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AVIAN INFLUENZA **A Minnesota Cooperative Control Program**

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Avian influenza (AI) infection is a viral disease of birds that has caused serious economic losses in domestic turkeys. Clinical signs range from nothing to swollen sinuses, coughing, and sneezing. The mortality rate in complicated infections ranges from 0% to 80%. AI also makes birds more susceptible to other disease agents. The unpredictability of AI infection means that every case is potentially disastrous.

In Minnesota, economic losses due to avian influenza in the turkey industry have been estimated annually and are shown in Figure 1. Losses in the turkey industry exceeded \$1 million in 7 of the years from 1978 to 2002. In 1979 losses exceeded \$50,000 in a commercial layer flock, and AI infection in pheasants and wild turkeys caused a gamebird producer to go out of business in 1980.

In 1983, an outbreak of highly pathogenic avian influenza (HPAI) in Pennsylvania and neighboring states resulted in an eradication program that cost the USDA over \$60 million and cost the industry a larger amount. In 2002, an outbreak of low pathogenic AI (LPAI) was subjected to similar eradication techniques at a total cost of around \$150 million.

A task force of industry-members and veterinarians from academia, industry, diagnostic laboratories, the Minnesota board of Animal Health and USDA-APHIS met after the HPAI outbreak in Pennsylvania and developed the following AI Control Program. They identified four objectives for a control program:

1. to develop guidelines for preventing introduction of AI into Minnesota poultry flocks;
2. to develop guidelines for the voluntary control and eradication of AI in the Minnesota poultry industry;
3. to develop and present an educational program for all segments of the Minnesota poultry industry;
4. to establish a united effort and have a program in place for the voluntary control and eradication of AI.

Some of the control measures recommended may seem extreme, but given the fact that AI infection is a highly transmissible and costly disease such measures are warranted. Experience has shown that extreme measures are required to prevent an outbreak from growing to disastrous proportions.

PREVENTING INTRODUCTION OF AVIAN INFLUENZA

Waterfowl as the Reservoir of Avian Influenza

The natural reservoir of AI is the native and migratory waterfowl population. Research in Canada and Minnesota has shown that 60% to 80% of juvenile mallard ducks, though not showing signs of illness, may be infected. Other waterfowl are also infected, although the infection rate may be lower. University of

Minnesota research has shown that the infection typically is detected in sentinel mallards from late July until the ponds freeze in November.

The avian influenza inhabits the intestinal tract and is excreted in the droppings. A single duck can excrete billions of virus particles per day. The virus is sensitive to heat but thrives in cold, moist conditions. It is preserved by freezing. These characteristics result in heavy contamination of pond and slough water, especially when the water is cold. Since waterfowl are continually excreting virus, the amount of virus in a pond or slough and surrounding environment will increase dramatically in the fall as water temperatures drop. Migrating waterfowl add even more AI virus to this environment.

High Risk Areas

Not only are waterfowl and their habitat a risk, but also other birds and mammals (particularly those sharing waterfowl habitat) may carry AI virus.

Because ranges, pens, and the area outside poultry houses cannot be kept free these animals they must also be considered contaminated with AI. Range or pen turkeys, domestic waterfowl, and yard poultry of any kind are also impossible to maintain "known free" of AI infection and so must always be considered infected carriers.

Preventive Measures

To effectively prevent the introduction of AI, any conceivable contact between the high-risk contamination areas and the poultry population must be avoided. The following measures have been identified:

- Do not hunt, trap or fish on the same day you take care of poultry. Bird hunters should be aware that the game they bag is likely to be infected.
- Do not allow clothes used for hunting, trapping or fishing on poultry farms unless they have been laundered.
- Do not allow vehicles, boats, or equipment used for hunting trapping or fishing to enter a poultry farm unless they have been washed with detergent and disinfected.
- Do not bring game or fish onto a poultry farm unless it has been dressed and packaged.
- -Isolate ponds, sloughs and streams from poultry. Do not walk directly from such environments into poultry houses. Do not use pond water for watering poultry.
- Do not allow pets, especially dogs, to enter a poultry house, pen or range.
- Have a control program for wild birds and mammal pests. Trapping of such animals must occur away from poultry and must be done by someone other than farm help.
- No other poultry of any kind, particularly domestic waterfowl, should be allowed on the farm.
- Because any turkey flock is potentially infected, it is strongly recommended that members of the farm household not work in a turkey processing plant.
- It is also strongly recommended that anyone helping with load-out of one turkey flock not have any contact with another flock.

CONTROLLING THE SPREAD OF AVIAN INFLUENZA

Early Detection is Key

The early detection of AI is the key to controlling its spread. History has shown that we can't be 100% successful in preventing the introduction of AI infection into poultry. From 1978 through 2002 there were 108 introductions of AI into the Minnesota poultry industry. In that period 1100 infected flocks were

detected.

Often in an outbreak the first flocks to be infected go through a silent infection (no evidence of disease) or become ill from another disease agent so that the diagnosis is missed. Clinical signs and lesions may lead to an improper diagnosis, e.g. cholera or E. coli infection. These flocks, as well as incubating and convalescent flocks, are excreting AI virus while they appear healthy; thus, there is no such thing as "known nonexposed" or "known noninfected" flocks. However, early detection and reporting of outbreaks has resulted in adoption of control measures to reduce the economic loss to the poultry industry.

A Monitoring Program

A monitoring program designed to detect these early, inapparent infections is essential to control the spread of AI. Serological testing is available from the Minnesota Poultry Testing Laboratory and the University of Minnesota Veterinary Diagnostic Laboratory.

The monitoring system is composed of:

- *Processing plant monitoring.* Twenty blood samples taken from each flock at the time of slaughter are submitted to the Minnesota Laboratory and tested for AI using the agar gel precipitin test (AGP) test. Blood samples taken from birds sacrificed for fat samples two weeks prior to slaughter may also be submitted for an AGP test.
- *Grower monitoring.* Farms are monitored weekly to monthly. The grower takes samples rather than having someone travel from farm to farm and he/she submits them to either laboratory.
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- *Flock observation.* A critical source of monitoring samples is a sick flock, particularly one exhibiting depression, respiratory problems or a drop in egg production. Such flocks must be routinely checked for AI. Take sick birds to the UM Veterinary Diagnostic Laboratory and/or take 20 tracheal swabs (pooled 5 per tube), 20 cloacal swabs (pooled 5 per tube) and 20 blood samples (individual) to the Veterinary Diagnostic Laboratory.

Reporting

Once AI is detected, prompt reporting is necessary to achieve industry-wide control. There is no stigma associated with having avian influenza! When either the Willmar Poultry Testing Laboratory or the UM-CVM Diagnostic Laboratory suspects AI infection, it notifies the grower (if known) and The Board of Animal Health which notifies the Minnesota Turkey Growers Association, which notifies processors, hatcheries, and turkey producers in the area of the outbreak by letter. The grower and processor are urged to spread the word by the "grapevine" to crews, service people and other growers.

When AI has been confirmed the Board of Animal Health notifies the Minnesota Turkey Growers Association which notifies all its members by letter, etc.

Measures to Avoid Spread

AI affects the respiratory and digestive systems. Thus, within a poultry house bird-to-bird transmission is probably by droppings, aerosol and drinking water. The greatest excretion of AI virus is in the droppings so poultry manure is the greatest source of transmission from flock to flock. Between flocks and farms the virus is transmitted on contaminated clothing and equipment.

All methods for controlling the spread of AI are based on preventing the contamination of, and controlling the movement of, people and equipment.

Anyone can transmit AI, but people that have direct contact with birds or their manure have been the cause of most AI transmission.

Once the disease has been detected and reported, stringent disease control measures must be taken. Half-hearted or routine disease control procedures are not sufficient to stop the spread of AI.

Specific Control Measures

Don't increase human farm-to-farm traffic! Because flocks can have undiagnosed AI infection and can excrete the virus for up to 14 days prior to the onset of illness it is impossible to say for certain that any flock is unexposed or uninfected. All flocks must be considered either infected or potentially infected.

Consider each flock you have visited infected and each flock you plan to visit free from infection. Bring nothing to a flock and take nothing away.

Be a good neighbor; if you have or suspect AI initiate a self-imposed quarantine.

The following management steps are designed to keep AI from escaping infected farms and from entering noninfected farms.

People (employees, visitors, crews, etc.) who must enter the farm

People who work with, and especially handle, birds and manure are the major concern for AI transmission. Use a log book in each house to record visitors. If infection occurs, this log will help you track down other potentially exposed flocks. Specific measures to follow are:

- Allow no unnecessary or unauthorized visitors into the flock. Do not allow other growers to visit.
- Make no unnecessary visits to other farms.
- Service flocks by phone.
- Review policy with all employees:
 - No other poultry on the farm
 - No other poultry at home
 - No other family members can work in a poultry meat processing plant, hatchery or assist in load-out.
- Establish a pattern for necessary traffic by supervisors. It is not possible to safely visit more than one flock per day! If you must visit more than one flock per day, disinfect your vehicle, shower and wear clean boots, coveralls, and hats at each site. After this outerwear has been used it should be placed in a garbage bag to avoid contaminating your vehicle.
- Provide boots and coveralls for necessary visitors, e.g., repair persons, etc.
- Inspect everyone who comes to the farm for cleanliness and evidence of bird contact.
- Do not allow truck drivers to enter the building.
- Require part-time help and crews to wear freshly laundered clothing or clothing supplied on the farm each day. Do not allow persons employed at other poultry operations on the premises.
- Isolate dead bird disposal. On farm disposal reduces risk (composting, burial, incineration). Maintain sites properly. Be aware that rendering trucks and barrels can spread the disease. Control traffic to and from bird disposal.

- If there are several farms in your organization, establish zones to prevent one person from traveling to all farms.
- Eliminate range production. Isolate range birds from completely confined birds. Do not travel between them.

Vehicles and equipment that must enter the farm and that come in direct contact with birds or their manure should not be moved from farm to farm. Do not allow the traffic area near the poultry house to become contaminated with manure! Specific measures to follow are:

- Wash with detergent and disinfect moving and loadout equipment (loaders, trailers, tarps, panels, screens).
- Wash with detergent and disinfect vehicles used in loading and moving birds after unloading. Truck washing guidelines are available from the Minnesota Board of Animal Health. Cabs must be cleaned.
- Wash and disinfect farm clean-out equipment (tractors, trailers, pumps, sprayers, etc.) taken from farm to farm.
- Make sure that service persons' vehicles are not contaminated with litter or birds. They should be cleaned and disinfected at least daily or after being on a farm where AI is suspected.
- Birds taken to the diagnostic lab should be double-bagged.
- Discard paper poult boxes and carefully wash with detergent and disinfect plastic poult boxes and the truck after returning to the hatchery.
- Send eggs to processing or the hatchery only on dedicated, washed and disinfected plastic or new paper flats and dedicated cases, pallets or racks. Wash or fumigate eggs from an infected flock.
- Do not allow shavings trucks to enter the house.
- Do not allow poult delivery trucks to enter the house.
- Do not allow delivery vehicles in areas grossly contaminated with manure.
- If possible, feed suppliers should set aside a truck to be used only for deliveries to infected farms. Do not pick up feed from a farm.
- Wash clothing (rubber boots, coveralls, gloves, etc.) to be used at another farm with detergent in hot water. Clothing for visitors or service persons may be kept in the entryway without laundering.

Other carriers - wild birds, pets, varmints, dead birds – must be completely controlled to prevent the spread of AI from farm to farm. AI could possibly be carried by flies, so fly control is also important.

Turkey flocks that have been infected (or that may be infected) are a significant threat. Once a flock has been infected it is considered infected for life!

- Leave infected flocks in the house for at least a couple weeks until the infection (and virus excretion) subsides.
- Coordinate marketing with the plant for a Friday so trucks and crews are out of contact with other flocks for two days.
- Fumigate eggs before they leave the farm.
- Be aware that offal, feathers, DOAs and condemned meat and eggs from AI-infected flocks are a potential source of the virus.

AI contaminated areas have been successfully cleaned using the following procedures after removal of infected birds. Remember the virus survives cold, moist conditions for months.

- Scrape the litter away from the sides of the building.
- Heat the building to 80 -90 F for one week.

- Dry clean or wash the walls and ceilings with detergent.
- Remove manure and dispose of it by composting or leaving it in a covered pile.
- Wash the entire house with detergent.
- Clean up outside the house.
- Disinfect the inside surfaces.
- Allow the house to remain empty for two weeks after clean out.

If a complete clean out is impossible this alternative procedure has been used:

- Scrape litter away from the sides of the building.
- Rototill the litter.
- Heat the building to 90 F or higher and make sure the heat penetrates all parts of the house.
- Dry clean or wash down as above; disinfect the walls.
- Leave the house empty for 2-3 weeks.
- Vaccinate the next flock before it is placed.

Always consider the area outside the building contaminated, particularly if the previous flock had AI. Set up your traffic pattern to prevent recontaminating the building from the area outside.

Vaccination should be considered once the AI subtype is known. The vaccine is inactivated and does not cause the disease. The vaccine only protects against the one subtype, so vaccinated flocks are still susceptible to other AI subtypes. In order to know whether the vaccinated flock has been exposed to AI is important leave 30 to 50 non-vaccinated sentinel birds and test blood samples each month.

Use the following guidelines when selecting flocks for vaccination:

- As soon as the subtype is identified vaccinate the other flocks on the farm,
- Consider vaccinating all flocks under the same management as the infected flock.
- Notify management of nearby farms and others you believe to be at risk so that they can consider vaccination as well.

RESPONSIBILITIES FOR AI CONTROL

AI infection outbreaks affect the whole poultry industry. Each segment of the industry must share responsibility for its control.

Managers should:

- provide an advance education program for all employees.
- establish a reporting and surveillance system.
- establish a company policy and communicate it to employees.
- communicate with personnel in case of an outbreak.

Producers (including breeder, hatchery, grow-out, and egg production personnel) should:

- monitor chick/poult delivery and truck driver.
- maintain surveillance and collect samples.
- scrutinize part-time help and crews.
- enforce no visits to other farms, no visitors.
- have no other poultry.
- restrict work place of other family members.
- maintain log book for all visitors.
- provide outer clothing (coveralls and boots) for visitors.

- ensure adequate farm clean-up and disinfection, manure disposal, general sanitation outside of buildings.
- decide on vaccine usage, maintain vaccination records, monitor vaccinated flocks.
- inspect vehicles entering the farm.
- arrange for dead bird pickup and disposal.
- maintain fly, rodent and wild bird control.
- sanitize eggs, flats, cases, racks, pallets.
- schedule marketing of birds or eggs.
- isolate load-out activities from other flocks and ensure that farm workers who help with load-out do not go back to other flocks.
- monitor cleanliness of load-out equipment.
- monitor other segments of the industry.

Service persons should:

- service flocks by phone if possible.
- visit only one farm per day, or, if more than one must be visited, start at the most vulnerable one.
- clean up before and after farm visit. Wear freshly laundered outer wear before entering a flock. When leaving, place used outer wear in a garbage bag to avoid contaminating the vehicle.
- maintain vehicle cleanliness.
- take birds to the lab.
- serve as education and communication liaison between management and production.

Crews (e.g. artificial insemination, vaccination, bleeding, moving and loading crews) should:

- isolate activities from other flocks.
- wash clothing each day.
- wash and disinfect equipment.
- clean vehicles--inside and outside.
- communicate with manager regarding AI infection control program.

Egg pickup drivers and hatchery or egg processing plant personnel should:

- designate flats, cases, pallets, and racks for each farm.
- not enter the house.

Feed truck drivers should:

- not park feed trucks where they may be contaminated by wild birds.
- not enter house or come in contact with poultry.
- keep truck off of range or areas contaminated with manure.

Processors have several key responsibilities in preventing spread of AI. The multi-age farm presents a unique opportunity for contaminated people or equipment loading out one flock to transmit AI to a remaining flock:

- The first critical responsibility is scheduling infected flocks for Fridays or as late in the week as possible. There should be no partial load outs.
- The second responsibility is cleanliness of equipment. Wash and disinfect tractor and trailer, tarps, panels, and screens.
- The third responsibility is the crews.
- After the flocks are loaded, the trucks must be routed away from other poultry farms, trucks should

not contaminate other vehicles at the processing plant and finally handle DOA's, offal, feathers, and condemned birds appropriately.

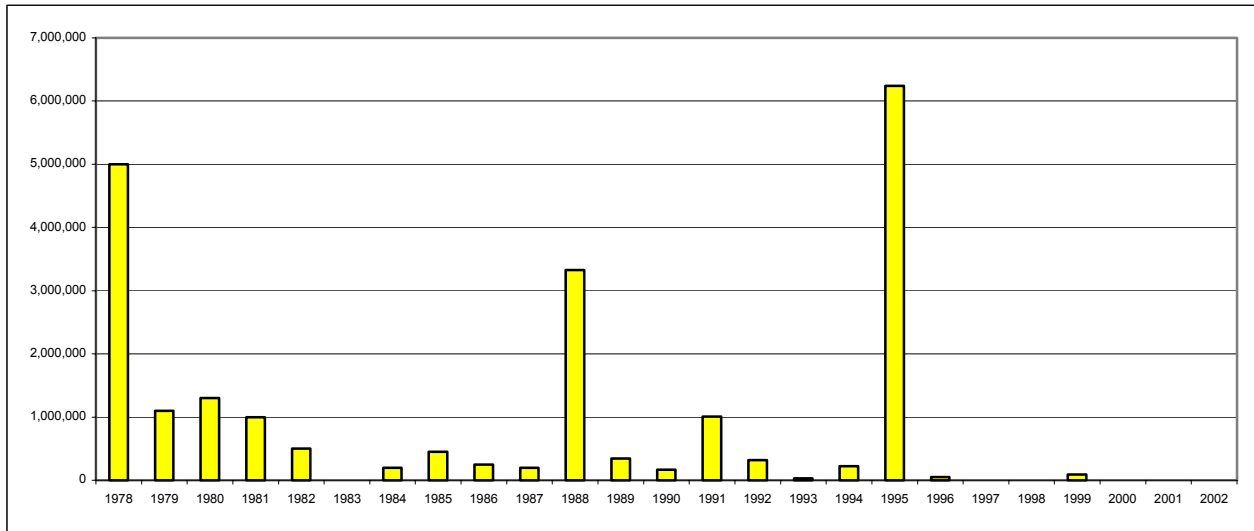


Figure 1. Each year the losses in Minnesota associated with avian influenza have been recorded. These annual losses have been borne by the poultry grower.