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Avian Influenza

A Minnesota Cooperative Control Program

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

In Minnesota, economic losses due to avian influenza in the turkey industry have been recorded since 1978 and are shown in **Figure 1.** Losses exceeded $1,000,000 in 5 of 11 years. Losses in 1979 in one chicken flock were estimated at $50,000. In 1980 a gamebird producer went out of business after AI devastated his pheasants and wild turkeys.

In Pennsylvania and adjoining states an outbreak in 1983-84 of a highly pathogenic form of AI crippled the poultry industry. The USDA spent over 60 million dollars attempting to eradicate the disease there.

In response to this 1983-84 outbreak, a Minnesota industry task force was established. It was composed of members of the Midwest Association of Avian Veterinarians, the Minnesota Board of Animal Health, the Minnesota Poultry Industries Association, the Minnesota Turkey Growers Association, the University of Minnesota's Extension Service, the University of Minnesota Avian Disease Research Center, the University of Minnesota College of Veterinary Medicine (UM-CVM) Diagnostic Laboratory, and the USDA-APHIS.[1]

The task force identified four objectives for a control program. They are:

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 if and when it strikes Minnesota poultry;
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 by the task force may seem severe, but given the fact that influenza is a highly transmissable 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

The reservoir of AI is the native and migratory waterfowl population.[2] 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 over in November.

The AI virus inhabits the intestinal tract and is excreted in the droppings. A single duck can excrete billions of viruses 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 the virus, the amount of virus in a pond or slough and

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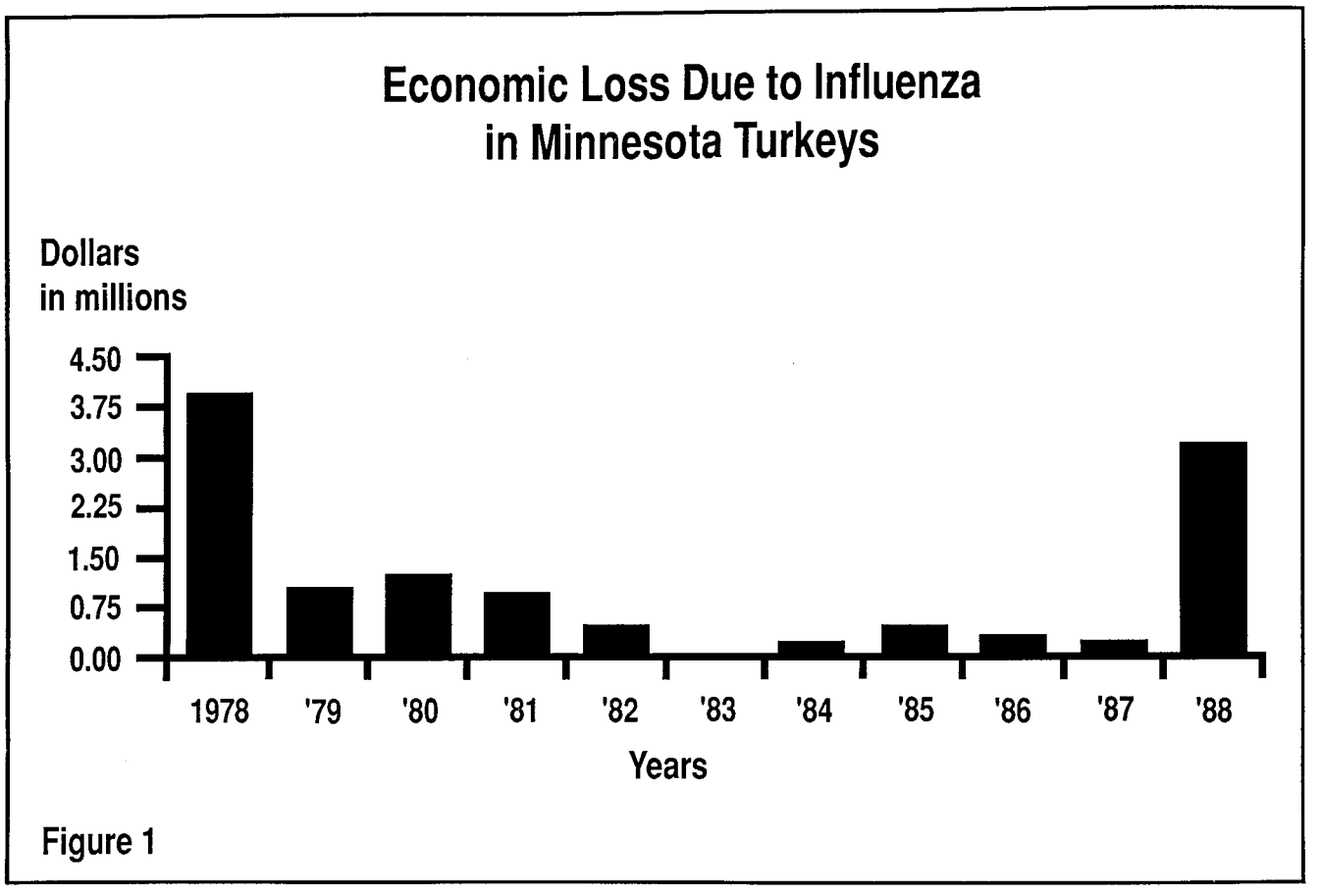

Figure 1

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 waterfowl and their habitat, but also other birds (particularly those sharing waterfowl habitat), skunks, raccoons, and rodents may become infected with AI.

Because ranges, pens, and the area outside poultry houses cannot be kept free of these animals, they must also be considered contaminated with AI, particularly during the high-risk periods of the spring waterfowl migration (April-May), the summer waterfowl brooding and growing period (July-September), and the fall migration (October-November). Range or pen turkeys, domestic waterfowl, and yard poultry of any kind are also impossible to maintain "known free" of influenza, and so must always be considered infected carriers.

Preventive Measure

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[3] 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.
- To the extent practical (depending on confinement scheme) have a control program for wild birds, rodents, skunks and raccoons. 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 flock is potentially infected, it is strongly recommended that members of the farm household not work in a poultry processing plant.
- It is also strongly recommended that anyone helping with load-out of one 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 influenza into poultry. (There were 70 introductions and 729 AI-infected flocks detected in Minnesota from 1978 through 1988.)

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. The program outlined below is recommended for the high-risk period from July to December. Serological testing is available from the Willmar Poultry Testing Laboratory and the University of Minnesota Avian Health Research Center for those who do not have their own testing facilities.

The monitoring system[4] is composed of:

- ***Processing plant monitoring.*** Twenty blood samples taken from each flock at the time of slaughter are submitted to the Willmar Laboratory and tested for AI using the Agar Gel Precipitin (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.*** Turkey farms are monitored weekly to monthly and chicken farms are monitored monthly to bimonthly using the AGP test. The grower takes samples rather than having someone travel from farm to farm.
- ***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-CVM Diagnostic Laboratory[5] and/or take 20 trachael swabs (pooled 5 per tube), 20 cloacal samples (pooled 5 per tube) and 20 blood samples (individual) to the Avian Health Research Center.[6] Sampling materials and instructions can be obtained from the Avian Health Research Center.

Reporting

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

- The Minnesota Poultry Industries Association will notify hen processors, pullet haulers, egg processors, and broiler or egg producers in the area of the outbreak by phone, and members by letter.
- The Minnesota Board of Animal Health will notify area veterinarians, gamebird associations and exhibition fowl organizations.

When AI has been confirmed, the Board of Animal Health notifies the Minnesota Turkey Growers Association, which notifies all of 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 aerosol and droppings. The greatest excretion of influenza virus is in the droppings, so poultry manure is the greatest source of transmission from flock to flock.

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 who 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. Halfhearted or routine disease control procedures are not sufficient to stop the spread of AI. Since nearly all of the introductions of influenza into Minnesota poultry occur between July and November, the program recommended here should be followed during that time period whether or not AI has been reported.

Specific Control Measures

Don't increase human farm-to-farm traffic! Because flocks can have undiagnosed influenza 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 who work with, and especially handle, birds and manure are the major concern for influenza 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 measure 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. Visit no more than one flock per day! If you must visit more than one flock per day, wear clean boots, coveralls, and hats at each site and wash your hands, arms, and face between sites.
- Provide boots and coveralls for necessary visitors, e.g., repair persons.
- 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. Maintain pits properly, and 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.
- Isolate range birds from completely confined birds. Do not travel between them.

Equipment that comes 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, batteries, coops, tarps, panels and rails).
- Wash with detergent and disinfect vehicles used in loading and moving birds after unloading. 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 servicepersons' 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.
- Enclose birds taken to the lab in plastic bags.
- Carefully wash and disinfect chick/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 in 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 chick/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, rodents, skunks, raccoons, pets, dead birds—must be completely controlled to prevent the spread of AI from farm to farm. AI has been detected on flies, so fly control is also important.

Poultry 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 two 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, DOA's 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 procedure after removal of infected birds. Remember, the virus survives cold, moist conditions for months.

- Scrape 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 burial or composting in a pile covered with plastic.
- Wash the entire house with detergent.
- Clean up the outside of the house.
- Disinfect inside surfaces.
- Disinfect dirt floors and a 5-foot area surrounding the house with a 1:10 solution of formalin, one gallon per 10 sq. ft. Formalin is hazardous and should be used only by experienced and protected personnel.
- Allow the house to remain empty for two weeks after cleanout.
- Consider vaccinating the next flock for added protection.

If complete cleanout 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. Make sure the heat penetrates all parts of the house.
- Dry clean or wash down as above; disinfect walls and ceiling.
- Leave the house empty for two to three 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 virus subtype is known. The vaccine, which is administered by injection, is a killed product and does not cause the disease. It increases the flock's resistance to both infection and disease, but only against the subtype involved. The flock is still susceptible to other subtypes. A flock also could become infected with the subtype it was vaccinated against, although this has not been observed in Minnesota under field conditions. To guard against these infection possibilities, 20 to 100 marked sentinel birds (nonvaccinated flock mates) are kept in the vaccinated flock and twenty are tested for AI each month.

Vaccination helps control AI in two ways:

- It increases flock resistance to infection.
- If a vaccinated flock becomes infected with the same subtype it was vaccinated with (an unlikely occurrence), it will not excrete as much virus as a non-vaccinated, infected flock. The vaccine reduces the output of virus from an infected flock about 1000 times.

Use the following guidelines to select flocks for vaccination:

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

Responsibilities for AI Control

Influenza outbreaks affect the whole poultry industry. Each segment of the industry must share responsibility for control of the disease.

Managers should:

- provide an advanced 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;
- prohibit visitors, as well as visits to other farms;
- have no other poultry;
- restrict work places of other family members;
- maintain a log book for all visitors;
- provide outer clothing (coveralls and boots) for visitors;
- ensure adequate farm clean-up and disinfection, manure disposal, and general sanitation outside of buildings;
- decide on vaccine usage, maintain vaccination records, and 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, and 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 a farm visit;
- maintain vehicle cleanliness;
- take birds to the lab;
- serve as education and communication liaison between management and production.

Crews (e.g. artificial insemination, debeaking, 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 the manager regarding the influenza control program.

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

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

Feed truck drivers should:

- *not* enter house or come in contact with poultry;
- keep truck off of range or areas contaminated with manure.

Processors should:

- schedule infected flocks for Fridays;
- wash and disinfect tractor and trailer, coop, batteries, tarps, panels and rails;
- handle DOA's, offal, feathers and condemned birds appropriately.

NOTES

[1] The task force included the following persons: Z. Baber, Land O'Lakes; Dr. Robert Berg, U of M Extension, Dept. of Animal Science; Dr. Marty Bergeland, U of M Dept. of Diagnostic Investigations; Charles Boevers, Crystal Foods; Rod Brooks, Wrightco, Monticello; Dr. Bill Cameron, Willmar Poultry; Darrel Carlson, Pelican Rapids, MN; Gil Dedrick, ISA Babcock; Leonard Doucette, Little Falls, MN; Dick Downs, Butterfield Foods; Dr. Dennis Dykstra, Jack Frost; Dave Fishbach, Swift & Co.—Detroit Lakes; Dr. Jack Flint, Board of Animal Health; Lester Giese, Apple River Farm; Francis Gillis, Gillis Agricultural Systems; Jeri Haggerty, MN Poultry Industries; Jeff Hanson, Apple River Farm; Mert Hanson, Jerome Rochester Hatchery; John Hausladen, MN Turkey Growers Assn.; Dave Hodnefield, Jack Frost; Dave Holmgren, Butterfield Foods; Fred Huebsch, Perham, MN; Ted Huisinga, Willmar Poultry; John Jeffords, Jennie-O; Dr. Scott Jones, Jerome Foods—Barron; Dr. Glen Kolb, Jerome Foods—Barron; Greg Langmo, Langmo Farms; Don Lende, West Central Turkeys; Ted Luoma, Luoma Egg Company; Norb Marthaler, Lake Country Farms; Roy Munson, MN Turkey Growers Assn.; Norman Nelson, Nelson Eggs; Dr. John Newman, U of M Avian Disease Research Group; Dr. Satish Nivas, Mill Farms; Dr. Harry Olson, Board of Animal Health; Dr. Bob Page, USDA-APHIS; Dick Peterson, Peterson Hatchery; Lyle Pederson, West Central Turkeys; Dr. Ben Pomeroy, U of M Avian Disease Research Group; Dr. Peter Poss, Earl B. Olson Farms; Bob Ramsey, Pietrus Foods; George Reed, Pietrus Foods; Jim Ridgeway, Wrightco, Monticello; Avron Rosenberg, Crystal Foods; Nordean Schmidt, Hy-Line; Bob Sparboe, Sparboe Summit Farms; Dr. George Speers, Land O'Lakes; Paul Tollefson, Viking Hills Farms; Ivan Wilroth, Willmar Poultry Co.

[2] Swine are an additional reservoir of one influenza subtype.

[3] Water alone is not sufficient. Detergent helps kill the influenza virus.

[4] Experimental data indicate water trough sampling may be an effective technique for detection of virus, and egg yolk antibody might be a convenient way to sample laying flocks. These techniques require further evaluation.

[5] 1943 Carter Avenue, St. Paul, MN 55108.

[6] 1971 Commonwealth Avenue, St. Paul, MN 55108.