Biosecurity Unit Lesson #1

**Title Of Lesson: *State veterinarian outbreak response***

**Subject/Course/Grade: Ag Science**

Learning Objectives:

* Students will understand the importance of state veterinarians
* Students will be able to recall what a state veterinarian can do during an outbreak
* Students will be able to explain a disease outbreak

Main Concept:

* Students will simulate, explore and explain how diseases can spread between bodily fluids like mucus and see how state officials do investigation to find outbreak sources.

Students will understand/know…

* **Vocabulary**
  + **pathogen**- a virus or bacterium that causes disease
  + **mucus**- a slippery substance produced by the body to help with lubrication and to aid in trapping germs. Humans have mucous membranes in several places, including the nose and lungs. Animals produce mucus in the same way as humans and for the same purposes.
  + **biosecurity**- steps taken to prevent the spread of germs and keep humans and animals healthy
  + **zoonotic diseases-** diseases that can be spread between humans and animals
  + **influenza**- a zoonotic disease that causes coughing and fever
  + **epidemiology**-the study of frequency, patterns, causes and risk factors of health related events in populations
  + **direct contact**- physical interaction between an infected person or animal and a susceptible person or animal
  + **indirect contact**-occurs when there is no direct contact between a person and an animal. This contact occurs when a susceptible person or animal is exposed to contaminated air, objects, fecal-oral matter, or insects
  + **Avian**-Of or relating to birds
  + **Poultry-** domesticated birds

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| * + **Low Pathogenic Avian Influenza (LPAI)-** type of bird flu that spreads rapidly in poultry but shows mild to no disease signs   + **\*\*\*Highly Pathogenic Avian Influenza (HPAI)\*\*\*-** bird flu that spreads rapidly with high mortality   + **State Veterinarian**- veterinarians employed by the state for zoonotic disease control, prevention, and surveillance   + **Disease surveillance-** monitoring for signs of disease |
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| Show introduction video “State Veterinarian” on swientist’s YouTube channel.  **Background:**  “Just like humans, animals can also spread pathogens through mucus. Animals who share the same water or feed pans share pathogens from their mouths and noses. When animals lick things, pathogens can spread, or when they cough or sneeze, tiny mucus particles spread through the air, just like when you cough or sneeze. Animals not only share pathogens with each other, but with humans too.  Pathogens that can be passed between animals and humans that cause illness are called **zoonotic diseases.** Influenza is a zoonotic disease that can change or mutate in the body. This means it can become easier to infect other animals or people and can make them sicker.”  “Like we saw in the video there are state officials to help control these outbreaks and make sure they don’t spread. Today you are going to be the state veterinarian and we will see how quickly pathogens can spread between **poultry.** Then you will be the investigator and find out who the outbreak started with.”  **Activity**  Materials Needed  1/8 cup (30ml) distilled water per participant  5 oz disposable cup for each participant  Sodium Carbonate Standard Solution 0.02N (Hach, cat. #18149) (Positive Solution) Phenolpthalein Solution 0.1% (Hach, cat. #189753) (Infection Testing Solution) Dropper bottle  Measuring utensils  Disposal container large enough to accommodate liquid from all participant cups  Safety Procedures   * Do not sniff or drink solution * If participant is exposed to solution, flush the area immediately with water   Before students arrive:   1. Add approximately 1/8 cup (30ml) of distilled water to a disposable cup for each student; filling the cup about 1/3 full. This should be done just before the activity begins, to ensure pH changes do not occur. In addition, do not use tap water, as not all water sources are pH neutral. 2. To make “positive mucus” add ¼ teaspoon (~25 drops) of Sodium carbonate Standard Solution to one cup. (More if you have a large group). Place a small, inconspicuous mark on each of the “infected cups”, to be identifiable later. 3. Add stock phenolphthalein solution to a dropper bottle, for easier distribution. |

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| Activity  Make sure all students have put on their safety equipment. Then distribute a cup of “mucus” to each student. Explain that each student and their cup represent a poultry in a large animal facility. Discuss animal contact within a barn, highlighting pathogenic spread. To mimic this, students will exchange the liquid in their cups. Additionally, **set aside 3 non-infected cups** that will not be exchanged to show what happens if there is low or no contact. During exchanges, students should pour their fluid into another student’s cup, and then half should be poured back into the original cup. Students should record who they exchange with. Inform the students that one (or however many were infected before) mucus cup is infected with **Highly Pathogenic Avian Influenza**. Make sure to note, without disclosing it to any students, who received the “infected” sample before the exchanges.  Now the students may to begin exchanging “mucus” cups. Students should exchange **three times** with a different classmate, preferably from a different part of the room, each time. Remind the students to keep a record of their exchanges!  After students have completed all three exchanges and are back in their seats, ask “Can anyone tell whether they are infected with the disease?” Emphasize that at this point it is not possible to tell because there are no visible signs of infection.  Hold up the bottle of “Infection Test Solution” and explain that the chemicals in this solution will reveal whether or not your cup of “mucus” is infected. If adding “Infection Test Solution” does nothing then the “mucus” is not infected but if the “mucus” turns pink, it means it is infected. Go around the room and add 2 drops of “Infection Test Solution” to each student’s cup.  **Following Through**  Notice all the individuals that are infected! Discuss with the students how this could have occurred, and how it relates to disease spread within a poultry population.  Using the mucus exchange records, allow the students time to figure out who started as “infected”. Confirm their findings with the inconspicuous mark put on the infected cup before the activity.  Make sure students understand that if an infected individual mingles with healthy individuals, random contact can cause many more to become infected.  Ask the class to decide, based on the descriptions alone, which individuals were less (or more) likely to have been the source of the disease. Make clear that individuals who have more potential contacts are more at risk of being infected and those with less contacts have a lower risk. This was the purpose of the non-infected cups that were not exchanged. Due to them not having contact with other poultry, the likelihood of them getting infected is lower. Even if one of the “less likely” individuals did happen to be the carrier, this provides a good lead to discuss other ways, other than direct contact with similar animals, that disease can be introduced, such as contaminated food or water.  Emphasize that the techniques used in this activity, called surveillance and response by public health professionals, is considered the best approach to combating disease outbreak and that some of the basic principles of epidemiology are tracking the outbreak, tracing the source, and understanding the connections.  Before class is over, have students pour their cups of solution into the disposal container, then thoroughly wash and rinse the cups.  Protocol modified from Lab aids Experiencing Science Kit #906 “Track the Spread of Infectious Disease” |
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| Monitoring and Feedback:   * Students will evaluate the spread of disease through a population. |
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| Learning Activities:  State Veterinarian video (2:30 minutes)  Introduce vocabulary, give background (10 minutes)  Mucus swap activity (10 minutes)  Post activity discussion and questions (20 minutes) |

# RESOURCES

Visit the Upper Midwest Agricultural Safety and Health Center (UMASH) agritourism website: <http://umash.umn.edu/agritourism/>