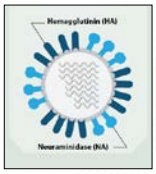
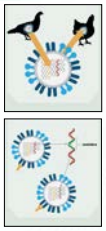
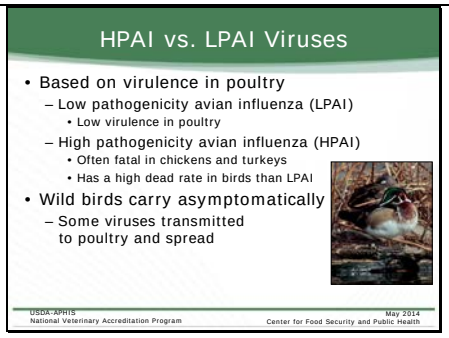
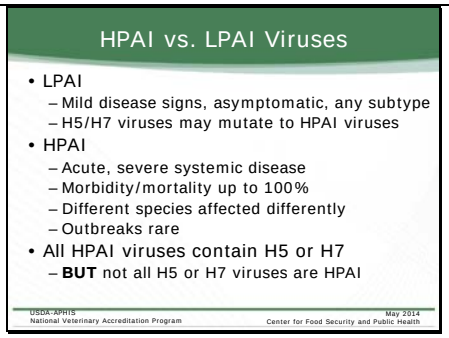
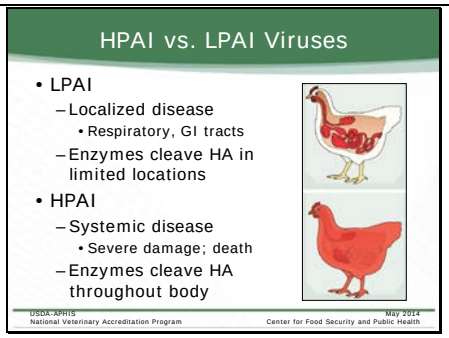
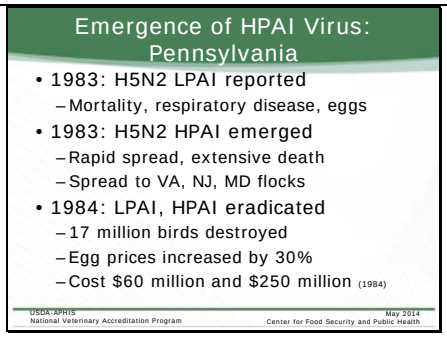
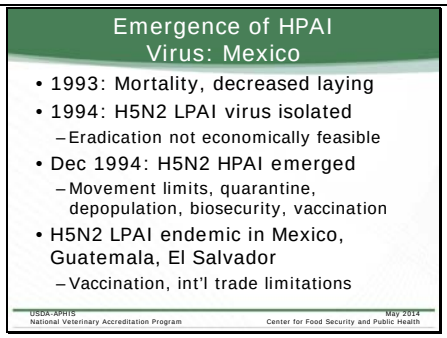
Slide 1	**Module 18:** **Avian Influenza &** **Exotic Newcastle Disease** *USDA-APHIS National Veterinary Accreditation Program (NVAP)* USDA the Center for Food Security & Public Health IOWA STATE UNIVERSITY	**Welcome to Module 18: Avian Influenza and Exotic Newcastle Disease**. This module was developed as supplemental training for the USDA-APHIS National Veterinary Accreditation Program (NVAP) by the Center for Food Security and Public Health at the College of Veterinary Medicine, Iowa State University. The content for this module was finalized in May 2014. *Presenters: As designed, slide completion time ranges from 30 to 90 seconds each, such that the entire presentation can be completed in 60 minutes. For this topic, there are seven handouts that can be referred to during this presentation. These can be found at the end of this PDF and available in the corresponding web module and print manual. You may want to print out hard copies and have them with you for demonstration purposes during the presentation.*
Slide 2	Supplemental Training 1. Print clearly on the sign-in sheets. 2. It is critical that we have your current email address for your accreditation renewal. 3. If you do not know your 6 digit National Accreditation Number, please see me at the conclusion of the presentation. 4. You will receive a Certificate of Completion during the presentation. 5. Keep your Certificate of Completion forever- **do not send it to APHIS**. USDA-APHIS National Veterinary Accreditation Program — March 2014 — Center for Food Security and Public Health	
Slide 3	Supplemental Training • All APHIS Approved Supplemental Training (AAST) modules are also available on our Website with interactive features and links to additional Web resources. • Type "NVAP" into your search engine e.g. Bing, Google, Yahoo. USDA-APHIS National Veterinary Accreditation Program — May 2014 — Center for Food Security and Public Health	
Slide 4	Supplemental Training • Familiarize accredited veterinarians with animal health regulatory concepts and activities – Does not supersede the regulations • For the most up-to-date regulations and standards, please refer to: – Code of Federal Regulations – Local VS District Office • Visit the USDA-APHIS district offices website USDA-APHIS National Veterinary Accreditation Program — May 2014 — Center for Food Security and Public Health	*Presenters: Please make sure your audience understands the intent of this information by reading what is written here.* This informational presentation is intended to familiarize accredited veterinarians with animal health regulatory concepts and activities. Information presented here does not supersede the regulations. For the most up-to-date regulations and standards, please refer to the Code of Federal Regulations and your local VS District Office.

Slide 5	**Overview** • Economic and public health impacts of disease outbreaks • Clinical signs of AI and END • Concerns associated with H5/H7 LPAI viruses • Roles of NPIP programs • Collection and submission of samples • Reporting positive results • Biosecurity measures USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	As an **overview**, this presentation will: • Explain the economic and public health impacts of an exotic avian disease outbreak • Describe the clinical signs associated with avian influenza (AI) and exotic Newcastle disease (END) • Introduce the concerns associated with H5 and H7 low pathogenicity avian influenza (LPAI) viruses • Clarify the role of the National Poultry Improvement Plan (NPIP) Avian Influenza Clean and Monitored programs and the Live Bird Marketing System program in preventing notifiable avian influenza (NAI) • Review how to collect and submit samples for the surveillance of AI and END • Provide information on how to report positive results for AI or END and understand the protocol for investigation, response, communication, and recovery • Highlight biosecurity measures specific for these diseases
Slide 6	**Introduction** • AI, ND: Similar, economically important • Causative viruses – Mildly pathogenic to highly virulent – Mild forms in U.S. – Severe forms reportable to State, Federal authorities • Serious consequences for international trade  USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Introduction:** Avian influenza (AI) and Newcastle disease (ND) are economically important poultry diseases that share many similarities. Both diseases are caused by groups of viruses that vary from mildly pathogenic to highly virulent. Milder forms of Newcastle disease and avian influenza are present in the United States. The severe forms of each disease are exotic and must be reported immediately to State and Federal authorities. The severe forms of each disease can have serious consequences for international trade.
Slide 7	**Avian Influenza**	First we will cover the history, etiology, and other information about **avian influenza**.

Slide 8	**Avian Influenza: History** • Once called "fowl plague" • 1878: Discovered in Italy – Endemic for 50 years, spread • 1901-1930: Europe, North and South America, Egypt, China, Japan – Self-limiting outbreaks – Depopulations – mandatory, voluntary – Disease control mistakes spread AI – Germany: "Brunswick disease" USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	The **history of avian influenza** – or "fowl plague," as it was once known – started when it was discovered in Italy in 1878. This disease remained endemic in Italy for the next 50 years and spread to many other countries. Between 1901 and 1930, fowl plague outbreaks were reported in Europe, North and South America, Egypt, China and Japan. Some early outbreaks were self-limiting, because farms tended to be isolated and this disease usually killed most of the birds. Governments sometimes ordered the remaining birds to be slaughtered. In other cases, farmers voluntarily undertook the culling, then restocked the farm. Occasionally, mistakes in disease control helped avian influenza spread widely. When birds started dying rapidly at the 1901 poultry show in Brunswick, Germany, the organizers panicked and sent all the birds back to their farms – thus, spreading the disease throughout the country. In Germany, avian influenza was once known as "Brunswick disease."
Slide 9	**United States** • 1924-25: First reported • Live bird markets, railways spread disease • Restrict imports from affected States • Federal programs – Slaughter infected flocks – Bury/burn carcasses – Clean, disinfect  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	In the **United States**, the first fowl plague outbreak was reported in 1924-25. Because the disease was associated with live bird markets, and railways were used to transport live birds, it spread extensively. To control the outbreak, States restricted the importation of poultry from affected States. They also established emergency programs requiring the slaughter of infected flocks, burning or burial of the carcasses, and cleaning and disinfection of crates and affected premises. Federally supervised crews carried out these processes.
Slide 10	**Avian Influenza: The Viruses** • 1955: 'Classical' virus isolated • 1959: New virus, Scottish chickens • 1961: New virus, South African terns – Highly virulent – Domestic poultry: Severe illness – Terns: Death  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Avian influenza** is caused by many different strains of **viruses.** Early researchers thought that fowl plague was caused by a single virus. However, the isolation of the 'classical' fowl plague virus in 1955 was soon followed by the discovery of a new virus in sick chickens in Scotland (1959) and another virus in sick wild terns in South Africa (1961). The highly virulent virus found in South African terns was unusual in two ways: it caused severe illness in domesticated poultry, and it killed terns. Viruses that can kill wild birds and poultry have also been found in wild populations during the H5N1 HPAI Asian strain outbreak that continues today. Strain refers to a genetic variant or subtype of the virus.

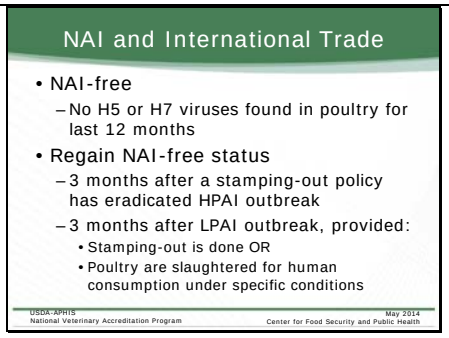
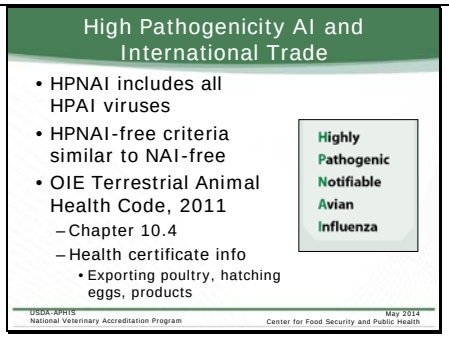
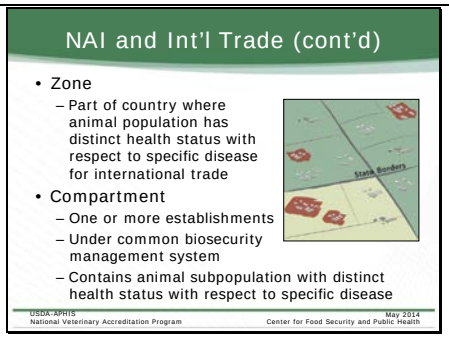
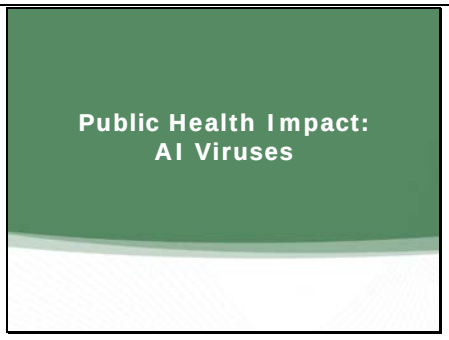
Slide 11	**AI: The Viruses (cont'd)** • 1960s: Milder AI viruses found – Not all highly pathogenic • 1970s: Less virulent AI viruses widespread in wild populations – Wild waterfowl, shorebirds – Carried subclinically – Few or no clinical signs in poultry • AI caused by heterogeneous viruses, some more virulent than others USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	In the 1960s, **avian influenza viruses** were found in poultry with milder diseases. This led to the realization that not all avian influenza viruses are highly pathogenic. In the 1970s, researchers discovered that less virulent avian influenza viruses are widespread in wild bird populations, particularly wild waterfowl and shorebirds. With very few exceptions, these viruses are carried subclinically in these populations, and usually cause few or no clinical signs in poultry. These and other findings led to our current understanding of avian influenza as a disease caused by a heterogeneous group of viruses, some more virulent than others.
Slide 12	**AI Viruses: Genetic Variability** • Orthomyxovirus (Type A) – Small-medium size, enveloped – RNA • Negative sense • Single stranded • 8 segments, codes 10 proteins • Subtypes classified by 2 surface antigens – Hemagglutinin (HA1-HA16) – Neuraminidase (NA1-NA9) – 144 potential combinations • H5N1, H7N3, etc.  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Avian influenza viruses belong to the genus *Influenzavirus* A in the family Orthomyxoviridae. This is a single stranded minus RNA virus, with segmented genome of 8 RNA segments. These viruses are classified into subtypes (e.g., H5N1 or H7N3), based on their hemagglutinin and neuraminidase proteins. Each virus contains one of sixteen hemagglutinin surface proteins, HA1 to HA16. Each virus also contains one of nine neuraminidase proteins, NA1 to NA9. In combination, this could theoretically result in 144 different subtypes.
Slide 13	**AI Viruses: Genetic Variability (cont'd)** • Gene segments reshuffled – May transfer between species or reemerge later – Abrupt change = Antigenic shift • Error-prone polymerase – High incidence mutations – Gradual change = Antigenic drift  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Influenza viruses change frequently and exhibit wide **genetic variability**. The gene segments that code for the hemagglutinin, neuraminidase and other proteins are often reshuffled between influenza viruses. Influenza viruses that replicate in the same cell can share genetic information. Alternatively, influenza viruses may be transferred wholly from one species to another, or reemerge after a lapsed time period. This can result in an abrupt change in the virus (an antigenic shift) and often results in pandemics, such as the acquisition of a new neuraminidase resulting in a new subtype virus (e.g., NA1 to NA2). Influenza viruses also contain an error-prone polymerase which results in a high incidence of point mutations in the gene segments that code for hemagglutinin and neuraminidase during virus replication. This causes a gradual change in a virus (antigenic drift) which results in annual epidemics. Not only hemagglutinin and neuraminidase undergo change, but all viral proteins. For this reason, an HA1 protein found in one virus is unlikely to be identical to an HA1 protein from another virus. Error-prone polymerases are enzymes that replicate DNA or RNA sequences, but do not have the ability to correct any mistakes made in the process, which can result in changes in (to) the genetic code.

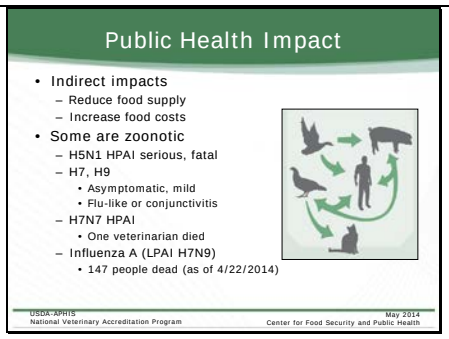
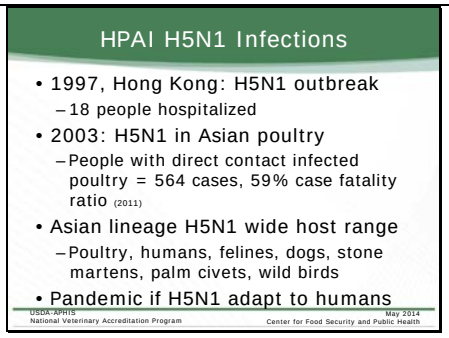
Slide 14		Based on the genetic features of the virus and its virulence for poultry, an avian influenza virus is also classified as either **low pathogenicity** (LPAI) or **high pathogenicity** (HPAI). With few exceptions, LPAI viruses are of low virulence for poultry. HPAI viruses are often fatal in chickens and turkeys and have a high dead rate in birds than LPAI viruses. Most avian influenza viruses are carried asymptomatically in wild birds, particularly waterfowl and shorebirds. Some viruses from wild birds can be transmitted to poultry and spread in these populations.
Slide 15		In poultry, low pathogenicity **avian influenza** (LPAI) viruses typically cause mild disease signs, such as decreased egg production, although increased daily mortality may also be observed. Some LPAI viruses are carried asymptomatically in poultry flocks. In flocks that are co-infected with other pathogens, more severe disease can be seen. Once LPAI viruses enter poultry populations, often via wild birds, viruses that carry H5 or H7 hemagglutinins may mutate or evolve to become HPAI viruses. HPAI viruses can cause severe systemic disease in poultry, and have morbidity and mortality rates up to 100%. These viruses may kill most members of one species while causing few problems in another. Often, chickens and turkeys are much more severely affected than ducks or geese. HPAI outbreaks are very rare compared to outbreaks of LPAI. To date, all known HPAI virus subtypes have contained H5 or H7, **BUT...** not all avian influenza virus subtypes that contain H5 or H7 are HPAI.
Slide 16		**HPAI and LPAI viruses** differ in their distribution in the body. This difference is related to the structure of the hemagglutinin protein, which must be split before the virus can enter cells and replicate. When an H5 or H7 virus becomes an HPAI virus, its hemagglutinin cleavage site changes. LPAI viruses usually cause localized disease in the respiratory (domestic birds mainly) and gastrointestinal tracts (waterfowl mainly). The hemagglutinin in these viruses can only be cleaved by enzymes found in limited locations. HPAI viruses can replicate throughout the body and cause severe systemic disease. The hemagglutinin of an HPAI virus can be split by enzymes found throughout the body. This allows the virus to infect and damage many organs and tissues, leading to disease and death.

Slide 17		The outbreaks in the next two slides describe episodes when HPAI viruses emerged during LPAI epidemics. An H5N2 LPAI virus was first reported in **Pennsylvania** chicken flocks in the spring of 1983. Affected flocks reported slightly increased mortality, decreased egg laying, and respiratory disease. After LPAI viruses had circulated in flocks for several months, an H5N2 HPAI virus emerged in October 1983 and began to kill chickens in large numbers. Up to 80% of affected flocks died within five days of the first symptoms. This virus also spread to some flocks in Virginia, New Jersey and Maryland. These LPAI and HPAI viruses were not eradicated until 1984. The direct costs of eradication were estimated at more than $60 million (approximately $222 million in 2011 dollars) and indirect costs to the poultry industry at more than $250 million (approximately $924 million in 2011 dollars). More than 17 million birds had to be destroyed and egg prices increased by 30%.
Slide 18		Decreased egg laying and increased mortality were reported in **Mexican** flocks late in 1993, and an H5N2 LPAI virus was isolated in 1994. Because the virus was already widespread, eradication was not considered economically feasible. An H5N2 HPAI virus emerged in December 1994 and began killing poultry in large numbers. This virus was eradicated by movement controls and quarantine, depopulation of infected flocks, enforcement of biosecurity, and vaccination. However, the H5N2 LPAI viruses remain endemic in Mexico, Guatemala and El Salvador. Control programs in these countries rely on vaccination and other measures. In addition to the costs of vaccination, affected countries face some limits on international trade. If a new HPAI virus arises from the circulating LPAI viruses, these countries must be ready to bear the costs of another emergency eradication program. HPAI viruses have also emerged from LPAI viruses in other outbreaks, including Australia in 1985, Italy in 1999, and British Columbia in 2004.

Slide 19	**Avirulent HPAI Virus Outbreak** • 2004, Texas – H5N2 isolated from broiler chickens that supplied live bird markets • HA cleavage site identical to HPAI H5N1 virus – Classified as HPAI based on genetic criteria (OIE) – Int'l trade restrictions • Embargoes – 40 countries – Quarantine, depopulated  USDA-APHIS National Veterinary Accreditation Program · May 2014 · Center for Food Security and Public Health	Next we will discuss an **avirulent HPAI virus outbreak.** In early 2004, a flock of broiler chickens in Texas that supplied live bird markets experienced mild respiratory signs and increased mortality. An H5N2 avian influenza virus was isolated from the flock. This virus had a hemagglutinin cleavage site identical to an HPAI H5N1 virus isolated in Scotland in 1959. The virus did not make any birds sick when inoculated intravenously into test chickens in the laboratory. The OIE defines any virus with an H5 or H7 hemagglutinin as an HPAI virus if it meets certain genetic criteria – even if it does not cause severe clinical signs in chickens. For this reason, the virus in Texas was classified as HPAI. Like all HPAI viruses, it resulted in international trade restrictions until the virus was eradicated. The flock was placed under quarantine and immediately depopulated. Two of five live bird markets in Houston received birds from this flock and were depopulated. The other three Houston markets were not linked to the outbreak, but they voluntarily depopulated as a biosecurity measure. Although no other flocks were infected and this virus did not spread beyond the markets, nearly 40 countries placed embargoes on poultry from Texas, or in some cases, the entire U.S.
Slide 20	**Controlling a U.S. LPAI Outbreak** • 2002: Virginia • H7N2 LPAI outbreak – Related to virus in NE U.S. live bird markets since 1994 – Was linked to farms in WV, NC • USDA assistance needed for control/eradication – 190 flocks, 4.7 million birds destroyed  USDA-APHIS National Veterinary Accreditation Program · May 2014 · Center for Food Security and Public Health	In spring and summer 2002, a large **LPAI outbreak** occurred in the Shenandoah Valley of Virginia. It also was linked to nearby farms in West Virginia and North Carolina. The H7N2 virus responsible was related to a virus that had circulated in live bird markets in the northeastern United States since 1994. LPAI outbreaks are usually managed by individual States. However, this virus spread rapidly, overwhelming Virginia's ability to **control** and eradicate it, and State authorities requested assistance from USDA. This was the first time the Federal Government had taken responsibility for controlling an LPAI outbreak in the United States. Over 190 flocks and 4.7 million turkeys and chickens had to be destroyed before the virus was finally eradicated.
Slide 21	**International Definitions**	Understanding the avian influenza terminology used **internationally** is important for communication purposes. The World Organization for Animal Health (OIE) **defines** HPAI, LPAI, poultry, and notifiable AI. Those details are covered next.

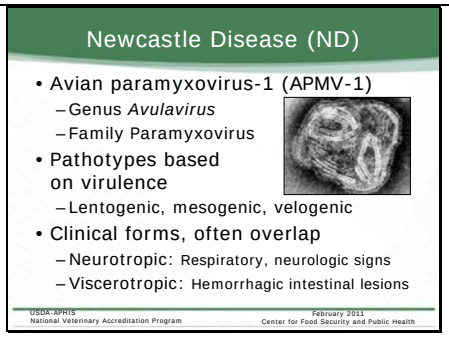
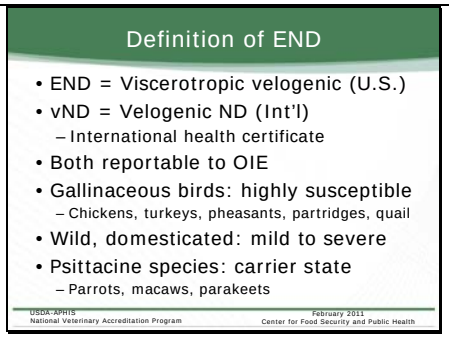
Slide 22	**International Definition: Poultry** • Domesticated birds, including backyard poultry, used to – Produce meat or eggs for consumption – Produce commercial products – Produce game bird restocking supplies – Breed poultry for these purposes • Fighting birds used for any purpose • Not Poultry: – Birds kept in captivity for: • Shows, racing, exhibition, competition or use as pets • Breeding or selling these categories of birds USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	The OIE **internationally defines** poultry to be all domesticated birds, including backyard poultry, used to produce meat or eggs for consumption, produce other commercial products, produce restocking supplies of game birds, or breed poultry for these purposes. It also includes all birds used for fighting purposes (fighting cocks). The OIE does not consider birds kept in captivity for any other reason than those reasons referred to, including those kept for: shows, racing, exhibition, competition or use as pets, or for breeding or selling these categories of birds to be poultry.
Slide 23	**International Definitions (OIE)** • HPAI virus – Meets specific virulence criteria when injected IV into young chickens OR – Contains genetic motifs at HA cleavage site associated with HPAI viruses • LPAI virus – Those that do not meet HPAI definition • All HPAI and H5/H7 LPAI (NAI) – MUST BE REPORTED USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	For the purposes of **international** trade, the World Organization for Animal Health (OIE) **defines** an HPAI virus as a virus that meets specific virulence criteria* when injected intravenously (IV) into young chickens OR contains certain genetic motifs** at the cleavage site of its hemagglutinin that have been associated with HPAI viruses. Any virus meeting either criterion MUST be reported to the OIE, and WILL cause losses in international trade. LPAI viruses are all viruses that do not meet the definition of an HPAI virus, **BUT** because H5 and H7 LPAI viruses can become HPAI viruses, any LPAI viruses with these hemagglutinins **MUST** be reported to the OIE, and could cause losses in international trade. * The isolate is either: 1) Lethal for at least six of eight 4-8 week old chickens within 10 days, when injected intravenously, OR 2) Has an intravenous pathogenicity index (IVPI - a numerical scoring system used to quantify illness and deaths) greater than 1.2 in 6-week old chickens. ** If a virus has an amino acid sequence at the cleavage site similar to any sequence that has previously been reported in an HPAI virus, then this virus is also classified as HPAI. Multiple basic amino acids are a common pattern, but other types of changes can also be seen.
Slide 24	**Notifiable Avian Influenza (NAI)** • NAI viruses – Found in poultry – Must be reported to OIE – All H5 and H7 viruses • NAI country status – Notifiable in country – Awareness program – Suspect cases investigated – Surveillance  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Notifiable avian influenza (NAI)** viruses are all H5 and H7 viruses detected in poultry, regardless of pathogenicity (HPNAI & LPNAI). NAI viruses detected in poultry must be reported to the OIE. Report all HPAI immediately (24hrs) and report H5/H7 LPNAI immediately if found in commercial operations. If found in live bird marketing system (LBMS) or other backyard environments (these are expected findings) report in 6-month report. In order to determine the NAI status of a country, zone, or compartment, the following criteria must be satisfied: NAI must be notifiable in the country; an ongoing NAI awareness program must be in place; all suspect cases must be investigated in the field and if necessary, in the laboratory; and surveillance must be in place to identify subclinical infections.

Slide 25		**NAI** can affect **international trade.** A country, zone or compartment is considered NAI-free when no H5 or H7 viruses have been found in poultry for the last 12 months. A country, zone or compartment can regain its NAI-free status three months after a stamping-out policy has eradicated an HPAI outbreak. It can also regain its NAI-free status three months after an LPAI outbreak, when either stamping out is done or the poultry are slaughtered for human consumption under specific conditions (Controlled marketing).
Slide 26		HPNAI stands for High Pathogenicity Notifiable Avian Influenza and includes all HPAI viruses. Similar to notifiable avian influenza (NAI), **high pathogenicity avian influenza** can affect **international trade.** Criteria similar to the definition of NAI-free are used to define an HPNAI-free country, zone or compartment. A country can qualify as HPNAI-free when its LPAI status is unknown or H5 and H7 LPAI viruses have been isolated. The OIE Terrestrial Animal Health Code, 2011 Chapter 10.4, contains detailed information on international health certificate requirements for exporting poultry, hatching eggs and poultry products from countries, zones or compartments that are either NAI-free, LPNAI-free or HPNAI-free. LPNAI viruses are LPAI viruses that contain the H5 or H7 hemagglutinin. Under the current definitions, a country that is NAI-free is LPNAI-free.
Slide 27		**NAI and International Trade (cont'd).** A zone is a part of a country where the animal population has a distinct health status with respect to a specific disease for international trade. For example, a State that is HPAI-free in a country that is not HPAI-free or does not monitor HPAI. A compartment contains one or more establishments under a common biosecurity management system. A compartment contains an animal subpopulation with a distinct health status with respect to (a) specific disease(s). For example, a turkey breeding company's facilities certified to be NAI-free has several separate farms managed identically under a distinct monitoring and biosecurity program. The entire company's farms would be considered a compartment.
Slide 28		In addition to their effect on poultry and other birds, **avian influenza viruses** may affect **human health**.

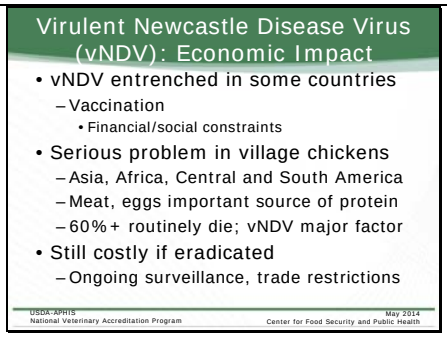
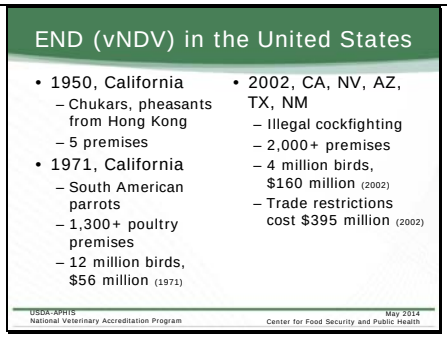
Slide 29		**Public health** can be severely **impacted** by avian influenza viruses. HPAI or LPAI outbreaks in poultry may indirectly influence human health by reducing the food supply and increasing the cost of any available poultry meat and eggs. Some avian influenza viruses are zoonotic. Serious and often fatal disease has been associated with the Asian lineage H5N1 HPAI viruses currently circulating worldwide. Reports of human infections with H7 and H9 viruses have also been published. H7 and H9 viruses have usually caused asymptomatic infections or relatively mild disease with flu-like symptoms or conjunctivitis, but one fatal HPAI H7N7 infection was reported in a veterinarian during an HPAI outbreak in the Netherlands in 2003. The Asian strain HPAI H5Nl has caused illness and death in approximately 386 people since 2003 and has resulted in the culling of millions of poultry in various parts of the world. Since March 2013 Influenza A (LPAI H7N9) virus with pandemic potential has caused illness and death in 147 people (as of 4/22/2014) in the People's Republic of China, Taiwan Province of China, and Sabah State of Malaysia.
Slide 30		Until the late 1990s, avian influenza viruses were thought to have little or no effect on human health. In 1997, an H5N1 outbreak occurred in poultry in Hong Kong. Eighteen people were hospitalized with severe **H5N1 infections** acquired from infected poultry. Beginning in 2003, widespread H5N1 outbreaks were reported in Asian poultry; these viruses eventually spread to poultry on other continents. Cases of avian influenza have been reported in people who had direct contact with infected poultry in Indonesia, the Middle East, northern Africa, and several countries in Asia. According to the World Health Organization, there were 566 cases, 59% of them fatal, as of May 2014. The circulating Asian lineage H5N1 viruses are unusual in their wide host range. In addition to poultry and humans, these viruses can infect cats, tigers, leopards, dogs, stone martens and palm civets. These strains have also caused fatal disease in wild birds, which usually carry influenza viruses asymptomatically. There are fears that an Asian lineage H5N1 virus could become adapted to humans. If this occurred, the virus would spread rapidly from person-to-person, resulting in an influenza pandemic.

Slide 31	**H7N7 Infections** • 2003, Netherlands – 89 confirmed, 258 suspect human infections – Conjunctivitis – Influenza symptoms – 1 fatal acute respiratory distress syndrome • Other H7 outbreaks – Symptomatic and asymptomatic infections  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	In 2003, 89 confirmed and 258 suspected human infections were associated with an HPAI **H7N7** outbreak among poultry in the Netherlands. Most human cases were limited to conjunctivitis, but a few people had influenza symptoms and one veterinarian developed acute respiratory distress syndrome and died. Symptomatic and asymptomatic **infections**, usually limited to conjunctivitis or upper respiratory signs, have also been associated with other H7 outbreaks.
Slide 32	**H9N2 Infections** • LPAI H9N2 circulating in poultry – Asia, Middle East • Blood donors in China – 2% seropositive for H9 viruses • Human LPAI H9N2 infections – Asymptomatic or indistinguishable from human influenza • Disease among pigs in China USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	LPAI **H9N2** viruses circulate in poultry in parts of Asia and the Middle East. At least 2% of human blood donors in China are seropositive for H9 viruses. Human LPAI H9N2 infections appear to be asymptomatic or clinically indistinguishable from human influenza virus **infections**. These viruses have also been associated with disease among pigs in China.
Slide 33	**AI Public Health Prevention** • Generate new viruses – Other species: Humans • Humans with seasonal influenza avoid contact with AI-infected poultry – Prevent cross-infection or combined infection • Annual flu shots – Poultry veterinarians, workers, first responders  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Avian influenza** viruses can be involved in generating new viruses that circulate in other species, including humans. It is important that anyone with human (seasonal) influenza avoid close contact with avian influenza-infected poultry to **prevent** a person from cross-infection or combined infection. Whenever possible, poultry veterinarians, poultry workers, and State/Federal first responders should receive annual flu shots for human influenza.
Slide 34	**Costs of AI Outbreaks** • Trade, economic impact – Loss of export • HPAI outbreaks – Morbidity, mortality – Possible zoonotic impact • LPAI outbreaks – Decreased egg production – Morbidity, mortality, euthanasia, etc. – Mutation of H5/H7 strains to HPAI  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Trade and economic impacts are a concern with HPAI or H5/H7 LPAI **outbreaks**. The loss of export markets in today's world will far exceed any other **costs** associated with AI. HPAI outbreaks are associated with direct losses from morbidity and mortality rates that can reach 100% in affected species and possible zoonotic impact with associated healthcare costs and fear. LPAI outbreaks may be associated with direct losses from decreased egg production, increased morbidity and mortality and other costs of disease (e.g., euthanasia, depopulation, decontamination, disposal, etc.) and H5 or H7 strains that could mutate to HPAI and the above costs will then apply.

Slide 35	**Direct Costs of AI Outbreaks** • Eradication costs – Examining/diagnosing cases – Depopulating, disposing of carcasses – Paying indemnity – Cleaning/disinfecting affected premises – Continued/Enhanced surveillance • $$ Millions to billions  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Eradicating any outbreak incurs **direct costs** from examining and diagnosing cases, depopulating flocks and disposing of carcasses, paying owners/producers for depopulated animals (paying indemnity), cleaning and disinfecting affected premises, and continued/enhanced surveillance to prove disease freedom. The cost of eradication and lost trade can reach millions of dollars from a small, controlled outbreak with only regionalized exports banned. In a larger outbreak, this figure could reach into the billions of dollars.
Slide 36	**Consumer Fear** • Loss of confidence in safety of food supply • Most AI viruses not a human hazard • Consumers may equate *any* AI virus with highly pathogenic zoonotic viruses – Lost income from decreased egg and meat purchases  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	In the event of an avian influenza incident, **consumer fears** can arise. An avian influenza outbreak can cause loss of confidence in the safety of the food supply. Although most avian influenza viruses are not a hazard to humans, incomplete understanding of this disease can cause consumers to equate any virus with highly pathogenic, zoonotic viruses such as the H5N1 HPAI viruses circulating in Asia. This could result in lost income for producers from decreased egg and meat purchases, even after an outbreak has ended.
Slide 37	**Newcastle Disease**	Next we will review the history, etiology, and other information about **Newcastle Disease**.
Slide 38	**History** • 1926 – England, Indonesia • Outbreaks resembled AI • Several panzootics – Spread slowly at first, then rapidly • 1930s, CA: Milder form – Death rate below 15% • Mid-1940s: U.S. spread  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	A brief **history** of Newcastle disease: Newcastle disease was discovered nearly 50 years after avian influenza. The first reported outbreaks of Newcastle disease occurred in 1926, at Newcastle-on-Tyne, England and in Java, an island in Indonesia. Because these outbreaks resembled AI, some prominent veterinarians insisted, at first, that Newcastle disease was just another form of fowl plague. Before outbreaks could be unequivocally distinguished with diagnostic tests, "fowl pest" was sometimes used to describe both diseases. Several panzootics of virulent Newcastle disease have occurred. The first, which began in 1926, spread very slowly. Later panzootics spread much more rapidly, because transportation of animals and people had become more efficient. Milder forms of Newcastle disease were also discovered. One form was first seen in California in the 1930's, as an outbreak of pneumoencephalitis. This outbreak was not recognized at first as Newcastle disease, because the death rate was usually below 15%, and neurological signs (which are common with virulent

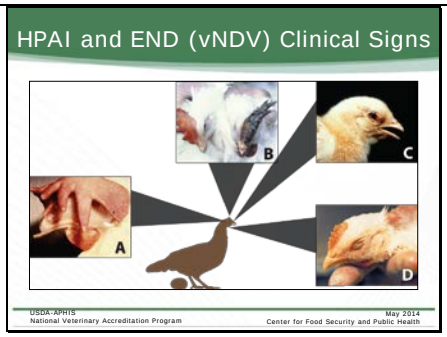
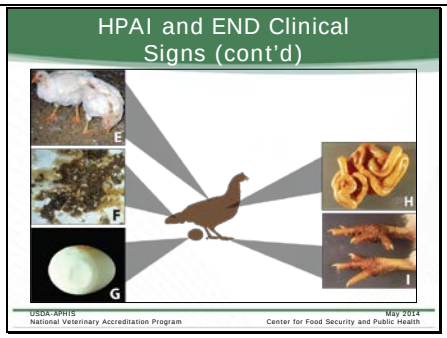
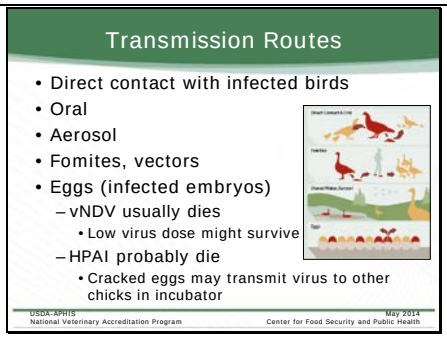
		Newcastle disease) were not prominent. By the mid-1940s, this form of Newcastle disease had spread across much of the United States.
Slide 39		**Newcastle disease** viruses are of the serogroup avian paramyxovirus-1 (APMV-1) in the genus *Avulavirus* (family Paramyxovirus). APMV-1 isolates can be classified as one of three pathotypes, based on their virulence for chickens – lentogenic (least virulent), mesogenic (moderately virulent), or velogenic (most virulent). The milder strains are endemic in the U.S. We will discuss the pathotypes in more detail on the next slide. The pathotypes can also be subdivided into a neurotropic form, which is typically associated with respiratory and neurologic signs, and a viscerotropic form with hemorrhagic intestinal lesions. These clinical forms overlap and are rarely clear-cut.
Slide 40		In the U.S., **exotic Newcastle disease (END)** is **defined** as the viscerotropic velogenic form of the disease. However, all highly pathogenic APMV-1 viruses, including neurotropic velogenic strains, impact international trade and must be reported to the World Organization for Animal Health (OIE)*. For the purposes of this module, END will be the term used for the disease caused by any highly pathogenic (velogenic) APMV-1 virus. The term END may not be recognized outside the U.S. When filling out an international health certificate, the disease should be referred to as velogenic Newcastle disease (vND). *The World Organization for Animal Health, formerly known as the Office International des Epizooties or OIE, is the international body that sets standards for important animal diseases ("OIE-listed diseases") affecting international trade. The OIE also collects and disseminates information about disease outbreaks. Nations recognized as free of an OIE-listed disease must report any change in this status to the OIE immediately. END and HPAI are both OIE-listed. END is highly contagious and has serious consequences for infected poultry. Chickens and some other gallinaceous** birds are very susceptible to this disease; the morbidity and mortality rates can be as high as 100%. Other species of wild and domesticated birds can be mildly to severely affected. A carrier state exists in some birds, particularly psittacine*** species. **Gallinaceous: Family of birds that includes chickens, turkeys, pheasants, partridges, quail and other related birds. ***Psittacine: Family of birds which includes parrots, macaws and parakeets.

Slide 41	**Newcastle Disease Pathotypes** **Lentogenic** / **Mesogenic** / **Velogenic** Common / Uncommon / Absent in U.S. Subclinical / Intermediate virulence: Occasional neurological signs / Most serious poultry disease in world Mild respiratory disease, decreased egg production & quality, weight loss / Death without clinical signs Negligible mortality / Low mortality / High mortality No effect on trade / Shut down trade USDA-APHIS National Veterinary Accreditation Program — February 2011 Center for Food Security and Public Health	**Newcastle disease (ND) pathotypes** include lentogenic, mesogenic, and velogenic. Lentogenic APMV-1 viruses are common in wild and domesticated birds throughout the world. These viruses are often carried subclinically, but they sometimes cause mild respiratory disease, decreased egg production and/or weight loss. The mortality rate is usually negligible. Lentogenic and mesogenic viruses can decrease productivity, but do not affect international trade. Mesogenic APMV-1 viruses, which are uncommon, are intermediate in virulence. These viruses can cause respiratory signs, decreased egg production and quality, and weight loss. They are occasionally associated with neurological signs, but the mortality rate is relatively low. Lentogenic and mesogenic viruses can decrease productivity, but do not affect international trade. Velogenic APMV-1 viruses are absent from domesticated birds in the U.S and cause one of the most serious poultry diseases in the world. These viruses are so virulent that, in very susceptible species such as chickens, many birds die before showing any clinical signs. Their presence in commercial poultry can shut down international trade. Velogenic APMV-1 viruses are often introduced in imported birds, but they may also arise by mutation from less pathogenic APMV-1 viruses.
Slide 42	**Exotic Newcastle Disease (END)** • Viscerotropic velogenic Newcastle disease (VVND) – *In vivo* pathogenicity tests in chickens • Highly contagious poultry – Up to 100% morbidity/mortality • Chickens very susceptible • Ducks and geese – Asymptomatic, mild USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	The United States uses the term **exotic Newcastle disease** (END) to describe viscerotropic velogenic Newcastle disease (VVND). END is defined based on *in vivo* pathogenicity tests in chickens. END is highly contagious in poultry, and can cause up to 100% morbidity and mortality in some species. Chickens are very susceptible to this disease. Other species of birds can be mildly to severely affected. Ducks and geese usually remain asymptomatic or mildly affected; however, some strains that emerged in China in the late 1990s have caused disease in geese.
Slide 43	**International Definition (OIE)** • Infection with APMV-1 virus meets one of these – Intracerebral pathogenicity index in day-old chicks of 0.7 or greater **OR** – Contains certain genetic motifs in F1 and F2 proteins associated with virulent viruses • U.S. considered disease-free, both descriptions  USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	The OIE Terrestrial Manual 2009 **internationally defines Newcastle disease** as infection with APMV-1 virus that meets one of the following criteria for virulence: • It has an intracerebral pathogenicity index (ICPI) in day-old chicks of 0.7 or greater **OR** • It contains certain genetic motifs in its F1 and F2 proteins that have been associated with virulent viruses. APMV-1 viruses with this characteristic are found in a wide range of cells and tissues. Viruses that do not contain these motifs have a restricted distribution in the body. Although the OIE definition of Newcastle disease differs technically from the U.S. definition of exotic Newcastle disease, the United States is considered disease-free under both descriptions. For the purposes of this presentation, END will be the term used for the *disease* caused by any highly pathogenic (velogenic) APMV-1 virus in the United States. The term vNDV will be used to describe the virulent

		strain of the virus causing highly pathogenic disease.
Slide 44		**Virulent Newcastle disease virus** (vNDV) strains are entrenched in some countries. In some countries, the virulent forms of Newcastle disease are controlled to some extent by vaccination. In others, financial and social constraints make control difficult, and losses can be devastating. Newcastle disease is often a serious problem in village chickens. Enormous populations of village chickens are found in many parts of Asia, Africa, and Central and South America. These birds are an important source of protein from meat and eggs. In some countries, up to 60% of village chickens routinely die; Newcastle disease is a major factor in these deaths. Countries that have eradicated vNDV strains, such as the United States, have ongoing costs from surveillance. They can also periodically face the cost of eradicating an outbreak, as well as the trade restrictions that result from the outbreak.
Slide 45		vNDV viruses have periodically caused outbreaks of exotic Newcastle disease (END) in the United States. The first outbreak occurred in California in 1950, among chukars and pheasants imported from Hong Kong. The disease spread to five poultry farms, but it was quickly eliminated by destroying the infected chickens. In 1971, a major outbreak occurred in southern California, when poor biosecurity at a bird importer allowed infected parrots from South America to contact neighboring commercial poultry. This infection spread rapidly and affected more than 1,300 premises. Vaccination was used to control the outbreak at first, but it was not effective until it was combined with aggressive destruction of infected birds and improved biosecurity. It took nearly 2 ½ years to eradicate the disease, and almost 12 million birds were destroyed. At the time, the eradication effort cost taxpayers approximately $56 million (which corresponds to approximately $543 million in 2011). Another outbreak of exotic Newcastle disease began in California in 2002. The introduction of the disease was due in part to illegal cockfighting, and the virus eventually spread to Nevada, Arizona, Texas, and New Mexico. More than 2,000 premises were affected. Eradication cost taxpayers $160 million (which corresponds to approximately $209 million in 2011), and approximately 4 million birds had to be destroyed. The impact from trade restrictions was estimated at $395 million (which corresponds to approximately $515 million in 2011).

Slide 46	**International Trade and vNDV** • Countries free from vNDV when: – Viruses **not** present for past 12 months, based on surveillance in accordance with OIE • Country can regain disease-free status 3 months after stamping out – OIE documents country as "Newcastle-disease free" rather than "END-free" – Zones considered infected for 21 days after stamping out USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Countries are considered free from vNDV when these viruses have **not** been present for **the past 12 months, based on surveillance in accordance with the OIE Terrestrial Animal Health Code 2011.** After an outbreak, a country can regain its Newcastle disease-free status three months after a stamping out policy is applied. Because the OIE defines Newcastle disease as the reportable disease caused by vNDV, OIE documents will state that a country is "Newcastle disease-free" rather than "END-free." Zones are considered infected for at least 21 days after stamping-out the last confirmed case.
Slide 47	**International Trade and vNDV** • OIE Terrestrial Animal Health Code 2011, Chapter 10.9 – Health certificate requirements for poultry exports, hatching eggs, products – Visit the OIE website • APHIS Import/Export website – USDA-recognized animal health status of countries and regions – Visit the USDA-APHIS import and export website  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	The OIE Terrestrial Animal Health Code 2011, Chapter 10.13, contains detailed information on the international health certificate requirements for exporting poultry, hatching eggs and poultry products from countries, zones or compartments that are Newcastle disease free. Information on the USDA-recognized animal health status of countries and regions for poultry diseases can be found on the Import/Export section of the APHIS website.
Slide 48	**Economic Impact of Exotic Newcastle Disease** **Losses Incurred from Eradicating END** Direct: Examining and diagnosing cases; Depopulating and disposing of animals; Paying owners/producers for depopulated animals (paying indemnity); Cleaning and disinfecting affected premises; Continued surveillance to prove freedom from disease Indirect: Lost international trade; Increased food costs; Other losses USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	In addition to the direct losses to producers due to the high morbidity and mortality rates (up to 100%), this chart lists the direct and indirect **economic impacts** of eradicating **END**. Direct costs result from examining and diagnosing cases, depopulating and disposing of animals, paying owners or producers for depopulated animals (paying indemnity), cleaning and disinfecting affected premises, and continued surveillance to prove freedom from disease. Indirect losses can occur from lost international trade, increased food costs, and other losses.
Slide 49	**Newcastle Disease: Zoonotic Impact** • Conjunctivitis – Exposed to large quantity – Not life-threatening • Immunocompromised may experience severe pneumonia – 2007: AMPV-1 isolated • Fatal pneumonia in stem cell transplant patient  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Newcastle disease** can potentially have a **zoonotic impact**. Newcastle disease viruses can cause conjunctivitis in humans, this condition usually occurs in people exposed to large quantities of virus. It is not life-threatening. However, it might be possible for APMV-1 to cause severe pneumonia in immunocompromised individuals. In 2007, AMPV-1, possibly of pigeon origin, was isolated from a patient with fatal pneumonia. The illness occurred 18 days after the patient had received a peripheral blood stem cell transplant; immunosuppression from the procedure and the drugs taken to suppress graft rejection probably allowed the infection to occur. APMV-1 appeared to be the only pathogen involved.

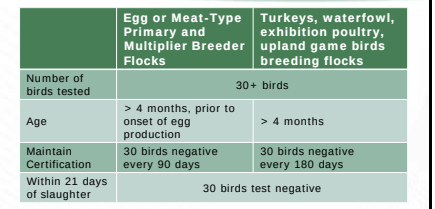
Slide 50	**Recognizing END (vNDV) and HPAI**	As an accredited veterinarian, you need to **recognize the signs of HPAI or END** in a flock as soon as possible. Those details are provided next.
Slide 51	Recognizing END (vNDV) and HPAI • **Clinically indistinguishable** • Nonspecific clinical signs – Vary with outbreak, flock • Respiratory signs – Coughing, sneezing, nasal discharge, dyspnea, cyanosis (head, comb, and wattles) • Neurologic signs – Depression, ataxia, torticollis  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	These two diseases are ***clinically indistinguishable***. The clinical signs are nonspecific, vary with the outbreak and flock, and may include: **Respiratory signs:** Coughing, sneezing, nasal discharge, dyspnea, cyanosis (particularly of the head, comb, and wattles). **Neurologic signs:** Depression, ataxia, torticollis; (torticollis means a contraction, often spasmodic, of the muscles of the neck, chiefly those supplied by the spinal accessory nerve, which results in the head being drawn to one side. Also commonly referred to as "wry neck".)
Slide 52	Recognizing END (vNDV) and HPAI • Digestive signs – Watery diarrhea, decreased food, water • Hemorrhagic signs – Petechial and ecchymotic hemorrhages, blood-tinged oral/nasal discharges • Sudden death, decreased egg production, thin-shelled or misshapen eggs, swelling of head, eyelids, comb, wattles, hocks • No signs pathognomonic USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	There are also several digestive and hemorrhagic signs to look for when **recognizing END and HPAI**. **Digestive signs:** Watery diarrhea, decreased food and water consumption; **Hemorrhagic signs:** Subcutaneous petechial and ecchymotic hemorrhages, blood-tinged oral and nasal discharges; **Other signs:** Sudden death without clinical signs, decreased egg production, thin-shelled or misshapen eggs, and swelling of the head, eyelids, comb, wattles, and hocks. Because the signs of END and HPAI are variable and influenced by other factors, none of these signs are pathognomonic. Under some circumstances, non-virulent ND or LPAI viruses could also mimic HPAI and END. The photos on the next slides depict some of the clinical signs of poultry infected with HPAI or END. The *END and HPAI Reference Chart* is available as a handout in the web module and in the appendix of the print manual for more detailed information. *Presenters: This handout can be found at the end of this PDF. If you printed a hard copy, hold it up for demonstration purposes.*

Slide 53		**Clinical images of HPAI and END.** A. Congestion and edema of the comb and wattles B. Cyanosis of the wattle and comb C. Respiratory signs such as sneezing, gasping for air, nasal discharge, and coughing D. Swelling of tissues around the eyes and in the neck For more information, an END and HPAI Reference Chart is available as a handout in the web module and in the appendix of the print manual. An Avian Influenza (AI) Disease Brief and an Exotic Newcastle Disease (END) Disease Brief are also available. These can be used as references. *Presenter: These handouts can be found at the end of the speaker notes PDF provided. If you printed a hard copy, hold it up for demonstration purposes.* Graphic: Clinical signs in a bird affected with HPAI or END. *Illustration by: Andrew Kingsbury, Iowa State University. Photo sources: A,C- Darrell Trampel, Iowa State University; B- USDA; D- AAAP.*
Slide 54		Additional **clinical images of HPAI and END.** E. Nervous signs may include depression, muscular tremors, drooping wings, twisting of head and neck, circling, and complete paralysis F. Greenish, watery diarrhea G. Decreased egg production, soft-shelled or misshapen eggs H. Hemorrhagic lesions of the gastrointestinal tract I. Shanks are swollen (edema) and extensively reddened (hemorrhages)
Slide 55		There are several **transmission routes** associated with HPAI and END. Avian influenza and Newcastle disease are spread by direct and indirect contact with infected birds. Birds may ingest these viruses in contaminated feed or water, or when they peck at each other and their environment. Birds can also inhale viruses in aerosol droplets from respiratory secretions. APMV-1 and avian influenza viruses can also spread on fomites and living mechanical vectors, including humans. Finally, APMV-1 and HPAI viruses can be found in eggs. An embryo infected with vNDV will usually die before hatching; however, a few embryos infected with low doses of the virus might survive and hatch. HPAI viruses can also occur in eggs. These embryos will probably die, but cracked eggs can transmit the virus to other chicks in the incubator. It is unknown whether LPAI viruses can be transmitted in eggs.

Slide 56	**Recognition of END (vNDV) and HPAI** • END, HPAI typically very contagious, fatal – Aids in recognition • Rate of spread affects: – Number of birds that develop clinical signs • More rapid in group housed flocks than caged birds – Rate mortality rate rises • Often exponential USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**END and HPAI** are typically very contagious and highly fatal. This characteristic can help in their **recognition**. Once the mortality rate begins to rise, it often rises exponentially. HOWEVER, how rapidly a virus spreads between birds affects the number of birds that develop clinical signs and the speed at which the mortality rate rises. Transmission is expected to be more rapid in group-housed flocks than among birds housed in cages. Be suspicious of **any** outbreak suggestive of HPAI or END, even if it appears to be confined at first to birds in a limited area.
Slide 57	**Recognition of Notifiable LPAI** • H5 and H7 LPAI **reportable** in all States • Asymptomatic or resemble any other LPAI outbreak • Clinical signs more severe in flocks co-infected with other pathogens, other stressors **Clinical Signs of H5 or H7 LPAI** Increased "daily" mortality Decreased feed and water consumption Decreased egg laying Decreased fertility and hatchability of eggs Depression/lethargy Respiratory signs: Ocular and nasal discharge, facial edema/swollen infraorbital sinuses, conjunctivitis Diarrhea USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Recognition of notifiable LPAI** is also important. H5 and H7 LPAI infections are **reportable** in all States. These diseases can be asymptomatic, or they may resemble any other LPAI outbreak. The clinical signs of LPAI are more severe in flocks co-infected with other pathogens or affected by other stressors. The pattern of signs varies with the flock and may include increased "daily" mortality, decreased feed and water consumption, decreased egg laying, decreased fertility and hatchability of eggs, depression/ lethargy, respiratory signs including ocular and nasal discharge, facial edema/swollen infraorbital sinuses, and conjunctivitis, and diarrhea (as listed in the chart).
Slide 58	**Differential Diagnoses for END (vNDV) & HPAI**	Next we will review **differential diagnoses** for diseases that share some or all of the clinical signs of **END** and **HPAI** in poultry and all avian species. As mentioned previously, END and HPAI are CLINICALLY INDISTINGUISHABLE from each other, and other diseases of poultry share some of the same clinical signs and would be included on a different differential list. A handout, "Differential Diagnoses for END/HPAI", provides more details for reference. *Presenters: This handout can be found at the end of the speaker notes PDF provided. If you printed a hard copy, hold it up for demonstration purposes.*
Slide 59	**Differential Diagnosis (DDx)** **In Poultry** • Fowl/Avian cholera (*Pasteurella*) • Fowl pox (diphtheritic or wet form) • Infectious coryza • Infectious laryngotracheitis (ILT) • Mycoplasmosis • Infectious bronchitis (IB) • Low pathogenicity avian influenza (LPAI) • Management problems  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Differential diagnosis (DDx) for HPAI and END** in **poultry** includes fowl cholera, fowl pox, infectious coryza, infectious laryngotracheitis (ILT), mycoplasmosis, infectious bronchitis (IB), and low pathogenicity avian influenza (LPAI). Of these diseases, certain strains of fowl cholera, ILT, mycoplasmosis, IB, and LPAI are reportable to OIE – contact your SAHO. LPAI is also a zoonotic disease. Management problems may also cause some of the same clinical signs.

Slide 60	DDx (cont'd) **All Avian Species** • Avian cholera • Avian chlamydiosis • Calcium deficiency • Encephalomalacia • Severe parasitism • Salmonellosis • Toxicosis  USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Differential diagnoses (DDx) for HPAI and END** for **all avian species** includes avian chlamydiosis, calcium deficiency, encephalomalacia, severe parasitism, salmonellosis, and toxicosis. Avian chlamydiosis is reportable to OIE, as is salmonellosis in some states. Contact your State Animal Health Official (SAHO) if you encounter these diseases. Avian chlamydiosis and salmonellosis are also zoonotic diseases. Some parasites carry zoonotic diseases; screwworms are a foreign animal and are reportable to OIE – contact your SAHO.
Slide 61	DDx for LPAI • Infectious bronchitis • Infectious laryngotracheitis • Mildly pathogenic Newcastle disease • Other paramyxovirus infections • Mycoplasmosis • Infectious coryza • Ornithobacteriosis • Turkey coryza • Respiratory form of fowl cholera • Aspergillosis USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Differential diagnoses (DDx) for LPAI** resembles many other respiratory diseases or causes of decreased egg production, including infectious bronchitis, infectious laryngotracheitis, mildly pathogenic Newcastle disease, other paramyxovirus infections, mycoplasmosis, infectious coryza, respiratory form of fowl coryza, and aspergillosis. Aspergillosis can cause opportunistic respiratory disease. Susceptibility increases with stress, poor management, respiratory irritants, concomitant disease, or the use of antibiotics or steroids. Clinical signs include weight loss, depression, and respiratory distress. Neuromuscular abnormalities are seen occasionally. Acute overwhelming infections are characterized by dyspnea or sudden death. Aspergillosis is a zoonotic disease.
Slide 62	**Reporting and Surveillance**	We will now review **reporting** requirements **and surveillance** procedures related to highly pathogenic avian influenza (HPAI) and exotic Newcastle disease (END).
Slide 63	Reporting Clinically Evident NAI (HPAI/LPAI) or END • **IMMEDIATELY** contact State, Federal regulatory officials • Do **NOT** attempt diagnosis – FADD will obtain and submit samples to authorized lab • H5 and H7 LPAI (NAI) reportable to **all** States, Federal government, OIE  USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	In suspect cases of **HPAI or END**, **IMMEDIATELY** contact State and Federal regulatory officials. Do **NOT** attempt to diagnose these infections yourself. A Foreign Animal Disease Diagnostician (FADD) will likely be assigned to obtain samples and submit them to an authorized laboratory. Remember, H5 and H7 LPAI (NAI) infections are **reportable** in **all** States, the federal government, and the OIE.

Slide 64	**Surveillance for END (vNDV)** • Tested upon import – Poultry, pet birds, ratites, zoo birds • Passive surveillance • Sampling of sick/dead birds at exhibitions • Commercial samples – Swabs, dead bird pickup at no or reduced cost  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	Birds, including poultry, pet birds, ratites, and zoo birds, are tested for exotic Newcastle disease during import testing. END may also be recognized by passive surveillance, when outbreaks are recognized after clinical signs are seen. Sick or dead birds may be sampled at fairs, shows, and exhibitions. No cost or reduced cost diagnostic assistance may be provided by routine pick-up of dead birds and/or swabs of birds at commercial facilities. Some states may have other programs for routine END surveillance in poultry. Become familiar with any programs in your State.
Slide 65	**Surveillance for AI** • Field detection • Routine surveillance • Import of birds • Interstate shipment • USDA LPAI surveillance plans 1. NPIP 2. LBMS 3. Wild bird surveillance 1. NPIP – National Poultry Improvement Plan AI Clean and Monitored programs – Voluntary, commercial poultry operations 2. LBMS – Live Bird Marketing System Prevention and Control Program for NAI 3. Wild bird morbidity and mortality events USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	Besides detection in the field, **avian influenza** can also be identified during routine **surveillance**, upon import of birds, or during interstate shipment. Because H5 and H7 LPAI infections are reportable to the States, Federal government, and OIE, the USDA has developed three LPAI surveillance plans, NPIP, LBMS and Wild bird surveillance. 1) The Avian Influenza Clean and Monitored programs of the National Poultry Improvement Plan (NPIP), a voluntary cooperative Federal-State-industry program that prevents disease transmission in commercial poultry breeding and production operations, 2) the Live Bird Marketing System (LBMS) Prevention and Control Program for Notifiable Avian Influenza (NAI), and 3) the wild bird surveillance plan. Other State programs may exist.
Slide 66	**NPIP Avian Influenza Clean** • AGID or ELISA tests for serum antibodies • rRT-PCR, antigen capture test, or virus isolation • Classifications achieved: – Avian Influenza Clean • Egg and meat-type chicken breeder flocks – H5/H7 AI Clean • Meat-type turkey, waterfowl, exhibition poultry & upland game bird breeder flocks  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	There are several things that must be done in order for a flock to be classified as **NPIP Avian Influenza Clean.** Birds can be tested for avian influenza with the agar gel immunodiffusion (AGID) or enzyme-linked immunosorbent assay (ELISA) test for serum antibodies, or for virus with a real-time reverse transcriptase polymerase chain reaction (rRT-PCR) or antigen capture test. The rRT-PCR test detects genetic material (RNA) from an influenza virus. It is very sensitive and can find even tiny amounts of RNA. The antigen capture test detects viral proteins found in influenza viruses. If positive birds are **not** found, two options for classification exist: • Egg and meat-type chicken breeder flocks are certified Avian Influenza Clean • Meat-type turkey, waterfowl, exhibition poultry & upland game bird breeder flocks are certified H5/H7 Avian Influenza Clean.

Slide 67	**NPIP Avian Influenza Clean (cont'd)**  USDA-APHIS National Veterinary Accreditation Program — May 2014 — Center for Food Security and Public Health	To be designated **NPIP Avian Influenza Clean**, for egg-type and meat-type primary and multiplier breeding flocks, at least 30 birds must be tested, and the birds tested must be more than 4 months of age and prior to the onset of egg production. Once the flock has qualified, at least 30 birds must be serologically negative or virus negative every 90 days to maintain the certification. Thirty (30) birds must test negative within 21 days of slaughter. Turkeys, waterfowl, exhibition poultry, and upland game birds breeding flocks can also participate in the H5/H7 Avian Influenza Clean program. For primary breeding flocks to qualify, a minimum of 30 birds must test negative for antibodies to avian influenza when the flock is more than 4 months of age. Then to retain qualification, a sample of at least 30 birds from the flock must test negative at intervals of 90 days. After multiplier breeding flocks qualify, a sample of at least 30 birds from the flock must test negative at intervals of 180 days to retain the classification. Thirty (30) birds must test negative within 21 days of slaughter.
Slide 68	**NPIP H5/H7 Avian Influenza Monitored** • NPIP Program for production flocks – Commercial egg-laying flocks – Meat-type chickens and turkeys – Meat-type waterfowl & Upland game birds – Raised-for-release waterfowl & upland game birds – Testing requirements vary – All programs allow serum or egg yolk testing for AI antibodies U.S. H5/H7 Avian Influenza MONITORED NPIP USDA-APHIS National Veterinary Accreditation Program — May 2014 — Center for Food Security and Public Health	Commercial egg-laying flocks, meat-type chickens, meat-type turkeys, meat-type waterfowl & upland game birds and waterfowl & upland game birds raised-for-release can participate in the **H5/H7 Avian Influenza Monitored** program of the **NPIP**. Specific testing requirements vary. Avian Influenza Clean, H5/H7 Avian Influenza Clean and H5/H7 Avian Influenza Monitored programs allow serum or egg yolk testing for AI antibodies.
Slide 69	**Live Bird Marketing System (LBMS) for H5/H7 AI** • Prevent, control persistent LPAI infections in LBM, their suppliers & distributors • State participation – Voluntary Federal/State cooperative program – Registration/Licensing requirements – Written biosecurity protocols, bird testing and recordkeeping • Positive LBM = mandatory closure – Depopulate, C&D, inspection to reopen USDA-APHIS National Veterinary Accreditation Program — May 2014 — Center for Food Security and Public Health	Persistent LPAI infections continue to be a problem at live bird markets and their suppliers. The **Live Bird Marketing System (LBMS) program for Notifiable Avian Influenza** is a State/Federal/Industry cooperative program to prevent and control NAI (H5 and H7 LPAI) in live bird markets (LBM), their producers and their distributors. States can participate in this program if all live bird markets, producers and distributors are registered/licensed, allow Federal/State inspectors access to their facilities, have written biosecurity protocols, and participate in testing. Periodic samples may be collected from birds and the environment at producers, distributors, and markets. A live bird market (LBM) that tests positive will undergo mandatory market closure by the State and will be required to depopulate and perform cleaning and disinfection. No additional birds will be allowed to enter the LBM or reopen for business until it passes inspection by a State or Federal animal health official.

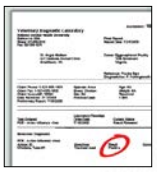
Slide 70	**Passive Surveillance** • All laboratories that perform diagnostic procedures on poultry must examine all submitted cases of: – Respiratory disease – Unexplained egg production drops – Unexplained severe mortality • Must use approved serological tests, antigen detection tests  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Passive surveillance** requires that all laboratories that perform diagnostic procedures on poultry will be required to examine all submitted cases of respiratory disease, unexplained egg production drops, and unexplained severe mortality for avian influenza by both an approved serological test and an approved antigen detection test. This requirement helps detect infections in live bird markets and their suppliers, as well as in commercial poultry.
Slide 71	**Additional Surveillance** • Poultry in high risk areas – Free range (non-confinement) flocks – Poultry raised near wetlands – Sick bird calls – State may perform • Free post-mortem examinations • Free testing for AI • Wild birds – Focuses on sampling of wild bird morbidity/mortality events USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Owners of backyard poultry should be encouraged to report illness in their flocks to a veterinarian, extension agent, and/or state animal health diagnostic laboratory. Free post-mortem examinations and free testing for avian influenza are available in most States. States may conduct routine **surveillance** in backyard poultry and birds at swap meets, exhibitions, auctions, flea markets, and small sales. National surveillance programs monitor wild birds, particularly waterfowl and shorebirds migrating along major flyways and focuses on morbidity/mortality events. Outbreaks of disease in wild birds are also investigated.
Slide 72	**Indemnity Benefits for Participation** • The program provides for indemnity for infected premises • APHIS is authorized to pay 100 percent of eligible costs from participating flocks in States that: – Participate in an APHIS approved diagnostic surveillance program for H5/H7 LPAI – Have APHIS approved Initial State Response and Containment Plan • Pays for 100% costs of depopulation, C&D, and disposal as referenced in 9 CFR part 56. • Only 25% indemnity provided for commercial or breeder flocks that do not participate in NPIP • LBMS & small flocks are eligible for 100% indemnity USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	There are **indemnity benefits for participation** in the NPIP AI Clean and AI Monitored Program. States formerly handled indemnification for LPAI. As of October 2006 in the Code of Federal Regulations, Title 9 Part 56.3, the USDA provides 100% indemnity for LPAI viruses in flocks that participate in active surveillance, as long as the State participates in passive/diagnostic surveillance and has an APHIS approved Initial State Response and Containment Plan. Commercial facilities that do not participate in active avian influenza surveillance, or facilities in states that do not have passive surveillance and an APHIS approved Initial State Response and Containment Plan, only receive 25% indemnity. For more information about indemnity and the Initial State Response and Containment Plan, please see 9CFR Chapter I, Subchapter B, Part 56, Control of H5/H7 LPAI . Note: All LBMS sector participants & small flocks in participating states are eligible for 100% indemnity.
Slide 73	**Reporting a Suspect Avian Disease Outbreak**	The next few slides will outline a real-life, hypothetical scenario to emphasize the information previously presented and apply it to identifying and **reporting a suspected avian disease outbreak.**

Slide 74	**Scenario** • Poultry veterinarian – Rural eastern U.S. • Clients range from large, modern egg production facilities to small broiler farms – Varied biosecurity – Large migratory flyway • Geese, other waterfowl  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Scenario:** As a poultry veterinarian in a rural area of the eastern U.S., your clients range from large, modern egg production facilities to small broiler farms with one to two barns per facility. While some of your clients have modern premises with excellent biosecurity, at times it can be a struggle to get others to establish and follow good protocols. An additional complication is that your area is on the flyway for many migratory birds. Each spring and fall, large flocks of geese and other waterfowl settle on fields and ponds to feed and rest during their migration. Today, you have several clients to see.
Slide 75	**First Farm Visit** • Producer sells eggs to local health food markets, also maintains small breeder flock of chickens – 2000 birds – Aviary housing – Excellent biosecurity – Participation in several aspects of the NPIP program USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**First farm visit:** Your first client is a producer who sells eggs to local health food markets and also maintains a small breeder flock of 2000 exotic chickens. He practices excellent biosecurity, and his facility participates in several aspects of the NPIP program.
Slide 76	**First Farm Visit (cont'd)** • Taking samples for initial certification of his flock in the AI Clean program – Serum samples for antibody testing • 30 birds • At least 4 months old • State is compliant with all USDA requirements  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	He has heard about the Avian Influenza Clean program and would like to participate. Today, you will be taking the samples for the initial certification. You arrive at the **farm** and find your client waiting. You have several testing options, and have decided to submit serum for antibodies. You check to make sure you have all of the information you need for the paperwork, collect your equipment, and take individual serum samples from 30 birds that are at least 4 months old. You are in a State that is in compliance with all USDA requirements.
Slide 77	**Necropsy** • 1 chicken died suddenly yesterday • Remaining chickens look healthy • Necropsy – No significant lesions – Submit samples to the lab  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	Incidentally, your client mentions that one of his chickens died suddenly yesterday, and he would like you to conduct a **necropsy** on the bird. The remaining chickens all look healthy. He reports no other losses during the past week. The necropsy reveals no significant lesions, but you collect some samples to submit to the lab.

Slide 78	**Follow-Up** • Unlikely to be AI, END at this point – Would expect rapid spread in an aviary – Many other possibilities • Biosecurity – Samples in cooler – Used supplies in bags for later disposal – Clean and disinfect boots, equipment – Remove coveralls, disinfect boots, wash hands, depart USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Follow-up:** What differentials come to mind based on this information? Although avian influenza or exotic Newcastle disease are among the many possibilities for the death of this bird, there is currently nothing to indicate that these diseases are very likely. In an aviary, you would expect a highly contagious disease to spread quickly. Although you'll want to be careful in your biosecurity measures to avoid becoming a traveling vector for disease, there is no reason to report a possible END or avian influenza outbreak in these circumstances. You put the tissue and blood samples in the cooler, place your used supplies in plastic bags for later disposal, clean up your equipment, and disinfect appropriately. You remove your coveralls, scrub and disinfect your boots, wash your hands, and go on to the next call.
Slide 79	**Next Farm Visit** • Large egg production facility – Battery caged – Excellent biosecurity – Participation in several aspects of NPIP • Investigating clinical signs associated with a drop in egg production and feed consumption in one barn • Park at a distance, wear clean coveralls, boots USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	**Next farm visit:** Your next client operates a large egg-production facility. The hens are battery caged, the biosecurity is excellent, and the facility participates in several aspects of the NPIP. Your visit today is to investigate clinical signs associated with a drop in egg production and feed consumption in one barn. When you enter the farm, you park away from the production area. You put on clean coveralls and boots when you leave your vehicle.
Slide 80	**Next Farm Visit (cont'd)** • 100,000 birds each barn • Barn one: Deaths – Yesterday, 100+ dead – 10% drop feed consumption – Egg production 94-95% of normal – Respiratory signs, watery stools  • Barn two: Normal USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	This **next farm** contains two barns, each with approximately 100,000 birds. The farm manager reported that two days ago, three dead birds were found in one barn. Yesterday, there were more than 100 dead birds in the same barn, feed consumption was down 10%, and egg production was 94-95% of normal. Some of the birds in the affected barn have begun to show respiratory signs and a few have watery stools. The birds in the second barn seem to be normal.
Slide 81	**Walk-Through** • Lethargic, moribund • Cyanotic wattles, combs • Subcutaneous hemorrhages • 400+ dead birds today • Affected birds at front – Birds at back of barn seem healthy – Producer concerned about poison  USDA-APHIS National Veterinary Accreditation Program · May 2014 Center for Food Security and Public Health	You **walk through** the facility and notice that several birds are lethargic and a few are moribund. Two or three live birds have cyanotic wattles and combs, and one bird has subcutaneous hemorrhages on its legs. Some of the cages are empty. The producer has already collected at least 400 dead birds from the barn today alone. You note that the affected birds are at the front of the barn. In contrast, the chickens near the back of the barn seem healthy. The producer comments that all the dead birds he collected were in cages near the front and asks you if you think it could be a poison of some sort.

Slide 82	**Next Steps**	Given the history of morbidity and mortality on this operation, the situation could be handled a number of ways. The following slides detail the **next steps** that should be taken.
Slide 83	**Options** **Option 1** • Collect feed samples and blood from birds to test for toxins • Euthanize 3 of the sick chickens and package to transport to clinic for necropsy **Option 2** • Collect environmental samples from cages • Collect serum from live birds • Collect tissues from dead birds • Test for toxins and infectious agents • Submit to diagnostic lab requesting rapid turnaround **Option 3** • Review records when deaths began, overall mortality rate, feed delivery • Inquire about changes in air handling USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	There are three different **options** to choose from. Option 1 is to collect feed samples and blood from birds to test for toxins, and euthanize and package three of the sick chickens to transport to clinic for necropsy. Option 2 is to collect environmental samples from cages, serum from live birds, and tissues from dead birds to test for toxins and infectious agents, and submit to the diagnostic lab requesting rapid turnaround. Option 3 is to review records to see when the deaths began and calculate the overall mortality rate as well as review feed delivery records and inquire about any changes in air handling.
Slide 84	**Option 1 Results** • Potential spread of disease • On-farm necropsy is best • Waiting for test results could delay recognition of an outbreak • Call State and Federal regulatory veterinarian  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Option 1 Results:** Transporting infected birds away from the facility might spread the disease. If you want to conduct a necropsy, it would be best to do it on the farm. These deaths and clinical signs are suspicious – time to call your State and Federal regulatory veterinarian. Waiting for the results of additional tests could delay the recognition of an outbreak.
Slide 85	**Option 2 Results** • Deaths and clinical signs suspicious – Consistent with HPAI and END – Potential repercussions are severe • Call State and Federal regulatory veterinarian  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Option 2 Results**: These deaths and clinical signs are suspicious. The mortality rate is increasing exponentially despite being in a localized part of the barn. The signs are consistent with HPAI or END. It might be another infectious disease or a toxin, but it's better to contact the State and Federal regulatory veterinarian immediately and investigate further, given the potential repercussions.

Slide 86	**Option 3 Results** • 0.4% mortality over last 3 days – Not high overall, but increasing exponentially – Localized to one part of barn • Signs consistent with HPAI or END • No abnormalities with feed deliveries or air handling system • Seek assistance of State and Federal regulatory veterinarians USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Option 3 Results**: Over three days the (cumulative) mortality rate was 0.4% (approximately 400 of 100,000). Not particularly very high overall. Mortality rate is exponentially increasing and is localized to one part of the barn. The birds in that area are showing signs consistent with HPAI or END. Nothing odd was noted with feed deliveries or the air handling system. These deaths and clinical signs are suspicious and worth investigating further with the assistance of State and Federal regulatory veterinarians.
Slide 87	**Reporting Your Suspicions** • Describe history and clinical signs • Await contact by a FADD – Collect and submit samples to test for AI and END at no cost • May be instructed to: – Remain on the farm, or – Follow strict biosecurity exit protocols; go directly home; avoid animal contact • Contact veterinary clinic USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Reporting Your Suspicions:** The State regulatory veterinarian asks you to describe the history and clinical signs and advises you that a Foreign Animal Disease Diagnostician (FADD) will be in touch shortly. FADDs are federal, state, or university affiliated veterinarians trained by VS at the Foreign Animal Disease Diagnostic Laboratory in Plum Island, NY to recognize and respond to foreign animal disease incursions. As of May 2014, there were approximately 500 FADDs nation-wide. The FADD will assist you in collecting and submitting samples to test for AI and END. This diagnostic testing incurs no cost to either the flock owner or local veterinarian. You may be told to remain on the farm until the FADD arrives, or to follow strict biosecurity exit steps and go directly home without any animal contact. Make sure you have called your veterinary clinic, as you cannot visit any other farms due to your potential exposure.
Slide 88	**Reporting Your Suspicions (cont'd)** • Farm must act as if NAI or END is present and take action – Stop movement of animals, people, vehicles to/from property – Await biosecurity instructions • Seek regulatory official advice USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Reporting Your Suspicions (continued):** Until NAI or END has been eliminated or confirmed as a possibility, the farm must act as if the disease is present and take strict precautions to prevent the spread of the infection. Movement of animals, people, and vehicles onto and off the property should stop until regulatory officials can establish biosecurity measures on the property. If it is essential for someone to leave, regulatory officials should be consulted for advice. State and Federal regulatory officials will help you advise the producer on additional steps to take.
Slide 89	**Pre-Diagnosis Biosecurity** • State quarantines farm – Single entrance/exit with sanitizing station – Clean and contaminated areas of farm – Minimize movement on/off farm • Essential farm workers, family only • Special arrangements for supply delivery  USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Pre-diagnosis biosecurity** is crucial. If an outbreak is likely, State officials will quarantine the farm and establish a single exit and entrance with a sanitizing station. Clean and contaminated areas may also be established on the premises, and biosecurity protocols must be followed when moving between these areas. Whenever possible, movement on and off the farm should be minimized, restricted to only family members and essential farm workers when possible, until either the farm has been cleared through diagnostic testing or the infection has been confirmed and eradicated. This may require making special arrangements for necessary supplies to be delivered.

Slide 90	**Outcome** • H5N2 HPAI positive • Investigation under guidance of FADDs, eradication teams – Responsible until outbreak ends – Until surveillance determines no infected birds remain in U.S.  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Outcome:** The samples come back from the lab positive for H5N2 HPAI influenza. Although you can remain involved, the next stage of this investigation will be conducted under the guidance of FADDs and eradication teams. These teams will be responsible for the outbreak until it has ended and surveillance has determined that no infected birds remain in the United States. The remaining stages of the investigation are outlined in the next several slides.
Slide 91	**Investigation Steps** • Quarantine – Before or after diagnosis – Neighboring farms • Hold orders (stop-movement) • Destruction of infected and exposed poultry – Euthanasia, disposal of carcasses, contaminated material – Owner compensated USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	The remaining **steps of the investigation** can include the following. The State Veterinarian can place a **quarantine** on the farm before or after a definitive diagnosis. Depending on the distance to the neighboring farms with susceptible animals, they may also be quarantined. Due to the highly contagious nature of HPAI or END and the consequence of a trade embargo, State or Federal authorities may place a "stop-movement" **(hold) order**. No animals should be moved off farm, poultry markets in the area may be shut down, egg shipments may cease, and all but emergency travel within the infected zone may halt temporarily. Many States do not use hold orders, but achieve the same results with quarantines. All **infected or exposed poultry** could spread the virus. State and Federal authorities will order the **euthanasia** of these animals, and determine the best disposal method for their carcasses, bedding, and other contaminated material. The owner of the poultry farm will receive compensation for the animals that must be destroyed.
Slide 92	**Investigation Steps (cont'd)** • Cleaning and disinfection – Premises and remaining equipment • Epidemiological investigation – Origin of infection – Trace-in and trace-out flocks – Other at-risk flocks • Testing epidemiologically linked flocks • Area flock surveillance USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Investigation Steps (cont'd):** Once the birds have been destroyed and the carcasses, bedding and other disposable items removed, destroyed, or buried, the premises and remaining equipment must be thoroughly **cleaned and disinfected**. An extensive **epidemiological investigation** of the incident will be performed by State and Federal personnel to determine the origin of the infection, as well as to identify the trace-in, trace-out, and other at-risk flocks which may be involved. All flocks determined during the investigation to be **epidemiologically linked** (as trace-ins, trace-outs, or other at-risk/ contact flocks) will undergo enhanced surveillance **testing** to determine each flock's disease status. **Surveillance** of other flocks located within a certain geographic proximity of the infected flock will be carried out in accordance with State and Federal HPAI response plans.

Slide 93	**Investigation Steps (cont'd)** • Public health investigation – Zoonotic potential – Serum sampling • Restocking – Time idle depends on extent of infection • Enhanced/follow-up surveillance – Population and environmental sampling  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Investigation Steps (cont'd): Public health** officials may be involved in the **investigation**, particularly during HPAI outbreaks. Because some of these viruses can be zoonotic, anyone who has been in close contact with the infected poultry will be questioned about illnesses. Serum samples may also be taken to test for asymptomatic exposure to the virus. Depending on the extent of the outbreak and the decisions made by the State and Federal authorities, this poultry farm will remain idle for a time. Eventually, the operation can be **restocked**. After the decontaminated premises are restocked, the new poultry population will undergo a period of **follow-up surveillance** to ensure that no residual virus remains. Often, environmental sampling will also be done immediately after cleaning and disinfection and prior to restocking, to verify that the virus has been eradicated.
Slide 94	**Prevention Practices** • Participate in NPIP AI Clean and Monitored programs and/or LBMS program • Practice biosecurity, review with clients – Biosecurity handouts available – LBMS, flea markets, poultry veterinarians  USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Prevention Practices:** Although avian influenza and Newcastle disease outbreaks are impossible to prevent completely, your clients can reduce the risk through several practices. Participation in the NPIP Avian Influenza Clean and Monitored programs and/or the Live Bird Marketing System (LBMS) program for notifiable avian influenza can help to prevent and control H5 and H7 LPAI influenza viruses from poultry flocks, thus reducing the chance of an HPAI outbreak. Finally, as a veterinarian having contact with a number of animals and operations, practice strict biosecurity measures to prevent spreading disease from farm to farm. Also review and practice good biosecurity measures regularly with your clients. A Biosecurity for Poultry Facilities document, as shown in the illustration, is available as a handout in the web module and in the appendix of the print manual. A Biosecurity for Live Birds Marketing System (LBMS) and Flea Markets handout and a Biosecurity for Poultry Veterinarians handout are also available. These can be used as references. *Presenter: These handouts can be found at the end of the speaker notes PDF provided. If you printed a hard copy, hold it up for demonstration purposes. Illustration by: Dani Ausen, Iowa State University*
Slide 95	**Summary** • Economic, public health impact of exotic avian disease outbreaks • Prompt recognition, immediate reporting to limit spread • Help producers understand – H5 and H7 LPAI viruses, NPIP and LBMS programs to prevent NAI • Biosecurity measures • Steps following AI, END diagnosis USDA-APHIS National Veterinary Accreditation Program May 2014 Center for Food Security and Public Health	**Summary:** The economic and/or public health impact of an exotic avian disease outbreak can be extensive. Prompt recognition and immediate reporting of a possible AI or END outbreak are essential to limit the spread of these potentially devastating diseases. As an Accredited Veterinarian, it is important that you help producers understand the concerns associated with H5 and H7 low pathogenicity AI viruses, and the roles of NPIP and LBMS in preventing notifiable avian influenza. Implementing biosecurity measures specific for these diseases, and being aware of the steps following a positive AI or END diagnosis, can help alleviate the fears of producers.

Slide 96	**Supplemental Training** • This informational presentation has been approved expressly to serve as one unit of supplemental training for participants in USDA's NVAP • Please ensure you complete, sign and retain a certificate stating that you attended this presentation • Contact your VS District Office for more details on accreditation renewal USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	*Presenters: Make sure your audience members know about obtaining credit for their attendance.* This informational presentation has been approved expressly to serve as one unit of **supplemental training** for participants in USDA's National Veterinary Accreditation Program. Please ensure you complete, sign and retain a certificate stating that you attended this presentation. Contact your VS District Office for more details on renewing your accreditation.
Slide 97	**Acknowledgments** • Cooperative agreement from USDA-APHIS NVAP. Prepared by the Center for Food Security and Public Health at Iowa State University, College of Veterinary Medicine. Authors and contributors include – **Anna Rovid Spickler, DVM, PhD** – **Danelle Bickett–Weddle, DVM, MPH, PhD, DACVPM** – **Cheryl Eia, JD, DVM** – **Kerry Leedom Larson, DVM, MPH, PhD** – **Shaine DeVoe, BS** – **Molly Peebles, BS** • Illustrations designed by: – **Dani Ausen, BFA** – **Andrew Kingsbury, BFA** • Reviewed within USDA-APHIS-VS by: – **Denise Brinson, DVM, MAM, DACPV** – **Tom Gomez, DVM, MS** – **Patrice Klein, MS, VMD, DACPV, DACVPM** – **Fidelis Hegngi, DVM, MS** – **Todd Behre, DVM, PMP** – **Timothy Cordes, DVM** – **Clement Dussault, VMD** – **Jamie Snow, DVM, MPH** • Also reviewed by: – **Scott Gustin, DVM, MAM, DACPV** The content has been reviewed and approved by **USDA-APHIS Legislative and Public Affairs** USDA-APHIS National Veterinary Accreditation Program — May 2014 Center for Food Security and Public Health	**Acknowledgments:** This presentation was made possible, in part, by a Cooperative Agreement from the USDA-APHIS for the National Veterinary Accreditation Program. It was prepared by the Center for Food Security and Public Health at the College of Veterinary Medicine, Iowa State University. Authors and contributors include Anna Rovid Spickler, DVM, PhD; Danelle Bickett–Weddle, DVM, MPH, PhD, DACVPM; Cheryl Eia, JD, DVM; Kerry Leedom Larson, DVM, MPH, PhD; Shaine DeVoe, BS; and Molly Peebles, BS. The illustrations in this presentation were designed by Dani Ausen, BFA and Andrew Kingsbury, BFA. The content was reviewed within USDA-APHIS-VS by Denise Brinson, DVM, MAM, DACPV; Tom Gomez, DVM, MS; Darrel Styles, DVM, PhD; Patricia Klein, MS, VMD, DACPV, DACVPM; Fidelis Hegngi, DVM, MS; Todd Behre, DVM, PMP; Timothy Cordes, DVM; Clement Dussault, VMD; and Jamie Snow, DVM, MPH. The content was also reviewed by Scott Gustin, DVM, MAM, DACPV.
Slide 98	**Questions?** *The NVAP website can be found by typing "NVAP" into your search engine.* USDA — the Center for Food Security & Public Health — Iowa State University College of Veterinary Medicine	Thank you for your time. I would be glad to answer any questions as time allows. The NVAP website can be found by typing "NVAP" into your search engine.