investigation. Other scenarios can be created to be more directly applicable to the animals with which the students are working (if any) from the examples provided in Appendix B of the full SCRUB curriculum which can be accessed at https://extension.arizona.edu/SCRUB.

Beginning the Investigation

Provide students with the information from the A: Dairy Disease Investigation Part 1 Student Handout 1 on page 13. This can be done verbally or printed and handed out. Have a conversation about what they know from the information provided and what questions they have. "Answers in text" or in next section which continues the investigation and provides more information.

Guide students through finding a differential diagnosis using the table in the handout. Three possible diseases have been filled in with two blank columns to add diseases as more information is uncovered. List symptoms identified from the provided scenario in the first column (the first two are filled in to get students started). Indicate whether the symptom is seen in the listed diseases to narrow down a potential diagnosis.

Proceed to SCRUB Activity 1: Disease Transfer Lab to learn more about disease transfer and transmission.

SCRUB Activity 1: Disease Transfer Lab

Activity Objective

To help students understand the ease of which an infected animal (with no visible signs) can transfer diseases to other animals with minimal contact or effort. In this case, the students can "become" the animals mingling together and unknowingly sharing "disease" with their peers. After they (their cups) get tested, then they can learn how to trace back to identify the original diseased animals based on common contacts.

Total Time	Preparation: 30 minutes	Difficulty Level	Suggested Group Size
Approximately 45 minutes	**Active:** 15 minutes **Wait:** 0 minutes	Easy	10 individuals or teams

Materials

Teacher
Items Included in Mini Kit

- 2 spoons for preparation
- 1 oz packet Povidone/Iodine solution
- Cornstarch
- Powered Milk
- Trash Bag for clean up

Additional Items Needed

- Water
- Scissors to open Povidone/Iodine packet
- Paper towels for clean up
- Dry erase board and markers or paper and pen to record which students shared cup material.

Students
Items Included in Mini Kit

- 10 small cups (5 oz) (1 per student or team)
- 10 stirrer/popsicle sticks (1 per cup)

Activity Links

WiscOnline Learning Module 1 – What is Biosecurity?

- https://www.wisc-online.com/courses/1207/biosecurities/modules/what-is-biosecurity

WiscOnline Learning Module 2 – Biosecurity: Routes of Infection and Means of Transportation

- https://www.wisc-online.com/courses/1208/biosecurities/modules/biosecurity-routes-of-infection-and-means-of

Disease transmission workshop overview for instructor

- https://youtu.be/lRVjlMHp5pc

SCAN ME

Scan the QR code or go to https://extension.arizona.edu/SCRUBmini to access the pdf version of the guide with clickable links.

Setup/Preparation – approximately 30 minutes

1. Instructor prepares cups prior to experiment.
2. Add 3 heaping spoonfuls of powdered milk to each "healthy" cup.
3. To the "sick" cup, add 2 heaping spoonfuls of cornstarch and 1 heaping spoonful of powdered milk.
4. Make the "healthy" cups with only the powdered milk first then the "sick" cups with the powdered milk and cornstarch to prevent cross contamination. **Be sure to not use the same spoon/stirrer for dispensing and mixing the "sick" and "healthy" cups.**
5. Use a ratio of about 1 cup with cornstarch per 10 students (ie. 1 "sick" cup and 9 "healthy" cups).
6. Discreetly mark the sick cups with a small mark on the bottom of the cup next to the seam.
7. Add 40 ml of water (about 3 Tablespoons or 1/3 of a dixie cup) to each cup. Be sure to fill no more than half the cup or contents will spill during the activity. Mix cup contents with the provided spoons. **Mix the powdered milk cups first, then the corn starch cups to avoid cross contamination.**
8. Stir each cup well to disguise any differences from the students.

Instructor Notes

1. Consider the area the activity will be conducted in, iodine will stain carpets, clothing, etc. if spilled
2. Make sure to explain the rules before passing out the cups.
3. If you are conducting this activity with a multi-age audience, you may want to have older youth pair with a younger one as the "animal" and "handler" to help with or decrease spillage possibilities.

Initial Engagement Questions

1. When you take your animal to a fair/show, what are concerns that you may have regarding your animal's health?
   Possible answers: direct or indirect exposure to sick animals, e.g. nose to nose vs contaminated shared water/tools/equipment, respectively
2. What are some signs that you might see in a sick animal?
   Possible answers: use visual/visible rather than "measurable" cues, such as animal not eating, snotty nose, lethargic, away from herd, etc., as opposed to high temperature.
3. How would you prevent your animal from coming into contact with any sick animals?
   Possible answers: no shared tools, water sources, equipment, no nose to nose contact, separation between your stalls/pens and others, etc.
4. What are some other situations/scenarios where you might be concerned about a healthy animal getting exposed to sick animals?
   Possible answers: sales animals sharing pens, bringing a new animal home to your healthy animals, shared water troughs, etc.

Disease Transfer Activity Introduction

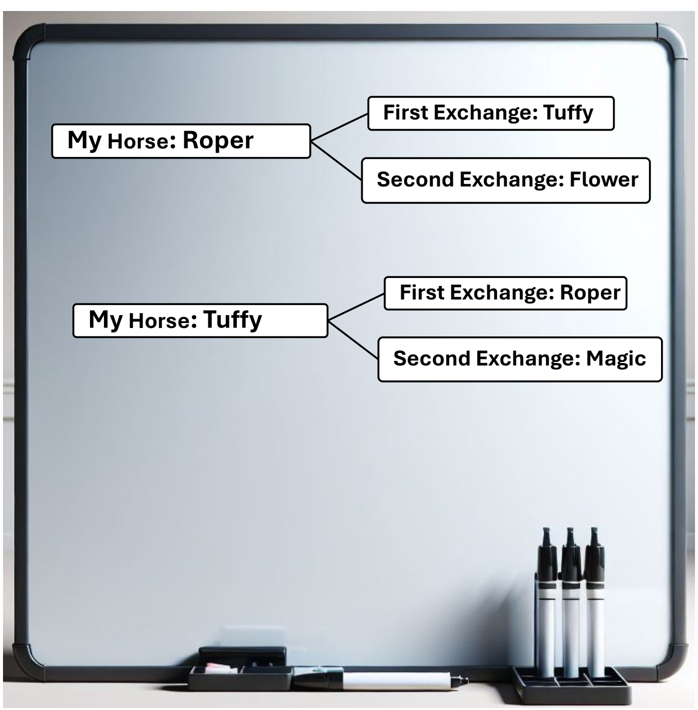
Present the scenario of your choice to the students, and explain that as the animals, they are going to mingle (in the pen, at the gate, etc.) with two different "animals" during the activity. Clearly present the ground rules (how students will record who they mingle with, how to "exchange fluids", no drinking out of cup, no changing cups, etc.). Note: The student as an animal scenario is used to decrease the possibility of students picking on an individual (he/she is contaminated).

Activity 1 Steps - approximately 15 minutes

1. Each student receives one cup with the "milk" powder solution. Be sure to inform students not to drink the contents of their cups. Have students name their cups either using their name or a chosen animal name and write it on their cup. This can be done ahead of time by the instructor prior to filling the cups if it is anticipated that participants will not be able to do this without spilling the contents of their cups.
2. Students will then exchange "bodily fluids" (e.g. shared water troughs, nose to nose, shared equipment, etc.) with another student in the classroom and record the "giver" and "receiver" on a chart or in their notebook. To do this, one student will pour all the contents of their cup into the other student's cup, pour back and forth between the two cups three times, and then split in half between the cups. Be sure the original cups ("animals") stay with their owners.

Example Worksheet/Whiteboard

	Student Name (Giver)	First Round Receiver	Second Round Receiver
1			
2			
3			
4			



Figures 1 (top) & 2 (bottom): Suggested options for recording student exchanges in the Disease Transfer Activity..

Deduction by Reduction

To find patient zero pick an animal to start (e.g. Roper from the white board in figure 2).

- If Roper and Tuffy are both sick (purple), one or the other (or both) was definitely sick when they exchanged fluids.
- If Tuffy is not sick, and Roper is, then Flower must have infected Roper, because if Roper were sick, Tuffy would have been infected on the first fluid exchange.
- Flower could have been healthy to begin with, but mixed with another sick horse before mixing with Roper.

Work through the horses to get down to one or two potential patient zero choices. If you get stuck, and can't go any further (all remaining animals are sick), you can "perform a second test" (look under the cups for the original sick cup mark).

Note: If the participants don't move around the room and exchange fluids from different places, you are more likely to end up with a pocket of sick animals and it will be harder to deduce patient one.

3. Have students record the name of each cup they exchanged fluids with and the order (i.e. first exchange, second exchange).
4. Repeat for 2 rounds, with students keeping an "individual" record of exposures, then recording them on a shared group worksheet or white board (examples on page 4).
5. Be sure to direct students to mix cups with students in different parts of the room. This will help ensure that there is more chance of exposure of the sick animal around the class in order to get a broad spread.
6. Encourage the youth to be silent and not to guess about the contents of the cups. And, do not tell them there are different cups.
7. Make sure that each student has exchanged cup contents with at least one other person.

Diagnosis

8. Test for the presence of the ill "animal" (student). Do not tell the participants which color means "sick" until after all cups have been evaluated and color groups are separated.
9. The instructor will drop 8 drops or so of iodine solution in each cup and give a stirrer (popsicle stick) to each student or team. The student will stir immediately while the instructor is there, so they can identify (with the student's help) if the cup is yellow or purple. Evaluate immediately, because the colors will fade with time.
10. Do not let students share popsicle sticks.
11. If the "animal" is infected, the color will be a murky purple. Have the yellow cup participants move to one side of the room and the purple cups go to the other side (or sets of desks/tables).
12. If they are not "infected" the iodine solution tends to stay on top or when mixed will just briefly be a bit yellowish/orange.

Finding the Infected Patient

13. Using the charts and sharing cup recipients infected students, try to trace back to the original "sick" animal(s). See blue Deduction by Reduction box on page 4.
14. Have the students look at the worksheets and the names of students infected to identify patient zero. Circle any name of students/animals who are healthy, or whose cup did not change color as you go.
15. From the infected group, then eliminate any individual who first encountered a healthy animal who is STILL healthy. If they had been patient zero, that individual would have also come up as sick.
16. Once narrowed down to the final one or more patient zeros check the bottom of the cups for the mark applied earlier to confirm results.

Discussion Questions

1. Can we identify the initial infected students? What evidence do you have?
2. Would the disease transfer rate be different depending on the virulence or how contagious the disease is?
   - Tips: You may want to talk about how cornstarch was diluted, but bacteria/viruses would instead replicate and keep going.
3. What if we had vaccinated some of the cups? When might vaccination fail?
4. In this lab, we mimicked the exchange of bodily fluids. What if the disease was transmitted in a different manner?
5. What other ways are diseased transmitted?
6. How could we prevent this disease outbreak in our scenario?
7. How could we have limited or prevented its spread?
8. What animals would be more susceptible to contracting the disease? How would you minimize their risk?
9. Think about what animal biosecurity measures we could put in place to limit disease spread via direct transmission of bodily fluids, etc.

A: Dairy Disease Investigation - Part 2

Continuing the Investigation

Now let's go back to A: Dairy Disease Investigation. Verbally provide students with the new information from March 25 and April 1 on A: Disease Investigation - Part 2 Student Handout 2 (page 15). Share or provide a copy of the disease Highly Pathogenic Avian Influenza (HPAI) in Dairies BOLO on page 14. Ask them what this new information adds to their knowledge base and what questions they have.

Have students add this information to the differential diagnosis table they started. What do they think is the most likely diagnosis?

Dairy Highly Pathogenic Avian Influenza (HPAI)

Share or provide a copy of the student handout information and infographics for the A: Dairy Disease Scenario - Part 2 (pages 15 and 16) to assist with answering the following questions.

Investigation Summary

1. What was the main mode of disease transmission? Could there have been others? Were they the same for all species?
2. Could we have prevented this disease outbreak? How?
3. Could we have limited or prevented its spread? How?
4. What animals would be more susceptible to contracting the disease? How would you minimize their risk?

Additional Resources

USDA - APHIS - Highly Pathogenic Avian Influenza Emergency Response

- https://www.aphis.usda.gov/animal-emergencies/hpai

US Centers for Disease Control and Prevention - H5 Bird Flu: Current Situation

- https://www.cdc.gov/bird-flu/situation-summary/index.html

SCRUB Lesson: Cleaning and Disinfecting

Educator Steps

1. Review Cleaning and Disinfecting introduction and goals and learning objectives
2. Complete B: Poultry Disease Investigation - Part 1
3. Conduct SCRUB Activity 2: Effective Handwashing
4. Conduct SCRUB Activity 3: Facility Sanitation Challenge
5. Complete B: Poultry Disease Investigation - Part 2

Proper hygiene and sanitation are keys to reducing the spread of animal diseases and human diseases as well. Proper sanitation involves not only washing to remove the visible dirt but also proper use of both detergents and disinfectants. The facilities which house animals and the materials of which they are constructed may make these tasks more difficult.

In these activities, students will explore their ability to scrub away the hidden germs on themselves through handwashing (in activity 2) as well as on materials used to build animal enclosures (in activity 3).

Goals & Learning Objectives

At the end of this activity, participants should be ready to do the following:

1. Explain what "animal biosecurity" is to friends or family members.
2. Emphasize the importance of proper cleaning techniques to limit disease spread.
3. Differentiate between surfaces/objects in animal environments which can harbor disease most easily and compare their ease in cleaning.
4. Identify the most effective cleaning and disinfecting methods used to limit disease spread.

B: Poultry Disease Investigation - Part 1

Setting the Scene

You have three chicken barns on your property. This morning you found two deceased hens and four hens with respiratory symptoms, including coughing and difficulty breathing. The deceased and sick chickens are all from the same barn.

Beginning the Investigation

Provide students with the information from the above setting the scene and share or provide a copy of the Poultry Disease: Avian Flu BOLO (page 17). Have a conversation about what they know from the information provided and what questions they have.

Proceed to SCRUB Activity 2 and 3 to learn more about cleaning and disinfecting.

SCRUB Activity 2: Effective Hand Washing

Activity Objective

Participants will experience and evaluate their hand washing effectiveness and compare and understand methods of hand washing practices with World Health Organization (WHO) guidelines.

Total Time	Preparation: 5 minutes	Difficulty Level	Suggested Group Size
Approximately 30 minutes	Active: 25 minutes Wait: 0 minutes	Easy	10 individuals

Materials

Items to Purchase or Included in Kit

- 1oz Glo Germ™ lotion
- 1 stirrer/popsicle stick for dispensing lotion
- 1 bar of soap
- 1 UV light
- 3 AAA batteries

Additional Items Needed

- Access to a sink
- Access to a darkened area (to see UV light)

Key Concepts

Biosecurity: the ability to reduce or eliminate the spread of disease through proactive management practices.

Fomite: inanimate object that can transfer pathogens from one animal to another. (e.g., boots or a shirt worn to multiple stables, shared brush used on a horse with ringworm).

Cleaning: removing dirt, organic matter, and germs from surfaces or objects. When you clean, you will likely use soap (or detergent) and water to physically clean off the surfaces and objects. This may not necessarily kill the germs. But since you removed some of them, there are fewer germs that could spread infection.

Disinfecting: uses chemicals (disinfectants) to kill germs on surfaces and objects. Some common disinfectants are bleach and alcohol solutions. You usually need to leave the disinfectant on the surfaces and objects for a certain period of time to kill the germs. Disinfecting does not necessarily clean dirty surfaces or remove germs.

Sanitizing: could be done by either cleaning, disinfecting, or both. Sanitizing means that you are lowering the number of germs to a safe level. What is considered a safe level depends on public health standards or the requirements for a specific activity or location. What you do to sanitize will vary, depending on your needs.

Video Links

Effective Hand Washing Activity Overview Video for Instructors

- https://youtu.be/w0DQosKdsR4

How to hand wash? With soap and water

- https://youtu.be/3PmVJQUCm4E

Setup/Preparation – Approximately 5 minutes

1. Day Prior: Be sure to warn students to wear appropriate clothing (i.e., easily washable) due to the use of Glo Germ™. Gather materials.

Initial Engagement Questions

1. Do you think you wash your hands properly?
2. Can you guess what parts of your hands you may miss when you wash?
3. Do you think you contaminate any other surfaces when you wash your hands?
4. Does shaking hands have the potential to transmit disease? Why or why not?

Hand Washing Activity Introduction

Students will visualize the degree of contamination through physical contact as well as the need for thorough hand washing. This can be structured in multiple ways depending on class size and set-up.

Activity 2 Steps - approximately 20 minutes

1. Apply a pea size drop of Glo Germ™ oil to students' hands or have them shake hands/handle something with Glo Germ™ oil on it.
2. Send students to wash their hands. Ask them to wash them as they normally would.
3. A classroom with sinks is ideal or access to restrooms is needed.
4. Student can dry their hands with driers (preferred) or rags. Paper towels can be used if no other options are available just note that lint from the paper towels can glow under UV light and result in a false positive.
5. Examine students' hands with UV light in a darkened room/space to determine how effective they were at handwashing.
6. Now watch the WHO hand washing video (see link on page 7).
7. Have students re-wash their hands using the technique discussed in the video.
8. Check their hands again with the UV light.
9. Now examine all surfaces they may have encountered during the process (e.g., doorknobs and counter tops) with the UV light. See how "disease" contamination can easily be spread.

Instructor Notes

Warning for teachers: The more the students touch, the more you will have to clean at the end of the class period, and they may smear "disease" on each other. The Glo Germ™ oil is washable with an oil-based product. It is important to advise students in advance to wear washable clothing the day of this activity.

Instructor Options

In activity step 1, introduce a new person to have students shake hands with, then announce later they are sick. "Oh, by the way, so-and-so isn't feeling well and may have a cold."

<u>Other options</u> can include some variation of placing the "disease" (Glo Germ™) on door handles or other commonly handled/shared equipment. Then set up the scenario explaining that one person has informed you that they have a sick horse/sheep/cow at home. Engage the students in a discussion and have them help identify the disease with signs. Ask if they should be worried about their own animals and "expose" the contamination on fomites and their hands.

Discussion Questions

1. How effective was your initial hand washing? Where did "germs" still reside on your hands?
2. Did you contaminate any other surfaces?
3. How clean were your hands after following the procedure shown in the video?
4. What specifically did you do differently from the first time you washed your hands?
5. What could you do to limit disease spread through contact?
6. When working with animals, when would it be important to follow these hand washing recommendations?

SCRUB Activity 3: Facility Sanitation Challenge

Activity Objective

Through this activity, participants will compare the ease (or not) and completeness of removal of contamination from various materials. Participants will relate their findings to the sanitation of various surfaces in facilities holding animals from multiple farms.

Total Time	Preparation: 20 minutes	Difficulty Level	Suggested Group Size
Approximately 40 minutes	Active: 20 minutes Wait: 0 minutes	Intermediate	2 groups of five

Materials

Teacher
Included in Mini Kit

- Potting soil mixed with powdered Glo-Germ™
- 1 spoon (to mix soil and glo-germ powder
- 1 UV light (from SCRUB Activity 2: Handwashing)

Additional Items Needed

- Water
- Paper Towels (for clean up, do not use on items that will be viewed with black light)

Students (divide between 2 groups)

Included in Mini Kit

- 2 small bar/chunk of Soap
- 1 plastic backed tablecloths
- 6 disposable bowls (cleaning vessels)
- 2 foam pieces (e.g. playroom flooring) simulating rubber mat flooring
- 2 flexible plastic cutting board mat simulating glass or plexiglass windows
- 2 linoleum pieces simulating flooring in human areas of barn
- 6 small scrub brushes (fingernail brushes)

Additional Items Needed (for each group)

- 1 gallon of water (helps them think critically and plan their methods when resource is limited)

Video Link

Facility Sanitation Challenges Activity Overview for Instructors

- https://youtu.be/GSi7OzNHRy4

Setup/Preparation – approximately 20 minutes (complete before students arrive)

1. Mix 2 tablespoons or more of water with soil/glo germ in container provided. The consistency should be slightly firm, but water should come out if squeezed. Add more water if needed.
2. This soil represents “manure” filled with Glo Germ™ representing the bacteria/virus.
3. Apply “manure” to one side of each material (rubber mat, linoleum, and plastic), so the manure covers about ¼ of the surface. Once applied, press down on the “infected soil” to ensure water runs out and spreads on the surface of the material. There should not be any large clumps of material only watery soil residue. These materials represent “barn” or “facility” surfaces that have been contaminated.
4. Allowing materials to dry should not affect the activity. However, conducting the activity while “manure” is still wet is recommended.

Initial Engagement Questions

1. What type of animal facilities/objects do you interact with which would need to be cleaned and disinfected?
2. What kind of facilities did you have at shows/auctions you've attended?
3. What materials were the stalls and animal holding facilities constructed of?
4. Have you ever cleaned a facility before use?
5. If you have animals, what materials were used to construct your housing systems/facilities?

Facility Sanitation Challenges Activity Introduction

In this activity you will work together in a team to achieve the objective of getting a clean barn!

NOTE: Decide ahead of time if you will run the activity with students competing as teams to get awarded a "sanitation contract" or competing as relay teams to fully clean their barns. (See instructor options below.)

Possible Examples

1. You have had an outbreak of _____________ (instructor's choice from list provided in Appendix B of the full SCRUB curriculum which can be accessed at https://extension.arizona.edu/SCRUB) and now must thoroughly clean all surfaces before healthy animals can move back in.
2. A new horse arrives on the premises and within 24 hours develops a fever and snotty nose.
3. Create your own scenario using animal/disease of interest to students.

Activity 3 Steps - approximately 20 minutes

1. Divide students into groups of five. Provide each group with three different "facility" or "barn" materials with "manure" on them, 3 small brushes, 1 bar of soap, 3 bowls for cleaning, and up to 1 gallon of water.
2. The goal will be for the students to clean each surface, with all group members participating, have them determine a plan for cleaning before they begin.
3. Allow students to come up with their own strategies, including how to clean and in what order.
   - Or: Have a team of students work up a procedure to clean all the items without "re-contamination" of the items (e.g. order of brushes, clean/dirty hands/water/brushes, etc.).
4. Do not allow materials to be dried with paper towels. Paper towel lint can glow under UV light. Kimwipes™ do not. You wouldn't dry a barn, so air drying is recommended.
5. Once the students determine cleaning is complete the instructor should go over the materials with the uv blue light to expose the Glo Germ ("bacteria or virus") that is still present even if they cleaned well.
6. As you check their "barn surfaces" with the blue light, also run it quickly over the student's tools/bowls and hands to see how far the "disease" was spread during cleaning.
7. Begin discussions on clean vs. disinfected, and the fact that the bacteria/virus is not visible and may remain regardless of "cleaning" process.
8. After the blue light, have students describe their thought process and the resulting procedure they created to clean their facilities, and if it was effective, and/or what they would change next time.

Instructor Options

1. Sanitation Contract
   - Students compete as teams to get awarded a "sanitation contract".
   - The team with the cleanest surfaces wins.
   - Measure "cleanness" with UV light at end or throughout (instructor's choice). Items are deemed clean when the UV light reveals no remaining Glo Germ™.
2. Relay Teams

- Students compete in relay teams to fully clean their barns.
- One surface must be "clean" before the next individual can start cleaning the next surface. Items are deemed clean when the UV light reveals no remaining Glo Germ™.
- The first team to completely clean their "barn" and have no evidence of germs/manure (Glo Germ™ powder) is the winner.

3. Teamwork Effort
   - Each team plans a method to clean the assigned items given the tools that they have. All students must have an identified role in this process. Determine which team did the most through job on their items.

Discussion Questions

1. Was it better to clean materials quickly or thoroughly? What was the impact on the number of pathogens remaining?
2. What material was easiest to clean? Why?
3. Which materials would you recommend for use in your home facilities? Why?
4. What materials would you recommend for show facilities?
5. What would you do if your animal had to be housed in a facility with evidence of organic matter?

B: Poultry Disease Investigation - Part 2

Continuing the Investigation

Following the completion of SCRUB activities 2 and 3, resume the discussion on B: Poultry Disease Investigation - Part 2 by verbally providing students with the new information from the flock veterinarian on B: Poultry Disease Investigation - Part 2 Student Handout on page 18. Ask them what they have learned from this new information and what questions they have.

Now provide share B: Poultry Disease Investigation - Part 2 Student Handout 1 - pages 1 and 2 to help with answering the following questions.

Key Points and Discussion Items

- What types of cleaning, disinfecting, and biosecurity measures could you implement to keep the disease from spreading to your other hen houses?
- Are there any other measures that could be taken to protect the healthy birds?
- What does depopulation mean? Why is it required?
- What are the economic impacts of depopulation? Discuss initial loss of birds and egg production then costs for depopulation, disposal, decontamination, time line for repopulation, etc.

Real World Case for Further Discussion

Arizona Producer loses 95% of chickens (6 million birds) to High Path Avian Influenza

- https://www.kold.com/2025/05/30/hickmans-family-farms-loses-95-arizona-chickens-bird-flu/

Additional Resources

USDA's Five-Pronged Approach To Address Avian Influenza

- https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-poultry

USDA - APHIS Depopulation Policy

- https://www.aphis.usda.gov/sites/default/files/depopulationpolicy.pdf

Arizona Livestock Incident Response Team

The Arizona Livestock Incident Response Team (ALIRT) is a team of large animal/livestock, private practice veterinarians, extension specialists and agents, and livestock officers that work with the Arizona Department of Agriculture and other state animal/ag agencies to respond to unexpected and/or unusual livestock losses. The program is a valuable resource to livestock producers by improving diagnosis and response in these events. Early diagnosis reduces individual producer loss and helps protect the livestock around the state by containing a potential issue before it becomes a problem. The program has been adopted in several other states including New Mexico.

More on ALIRT: https://extension.arizona.edu/alirt

ALIRT ARIZONA LIVESTOCK INCIDENT RESPONSE TEAM

SCRUB Mini Kit Contents

This information sheet provides a list of what is included in the SCRUB Mini Kit and a guideline for any additional materials needed for each of the modules and activities. Mini Kit contains materials for a group of 10 students.

1 SCRUB Mini Kit Instructor Guide

Direct and Indirect Disease Transfer

Activity 1: Disease Transfer Lab

Teacher
Included in Mini Kit

- 2 spoons for preparation
- 1 oz packet Povidone/Iodine solution
- Cornstarch
- Powered Milk
- Trash Bag for clean up

Additional Items Needed

- Water
- Scissors to open Povidone/Iodine packet
- Paper towels for clean up
- Dry erase board and markers or paper and pen to record which students shared cup material.

Students
Included in Mini Kit

- 10 small cups (5 oz) (1 per student or team)
- 10 stirrer/popsicle sticks (1 per cup)

Cleaning and Disinfecting

Activity 2: Handwashing

Included in Mini Kit

- 1oz Glo Germ™ lotion
- 1 stirrer/popsicle stick for dispensing lotion
- 1 bar of soap
- 1 UV light with 3 AAA batteries

Additional Items Needed

- Access to a sink
- Access to a darkened area (to see UV light)

Activity 3: Facility Challenge

Teacher
Included in Mini Kit

- Potting soil mixed with powdered Glo-Germ™
- 1 spoon (to mix soil and glo-germ powder
- 1 UV light (from Module 2-Activity A: Handwashing)

Additional Items Needed

- Water
- Paper Towels (for clean up, do not use on items that will be viewed with black light)

Students (divide between 2 groups)

Included in Mini Kit

- 2 small bar/chunk of Soap
- 1 plastic backed tablecloths
- 6 disposable bowls (cleaning vessels)
- 2 foam pieces (e.g. playroom flooring) simulating rubber mat flooring
- 2 flexible plastic cutting board mat simulating glass or plexiglass windows
- 2 linoleum pieces simulating flooring in human areas of barn
- 6 small scrub brushes (fingernail brushes)

Additional Items Needed (for each group)

- 1 gallon of water (helps them think critically and plan their methods when resource is limited)

A: Dairy Disease Investigation - Part 1

Student Handout 1 - page 1 of 1

Early March, 2024

You are the manager of a dairy farm with three barns in southeast Arizona. In the last week you have noticed an abrupt drop in milk production at one of your locations. Upon further investigation you learn that some of the cows have fevers and/or changes in feces but it's not consistent across all the affected cows. You reach out to your herd veterinarian for a farm call and they are scheduled to come out tomorrow to assess what might be going on.

March 19, 2024

Your herd veterinarian has done an evaluation of the herd and taken samples from the affected cows. They have reached out to some of their veterinary colleagues to see if any other barns are experiencing similar issues. To add to your management issues, one of your workers has called out with pink eye, which has left you short handed.

March 21, 2024

Your veterinarian forwards you an email from the Arizona State Veterinarian relaying a developing "Milk Drop" Syndrome situation that may relate to what your cows have been experiencing. You are down another worker who has called in sick with respiratory issues and to top it all off, two of your barn cats have died in the last day.

From the Arizona State Veterinarian

". . . a cluster of dairies in the Texas panhandle that were experiencing an abrupt drop in milk production in mature cows, often mid-lactation with animals displaying varying degrees of fever, scant dry or diarrhea-like feces, and pseudomastitic changes to the milk such that it assumes a colostrum-like consistency. Anywhere from 2%-10% of milking cows seem to be affected but interestingly enough, calves and heifers on the same affected farms, do not seem to be susceptible. Thus far, TAHC has been working diligently with producers, the Texas Veterinary Diagnostic Lab (TVDL) and the veterinary consultants servicing these dairies to try and solidify both a case-definition for affected animals and to identify the root cause. As of earlier this week, there were reports of some similar cases affecting some New Mexico dairies adjacent the Texas panhandle and potentially some others in Kansas. It appears some of the affected dairies may be under common ownership or management."

Differential Diagnosis Table

Symptom	Mastitis	Brucellosis	Foot and mouth		
Reduced milk production					
Fever					

Example Animal Diseases

Brucellosis: Bacterial infection. Animal - Cattle, horses, swine, sheep, goats. Symptoms - abortion, less milk production, lower fertility, retained afterbirth, weak calves. Transmission route - direct contact; contaminated environment, urine, milk, blood, semen, or birth tissues and fluids. Zoonotic - Yes.

Foot and Mouth: Viral infection. Animal - cattle, swine, sheep, goats. Symptoms - fever, excessive salivation, lameness, blisters, loss of appetite, abortions, low milk. Transmission route - Infected saliva, urine, excrement, and even breathing; contaminated feed, water, and environment production, possibly death. Zoonotic - No.

Mastitis: Bacterial infection of the mammary gland. Animal - any mammal with mammary glands, most often seen in lactating females. Symptoms - swelling, redness, and warmth in udder, changes in milk appearance, decreased milk yield, fever, lethargy, and decreased appetite. Zoonotic - Not directly transmitted but can bacteria can be transmitted through raw milk or meat of infected animals.

AZ ALIRT BOLO

AZ2085

April 2024

Highly Pathogenic Avian Influenza (HPAI)

Location: Idaho, Kansas, New Mexico, Michigan, Texas (follow this link for the most recent updates from USDA https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/livestock)

Name: Highly Pathogenic Avian Influenza (HPAI)

Type: Virus

Affected Livestock: Dairy Cattle

Transmission: Highly Pathogenic Avian Influenza, or avian flu or bird flu, is a disease caused by infection with avian Type A viruses. This virus spreads naturally among wild aquatic birds via the fecal-oral route, but it can infect other birds, such as poultry and other animals. While HPAI can infect humans via direct contact (e.g., touching eyes, mouth, etc., with contaminated hands) and/or the respiratory route, it is rare. The transmission route is from a wild or domestic bird that may or may not have clinical signs to other birds and dairy cows nearby. Cow-to-cow spread is possible, but the specific transmission methods have not yet been determined. As of April 1, 2024, APHIS confirmed HPAI in dairy herds in Texas, New Mexico, Michigan, Idaho, and New Mexico, and the CDC confirmed HPAI in one dairy farm worker.

Clinical Signs in Dairy Cows: Clinical signs that have been seen include a drop in milk production, thickened or colostrum-like milk, appetite loss, manure inconsistencies, or a low-grade fever. Cows that are infected typically display symptoms for a period ranging from 7 to 10 days before experiencing a recovery. Approximately 10% of afflicted cows do not fully recuperate and fail to return to their previous levels of milk production, particularly those exhibiting the most severe symptoms. Moreover, those with severe symptoms can contract secondary infections like mastitis, pneumonia, or salmonellosis. Most infected have been multiparous, with signs occurring after early lactation.

Diagnosis: Producers working with their herd veterinarian and State Animal Health Officials and/or ALIRT veterinarians will collect a series of samples including nasal swabs and milk samples from all 4 quarters of symptomatic and asymptomatic dairy cows on a premises under investigation. These samples will be analyzed at both the National Animal Health Laboratory Network (NAHLN) lab in-state (Arizona Veterinary Diagnostic Lab) and National Veterinary Services Laboratory for confirmation of a non-negative.

Treatment: Following investigation by State Animal Health Officials, treatment shall be directed by the herd veterinarian and typically consists of supportive care (managing hydration and electrolytes, anti-inflammatory medication for fever, antibiotics if secondary bacterial pneumonia or mastitis are identified etc.) To prevent the virus from spreading and to protect human health, cows showing clinical signs should be isolated, and their milk must be diverted from the supply chain per Pasteurized Milk Ordinance requirements. Precautions for disposal of discarded milk should be taken, such as heat treatment or pasteurization. Cattle movement in and near the affected areas should stop immediately. Prevention is the best strategy and should focus on wild bird control on premises, limiting unnecessary animal or human movement on or off farm and quarantine of replacement animals prior to introduction to the herd.

Prognosis: Affected cows recover 7-10 days after showing first clinical signs. About 10% of affected cows do not recover fully in response to milk productivity.

Prevention: Biosecurity measures are the best tools for prevention. Avoid interstate movement of cattle when possible. Quarantine new cattle and avoid interacting with other cows. Sanitation of clothes, footwear and vehicles is recommended for those traveling in between several operations. Practice good hygiene when working with infected or non-infected cows, including frequent washing with virus-killing soaps, sanitizing shoes, and wearing appropriate masks. Controlling or avoiding wild bird populations although extremely difficult should be prioritized on farm. Equipment maintenance and appropriate milk parlor and claw sanitation and udder preparation should be of paramount importance.

Food Safety: *Dairies are required by law to send only milk from healthy cows to the processing plant for human consumption. Furthermore, pasteurization kills the virus, making milk safe to drink. Raw milk, however, carries risk for not only this virus but other pathogens as well so consumers assume their own risk with raw milk products. For more information on milk treatment or disposal, see https://www.aphis.usda.gov/sites/default/files/vs-recommendations-hpai-livestock.pdf.

BOLO Authors:
Dr. Duarte Diaz – Dairy Extension Specialist
BOLO Reviewer:
Dr. Liliana Salvador – Assistant Professor, ACBS

BOLO Bulletin Contact:
Arizona State Veterinarians Office
diseasereporting@azda.gov
602-542-4293

For more information on ALIRT go to: https://extension.arizona.edu/alirt

A: Dairy Disease Investigation - Part 2

Student Handout 2 - page 1 of 2

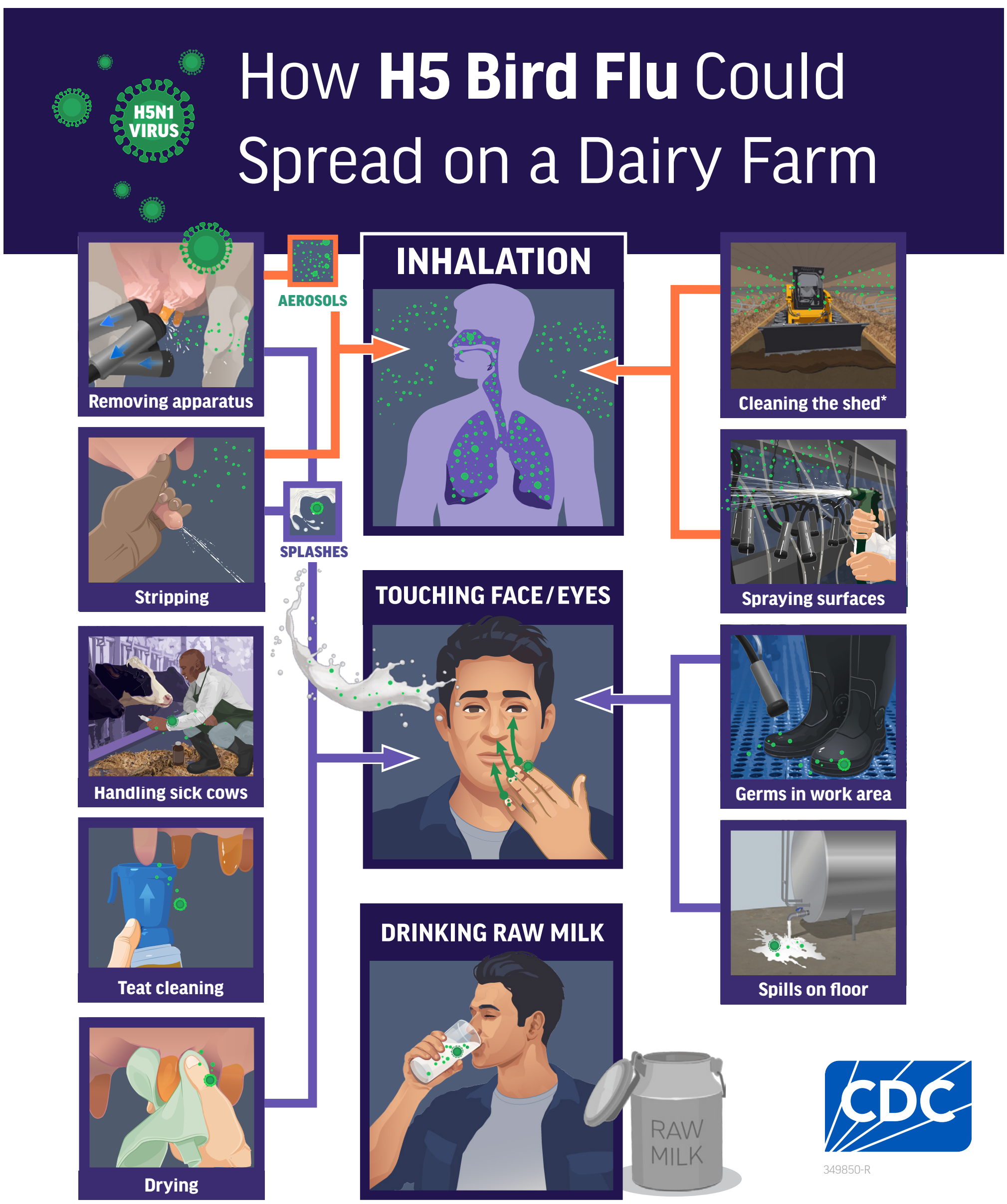
New Information

March 25, 2024

Today, USDA announced that unpasteurized milk samples from clinically affected animals from several affected premises have tested positive for Highly Pathogenic Avian Influenza (HPAI). As many are aware, the current HPAI outbreak has been ongoing since 2022 predominantly affecting the poultry industry. HPAI has been maintained in the environment by reservoir species such as waterfowl and other migratory birds. HPAI has also been recognized in other species (foxes, cougars, eagles, bears, and other opportunistic scavengers) and domestic livestock (HPAI identified in juvenile goats in Minnesota) as of very recently. This is the first detection of HPAI in adult cattle.

April 1, 2024

You receive the disease BOLO (be on the look out) on page 14 from your state dairy extension specialist.



The above examples represent ways that H5N1 bird flu can spread on a dairy farm and are not comprehensive.

*It is not yet known whether H5 Bird Flu can spread via cow feces (poop). H5 Bird Flu can spread via feces of infected birds and poultry.

Image Credit: https://www.cdc.gov/bird-flu/media/pdfs/2024/11/Bird-Flu-Could-Spread-Handout.pdf

A: Dairy Disease Investigation - Part 2

Student Handout 2 - page 2 of 2

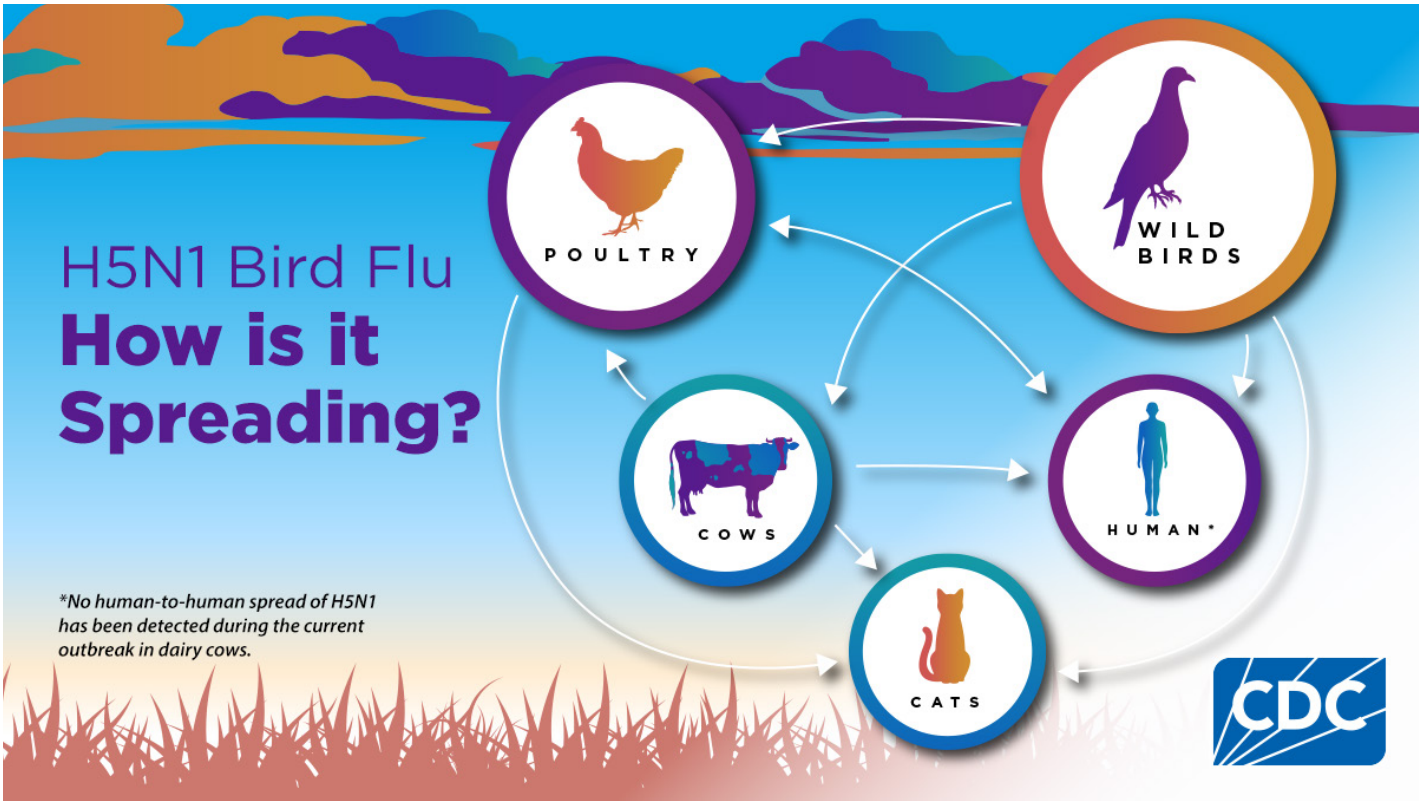


Image Credit: https://www.cdc.gov/bird-flu/situation-summary/index.html

Key Points

- If spread by wild birds, this could be "dropped" from the sky into feed or water sources, etc.
- It is NOT passed from cow to cow through direct contact, but milk can be a problem.
- Workers can get pink eye, respiratory symptoms, etc. from exposure to virus in milk, milk spray, ingesting raw milk, hands to eyes, nose, or mouth with contaminated (raw milk on hand, etc.).
- If milk is pasteurized, the avian flu virus is killed but "infected" raw milk is dangerous.

ALIRT ARIZONA LIVESTOCK INCIDENT RESPONSE TEAM

ARIZONA BOLO

BE ON THE LOOK OUT FOR:

az-1989

Updated June 2022

Poultry Disease: Avian Flu (Avian Influenza)

Location: State of Arizona (see www.aphis.usda.gov for counties of confirmed positive infections)

Type: Virus

Affected Livestock: Domestic Poultry (including Geese, Quail, Chickens, Ducks, Pheasants and Turkeys)

Transmission: Avian Influenza is a naturally occurring virus in wild (non-domestic) birds that can be transmitted to domesticated poultry. The virus can be found in the feces, nasal secretions or saliva of infected birds. There are two well known versions of the virus - low pathogenic and high pathogenic. High pathogenic is very fatal to birds. The transmission route is from a wild or domestic bird that may or may not have symptoms, to other birds nearby. People can spread the virus from bird to bird or flock by poor bio-security habits. Humans can rarely catch Avian Influenza, but it is possible so care should be taken when working around birds with a suspected or known infection.

Signs of highly pathogenic Avian Influenza (can vary by poultry type): Chickens can have respiratory symptoms including coughing, sneezing and gasping for breath, swollen head and neck, purple wattles, a pronounced lack of energy, loss of coordination and severe diarrhea. The virus is usually fatal and can kill in under 48 hours. Ducks may not show any symptoms before death occurs. Turkeys and other poultry may show signs of tremors, twisting neck and paralysis.

Diagnosis: Diagnosis is confirmed by a veterinarian and lab cultures.

Treatment: Treatment: Contact your veterinarian or State or Federal veterinary officials immediately if any compatible symptoms are noticed. There are no treatments for poultry with highly pathogenic avian influenza. To reduce suffering and keep virus from spreading, birds should be humanely euthanized in coordination with your veterinarian and state or federal veterinary officials. Prevention is the best strategy.

Prognosis: Poor prognosis for infected birds.

Prevention: Good biosecurity practices are essential to reduce impacts to your flocks. Keep flocks away from wild birds and use netting to keep wild birds from sharing food and water sources of domestic birds. Do not allow visitors to the flock pens without appropriate biosecurity measures in place. Disinfect shared feeders and waterers. Wash and disinfect clothes worn near infected birds. If dead wild birds have been found in with your domestic poultry which are now sick, please contact the Arizona Game and Fish Commission or the Arizona Department of Agriculture for guidance. Practice good hygiene when working with infected or non-infected birds including frequent washing with virus killing soaps, sanitizing shoes, and wearing appropriate masks.

NOTE: This virus has not been identified in all Arizona counties at this time. *For more information, use the QR code to access the Animal and Plant Health Inspection Service (APHIS) page on Avian Health*

BOLO Author: '
Anita Thompson
Assistant Area Agent - Agriculture
Navajo, Apache, N. Greenlee Counties

BOLO Bulletin Contact:

County Extension Agent
https://extension.arizona.edu/locations

AZDA ARIZONA DEPARTMENT OF AGRICULTURE

For information on ALIRT go to:
https://extension.arizona.edu/alirt

THE UNIVERSITY OF ARIZONA Cooperative Extension

B: Poultry Disease Investigation - Part 2

Student Handout 1 - page 1 of 2

Update

You contact your flock veterinarian who works with the state veterinarian in cooperation with USDA-APHIS to confirm that your flock is infected with Highly Pathogenic Avian Influenza (HPAI). The state veterinarian takes samples from the impacted hens, and the laboratory analysis determines that the HPAI strain originated from a wild bird strain.

Unfortunately, many more hens were impacted from the first barn, and shortly thereafter there were significant numbers of laying hens impacted at the second barn and your pullet barn suffered significant losses as well.

In hindsight, when the original affected hens were discovered, there was a delay in incorporating a strong biosecurity plan including separation of workforce or tools/equipment/vehicles between barns, so on site spread may have been amplified by human/equipment spread.

What Happens Now

From USDA APHIS

HPAI Response - Response Goals & Depopulation Policy

USDA-APHIS EPIDEMIOLOGICAL PRINCIPLES OF AN HPAI RESPONSE

Three basic epidemiological principles form the foundation to contain, control, and eradicate HPAI in the U.S. poultry population:

1. Prevent contact between the HPAI virus and susceptible poultry.
    - This is accomplished through quarantine of infected poultry and movement controls in the Infected Zone(s) and Buffer Zone(s) (which comprise the Control Areas), along with biosecurity procedures to protect non-infected poultry.
    - Certain circumstances may warrant accelerating the depopulation or euthanasia of poultry at risk for exposure to HPAI to decrease the population density of susceptible poultry.
    - There is a serious transmission risk posed by people, material, conveyances, and animals that may have been in contact with HPAI and serve as mechanical vectors. Contact between poultry and these items should be prevented, and transmission risk mitigated through stringent biosecurity and cleaning and disinfection measures.
2. Stop the production of HPAI virus by infected or exposed animals. This is accomplished by rapid mass depopulation (and disposal) of infected and potentially infected poultry.
3. Increase the disease resistance of susceptible poultry to the HPAI virus or reduce the shedding of HPAI in infected or exposed poultry. This may be accomplished by strategic emergency vaccination if a suitable vaccine is available and can be administered in a timely manner.

Key Concepts

Depopulation: Animal depopulation refers to the rapid and efficient destruction of a complete population of animals, typically in response to a crisis or emergency. It's a measure taken to control disease outbreaks, address public health concerns, or handle other dire situations where maintaining animal welfare is paramount, even if it means ending their lives.

How Infected Backyard Poultry Could Spread Bird Flu to People

Human Infections with Bird Flu Viruses Rare But Possible

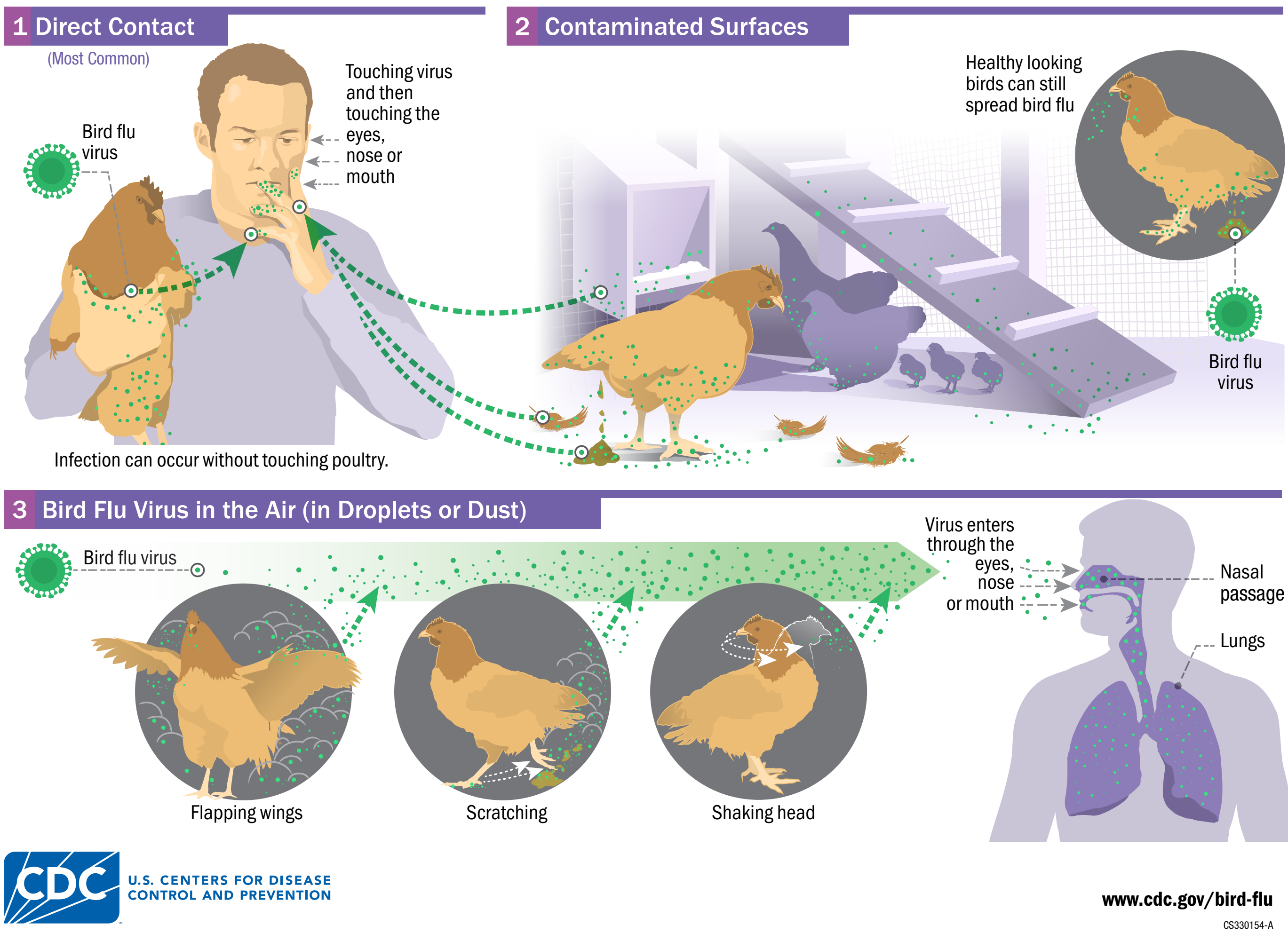


Image Credit: https://www.cdc.gov/bird-flu/communication-resources/avian-flu-transmission.html

Please share any feedback, successes, or suggested changes with Dr. Betsy Greene at betsygreene@arizona.edu.

To learn more about ordering a SCRUB kit or mini kit contact Dr. Betsy Greene at betsygreene@arizona.edu or Debbie Reed at dlreed@arizona.edu

AUTHORS

Betsy Greene, PhD
Horse Specialist - University of Arizona, Tucson, AZ

Debbie Reed, MBA
Program Coordinator, Senior- University of Arizona, Tucson, AZ

CONTACT

Betsy Greene
betsygreene@arizona.edu

This information has been reviewed by University faculty.
https://extension.arizona.edu/SCRUBmini

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extension.arizona.edu/pubs

ACKNOWLEDGEMENT OF ORIGINAL AUTHORS

SCRUB Activity 1: Direct and Indirect Disease Transfer adapted from University of Arizona Cooperative Extension publication az2043-2023 Science Creates Real Understanding of Biosecurity Curriculum Module 2 - Direct and Indirect Disease Transfer (page 39). Authors: Kris Hiney, Betsy Greene, and Brittani Kirkland.

SCRUB Activity 2: Effective Hand Washing adapted from University of Arizona Cooperative Extension publication az2043-2023 Science Creates Real Understanding of Biosecurity Curriculum Module 1 - Cleaning and Disinfecting Activity A: Effective Hand Washing (page 17). Authors: Kris Hiney, Betsy Greene, and Brittani Kirkland.

SCRUB Activity 3: Facility Sanitation Challenge adapted from University of Arizona Cooperative Extension publication az2043-2023 Science Creates Real Understanding of Biosecurity Curriculum Module 1 - Cleaning and Disinfecting Activity B: Facility Sanitation Challenge (page 19). Authors: Kris Hiney, Betsy Greene, and Brittani Kirkland.