**Excellence in Exhibition:   
Preventing Disease in Animals and People**

**Learning Objectives All Lessons**

**Lesson 1: Introduction to Influenza, Zoonoses, and Disease Risks**

**Learning Objectives**

1. **Define zoonoses.**
2. **Describe the importance of influenza and other zoonoses.**
3. **Recognize common zoonotic diseases that might affect people and animals at fairs or exhibitions.**
4. **Identify risk factors for zoonotic disease infection.**

**Lesson 2: Zoonotic Disease Transmission**

**Learning Objectives**

1. **Explain the five routes of disease transmission.**
2. **Give an example of a zoonotic disease that can be transmitted by each route.**
3. **Describe how influenza viruses are transmitted among animals and to humans.**
4. **Explain ways to prevent each route of transmission.**

**Lesson 3: Zoonotic Disease Prevention and Biosecurity**

**Learning Objectives**

1. **Define biosecurity.**
2. **Explain the importance of biosecurity in zoonotic disease control.**
3. **Review ways zoonotic diseases might be spread to you, your family, and your animals on the farm and at exhibitions.**
4. **Describe measures to prevent zoonotic disease spread to you, your family, and your animals on farms and at exhibitions.**

**Lesson 4: Highly Pathogenic Avian Influenza (HPAI) Outbreak**

**Learning Objectives**

1. **Describe avian influenza and how it is transmitted among animals and between animals and people.**
2. **Explain the impact that an HPAI outbreak has on animal agriculture.**
3. **Identify potential public health impacts of a highly pathogenic avian influenza outbreak.**
4. **Identify those persons most at risk for being infected with avian influenza A viruses and those with the highest risk of complications.**
5. **Explain how and why animal exhibitions might be impacted by HPAI.**

**Lesson 5: Influenza A Virus of Swine Origin (H3N2v) Outbreak**

**Learning Objectives**

1. **Describe influenza A viruses of swine and how they can be transmitted among animals and to humans.**
2. **Explain measures to protect swine from infection with influenza viruses.**
3. **Identify the public health impacts of the H3N2v virus outbreak.**
4. **Identify those persons most at risk for being infected with swine influenza A viruses and those with the highest risk of complications.**
5. **Explain the measures humans can take to protect themselves from influenza A viruses of swine when on farms or attending animal exhibitions.**

**Lesson 6: Public and Animal Health Agencies and Careers**

**Learning Objectives**

1. **Identify agencies that promote animal and public health.**
2. **Recognize careers that are available in animal and public health.**
3. **Describe the education and responsibilities that different animal and public health jobs require.**

**Excellence in Exhibition:   
Preventing Disease in Animals and People**

**Learning Objective ANSWERS All Lessons**

**Lesson 1: Introduction to Influenza, Zoonoses, and Disease Risks**

**Learning Objectives and Answers**

1. **Define zoonoses.**

Zoonoses (also known as zoonotic diseases) are diseases of animals that can be spread to humans.

1. **Describe the importance of influenza and other zoonoses.**

Zoonoses are important for many reasons, including animal health, personal health, public health, and food safety. Animals with zoonotic diseases could have severe disease or could appear healthy on the outside but still have decreased weight gain, poor performance, or decreased production. Even if animals do not show signs of disease they can still spread the disease to humans. Some zoonoses are capable of causing widespread and severe disease in humans. In addition, some zoonoses are foodborne pathogens. Foodborne pathogens cause illness in many humans every year. Influenza is an important zoonotic disease because it can cause very severe disease in both humans and animals. It is also able to spread quickly through a population.

1. **Recognize common zoonotic diseases that might affect people and animals at fairs or exhibitions.**

Common zoonotic diseases that could affect people and animals at exhibitions include:

* Avian influenza
* Influenza A of swine
* Q fever
* Salmonellosis
* *E. coli*
* Ringworm or club lamb fungus
* Contagious ecthyma or orf
* Cryptosporidiosis
* Campylobacteriosis

1. **Identify risk factors for zoonotic disease infection.**

Persons at higher risk include:

* Children aged five years and younger
* Pregnant women
* People aged 65 years and older
* People who are in close contact with animals
* People with weakened immune systems

**Lesson 2: Zoonotic Disease Transmission**

**Learning Objectives and Answers**

1. **Explain the five routes of disease transmission.**

Direct Contact: Spread of pathogens through contact with an infected animal, its tissues, or its fluids by way of open wounds, mucous membranes (such as the lining of the digestive, respiratory, or urinary tracts), or scraped skin

Aerosol: Droplets containing pathogens travel through the air and are inhaled by another animal or human

Fomites: Spread of pathogens through contact with objects or surfaces contaminated by an infected animal

Ingestion: Ingestion of disease-causing agents from contaminated food or water or by licking or chewing contaminated objects in the environment

Vectors: Transfer of a pathogen from an infected animal to another animal or human by an insect

1. **Give an example of a zoonotic disease that can be transmitted by each route.**

Direct Contact: Avian influenza, influenza A of swine, Q fever, salmonellosis, *E. coli*, contagious ecthyma, campylobacteriosis, cryptosporidiosis, ringworm

Aerosol: Avian influenza, influenza A of swine, Q fever

Fomites: Avian influenza, influenza A of swine, contagious ecthyma, ringworm

Ingestion: Q fever, salmonellosis, *E. coli*, contagious ecthyma, campylobacteriosis, cryptosporidiosis

Vectors: Q fever, West Nile virus

1. **Describe how influenza is transmitted among animals and to humans.**

Influenza can be spread among animals by direct contact, aerosol, fomites, and ingestion. Influenza is most often spread to humans when they are in close contact with sick animals.

1. **Explain ways to prevent each route of transmission.**

Direct Contact

* Isolate sick animals
* Wear gloves when working with sick animals
* Wash your hands after having contact with animals

Aerosol

* Increase distance between sick animals and healthy animals and humans
* Wear respiratory protection when working with sick animals
* Provide fresh air to animals and humans
* Decrease humidity and odor build up in barns

Fomites

* Avoid sharing equipment or clean and disinfect when sharing is necessary
* Clean and disinfect any equipment used with sick animals or animals with skin lesions
* Dispose of or wash boots and clothing after animal contact

Ingestion

* Wash your hands
  + After contact with animals
  + After cleaning pens or contact with manure
  + Before preparing food
* Cook meat to an appropriate temperature
* Store food at proper temperature

1. Vectors

* Use insect control products
* Work with your veterinarian to check and treat your animals for parasites

**Lesson 3: Zoonotic Disease Prevention and Biosecurity**

**Learning Objectives and Answers**

1. **Define biosecurity.**

Biosecurity is a series of practices designed to prevent the introduction and spread of pathogens. Biosecurity has two components. The first component is keeping disease from entering an area. The second component is preventing disease from spreading to other locations.

1. **Explain the importance of biosecurity in zoonotic disease control.**

People who live or work with animals are at risk of infection with zoonotic diseases. Good biosecurity practices can help keep both animals and humans healthy.

1. **Review ways zoonotic diseases might be spread to you and your animals on the farm and at exhibitions.**

Diseases can be spread by five different routes. The routes of transmission are direct contact, aerosol, fomites, ingestion, and vectors. Pathogens can get onto a farm or an exhibition in many different ways. Some of the ways pathogens can enter are:

* Animals
* People
* Feed and water
* Equipment and bedding
* Rodents, birds, and insects
* Vehicles and trailers

1. **Describe measures to prevent zoonotic disease spread to you and your animals on farms and at exhibitions.**

On Farms

* Limit access to the farm
* Maintain fences to keep your animals in and others out
* Limit contact between your animals and outside animals
* Post signs at the farm entrance to inform visitors of procedures to follow
* Keep a record of visitors who enter and leave
* Require that all people wash hands before and after animal contact
* Require that employees who have contact with outside livestock use the same biosecurity measures as visitors
* Be able to recognize and report diseases
* Avoid sharing equipment or vehicles between farms
* Prevent off-farm vehicles from driving where animals travel
* Make sure visitors avoid livestock areas and do not contact animals
* Wear gloves when working with animals
* Wear clean boots or disposable boot covers in animal areas
* Wear clean protective outer clothing when working with animals
* ID animals individually
* Maintain health records and records of animal movement
* Inspect animals for signs of illness at least daily
* Review vaccination and treatment protocols with your veterinarian yearly
* Use separate facilities and equipment to handle isolated animals
* Visit sick animals last when working with groups of animals
* Clean equipment and boots and change clothing between groups of different health statuses
* Quarantine all new or reintroduced animals to prevent exposing your herd to different pathogens
* Isolate sick animals immediately to minimize disease exposure of others in the herd
* Remove dead animals quickly and dispose of carcasses in a safe manner that prevents wildlife and rodent attraction
* Prevent contact with free roaming animals
* Control wildlife access to the farm
* Minimize bird contact and nesting on your farm
* Have a rodent control program
* Secure all feed storage areas and clean up spilled feed to minimize access by pests

At Exhibitions

* Do not bring sick animals to exhibitions
* Remove animals that become sick at exhibitions from areas of human contact
* Make sure all animals brought to an exhibition are up-to-date on vaccinations and parasite control
* Wash your hands before and after contact with animals
* Remove manure and soiled bedding from areas where humans have contact with animals
* Cover feed and store it in sealed containers
* Avoid bringing strollers, toys, etc. into animal areas
* Avoid eating, drinking, and sleeping in animal areas
* Clean and disinfect facilities after the animals leave
* Avoid mixing of animals from different farms
* Do not share equipment with other exhibitors
* Clean and disinfect any equipment, clothing, shoes, and vehicles that were at the exhibition

**Lesson 4: Highly Pathogenic Avian Influenza (HPAI) Outbreak**

**Learning Objectives and Answers**

1. **Describe avian influenza and how it is transmitted among animals and to humans.**

Avian influenza is caused by an influenza A virus. It can infect wild birds, pet birds, poultry, and mammals. Avian influenza viruses are classified as highly pathogenic avian influenza (HPAI) or low pathogenic avian influenza (LPAI). Classification is based on severity of disease in poultry and genetic characteristics of the virus. HPAI viruses cause more severe disease in poultry than LPAI viruses. Most wild birds do not show symptoms when infected with avian influenza. Spread of avian influenza among wild bird populations is largely through ingestion. Birds will eat the feces of infected birds that contains the virus and then become infected themselves. This can also occur in domestic poultry. Due to the closeness of birds in commercial poultry facilities, aerosol is another common route of spread. Fomites can spread avian influenza as well. Zoonotic avian influenza is usually transmitted to people when they are in close contact with infected birds or tissues. Poultry that have avian influenza will not enter the food supply. People cannot get avian influenza from eating cooked poultry or poultry products.

1. **Explain the impact that an HPAI outbreak has on animal agriculture.**

An HPAI outbreak can have a huge impact on animal agriculture. It can cause a decrease in the number of poultry due to death or depopulation of infected birds. The loss of poultry will lead to a decrease in the number of poultry products available. Workers in the poultry industry can be laid off because of the stop of production for depopulation, cleaning, and disinfection of facilities. Other businesses associated with the poultry industry, such as processing plants, feed mills, trucking companies, food production companies, and retail stores, will also be affected. The HPAI outbreak may cause other countries to limit the importation of U.S. poultry and poultry products as well.

1. **Identify the potential public health impacts of a highly pathogenic avian influenza outbreak.**

Some avian influenza viruses have zoonotic potential. The two most common zoonotic avian influenza viruses are the Asian H5N1 HPAI virus and the H7N9 LPAI virus that has caused disease in China. People are usually infected with avian influenza when they come in close contact with infected birds or their tissues. Clinical signs of avian influenza in humans include flu-like symptoms, swelling and reddening of the tissues around the eyes, fever, and aches. Avian influenza viruses are able to cause severe disease as well.

1. **Identify those persons most at risk for avian influenza.**

People at a high risk of getting avian influenza are:

* People in close contact with birds
* Children aged 5 years and younger
* Pregnant women
* People aged 65 years and older
* People with weakened immune systems

1. **Explain how and why animal exhibitions might be impacted by HPAI.**

An HPAI outbreak could lead to poultry being banned from exhibitions. During the 2015 HPAI outbreak, states banned all live birds, waterfowl, out-of-state waterfowl, or out-of-state birds. The bans are put in place to reduce the spread of HPAI through poultry populations.

**Lesson 5: Influenza A Virus of Swine Origin (H3N2v) Outbreak**

**Learning Objectives and Answers**

1. **Describe influenza A viruses of swine and how they can be transmitted among animals and to humans.**

Influenza A viruses of swine origin can infect pigs, turkeys, ferrets, mink, and humans. Influenza viruses normally found in pigs are called “variant” viruses when they are found in people. One example of a variant virus is the H3N2v influenza virus that was first detected in humans in 2011. Clinical signs in pigs include fever, tiredness, lack of appetite, weight loss, coughing, sneezing, nasal discharge, and difficulty breathing. Humans with IAV-S will have flu-like symptoms such as fever, cough, sore throat, runny nose, muscle aches, headache, and tiredness. The influenza virus is transmitted between pigs by aerosol and contact with nasal discharge, either directly or on fomites. The virus is thought to be spread to humans when an infected pig coughs or sneezes and the droplets with influenza virus spread through the air. If the droplets land on a person’s nose or mouth, or are inhaled, the person can become infected. It is also possible that a person can get the virus from touching an object with the virus on it and then touching their nose or mouth. Influenza can be spread from humans to pigs as well.

1. **Explain measures to protect swine from influenza.**

* Do not bring sick animals to an exhibition
* Avoid taking swine to multiple exhibitions
* Avoid mixing of animals from different farms
* Limit the amount of time your animals spend at an exhibition
* Avoid sharing equipment with other exhibitors
* Observe swine regularly for signs of illness
* Contact your veterinarian if your pig becomes sick
* Quarantine animals for at least 7 days before allowing contact with other animals after a show
* Clean and disinfect equipment, clothing, shoes, and vehicles that were at the exhibition before using them on your farm

1. **Identify the public health impacts of the H3N2v virus outbreak.**

Most human infections with H3N2v have been mild and similar to seasonal flu infections. As with the seasonal flu, serious illness is possible, especially in people with a high risk of flu-related complications. The H3N2v virus contains a gene from the 2009 H1N1 pandemic virus. This gene may allow the virus to infect humans more easily than swine influenza viruses typically can. The people most likely to be infected with IAV-S are those who are in close contact with swine. Person-to-person transmission of IAV-S is limited. However, it is possible that the virus could change to allow for more efficient person-to-person transmission.

1. **Identify those persons most at risk for swine influenza.**

People at a high risk of getting influenza A of swine are:

* People in close contact with pigs
* Children aged 5 years and younger
* Pregnant women
* People aged 65 years and older
* People with weakened immune systems

1. **Explain the measures humans can take to protect themselves from influenza A viruses of swine when on farms or attending animal exhibitions.**

* Avoid eating and drinking in animal areas
* Wash your hands often, especially before and after pig exposure
* Avoid sleeping in animal areas
* Avoid putting anything in your mouth while in swine barns
* Leave toys, pacifiers, cups, strollers, etc. outside of animal areas
* Avoid pigs and swine areas if you are at a high risk of flu complications
* Avoid contact with pigs if you have flu-like symptoms to prevent spreading illness to pigs
* Avoid contact with pigs that look or act sick
* Take protective measures, such as wearing PPE, if you must come in contact with pigs that are known or suspected to be sick

**Lesson 6: Public and Animal Health Agencies and Careers**

**Learning Objectives and Answers**

1. **Identify agencies that promote animal and public health.**

There are many different agencies that work to promote animal and public health. These agencies can operate at the local, state, or national level. Some of the more common agencies are listed here.

Local Agencies

* Local Health Department

State Agencies and Personnel

* State Health Department
* State Veterinarian
* State Public Health Veterinarian

National Agencies

* Centers for Disease Control and Prevention
* Food and Drug Administration
* United States Department of Agriculture

1. **Recognize careers that are available in animal and public health.**

Many different careers are available in animal and public health. Some of the more common careers are epidemiologist, public health laboratory scientist, nurse, physician, veterinarian, and public health veterinarian.

1. **Describe the education and responsibilities that different animal and public health jobs require.**

Epidemiologist: Epidemiologists investigate disease outbreaks and are called “disease detectives.” They work to identify people with the illness, determine the cause, and develop a plan to prevent future outbreaks. Depending on where they work, epidemiologists might need to obtain a master’s degree, usually a Master of Public Health.

Public Health Laboratory Scientist: Scientists who work in public health laboratories perform screening tests, diagnostic tests, and surveillance tests. They can research infectious diseases and aid in investigating disease outbreaks. Laboratory scientists usually have a bachelor’s degree in a science-related field and sometimes a master’s degree in public health.

Nurse: Nurses work with other healthcare providers to monitor health conditions, administer medicine, and provide care for patients. One specialty type of nurse is a public health nurse. Public health nurses work to improve the health of the community. They help to identify health issues within a community and create intervention strategies. Depending on where they work, public health nurses may need either an associate’s degree or bachelor’s degree in nursing.

Physician: Physicians are responsible for the health of humans. Some of their duties include diagnosing illness, prescribing medications, and developing treatment plans. Some specialized physicians will also perform surgery. Physicians need to have a Doctor of Medicine or a Doctor of Osteopathic Medicine degree. Most physicians also have bachelor’s degrees.

Veterinarian: Veterinarians are responsible for the health of animals. They perform many duties including giving vaccinations, diagnosing and treating illnesses and injuries, and doing surgery. Veterinarians can also conduct research or work in food safety. Veterinarians need a Doctor of Veterinary Medicine degree (DVM or VMD). Most veterinarians also have a bachelor’s degree.

Public Health Veterinarian: Public health veterinarians focus on the interaction between animal and human health. They can work in many different fields, including food safety, disaster preparedness efforts, zoonoses prevention, epidemiology, drug and vaccine safety, and occupational health. Public health veterinarians need a Doctor of Veterinary Medicine degree and a Master of Public Health degree.