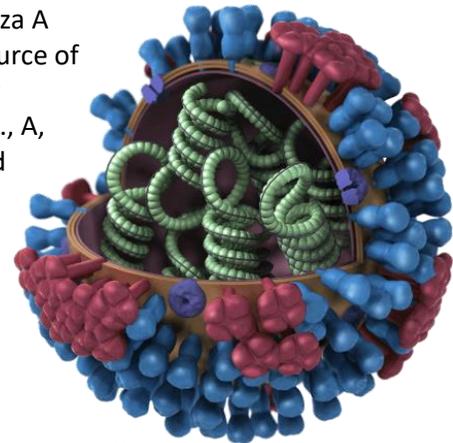




Highly Pathogenic Avian Influenza (HPAI)

Avian influenza, or bird flu, can be caused by different strains of influenza A virus. Avian influenza A virus subtypes are thought to be the original source of *all* influenza A viruses that infect mammals, either in the distant past or more recently. Influenza viruses are classified by their core proteins (i.e., A, B, or C), and, for influenza A, by the subtypes of hemagglutinin (HA) and the neuraminidase (NA). HA and NA are two major antigens embedded into the membrane of the influenza virus. At least 16 hemagglutinins (H1 to H16) and 9 neuraminidases (N1 to N9) have been found in viruses from birds, while two additional HA and NA types have been identified only in bats. Only three HA subtypes cause widespread human infections (H1, H2, and H3). Avian influenza virus infections have been found occasionally in many different species of mammals. Some of these species include cats, dogs, pigs, horses, donkeys, mink, and various wild and captive wild mammals.



<https://www.cdc.gov/flu/resource-center/freeresources/graphics/images.htm>

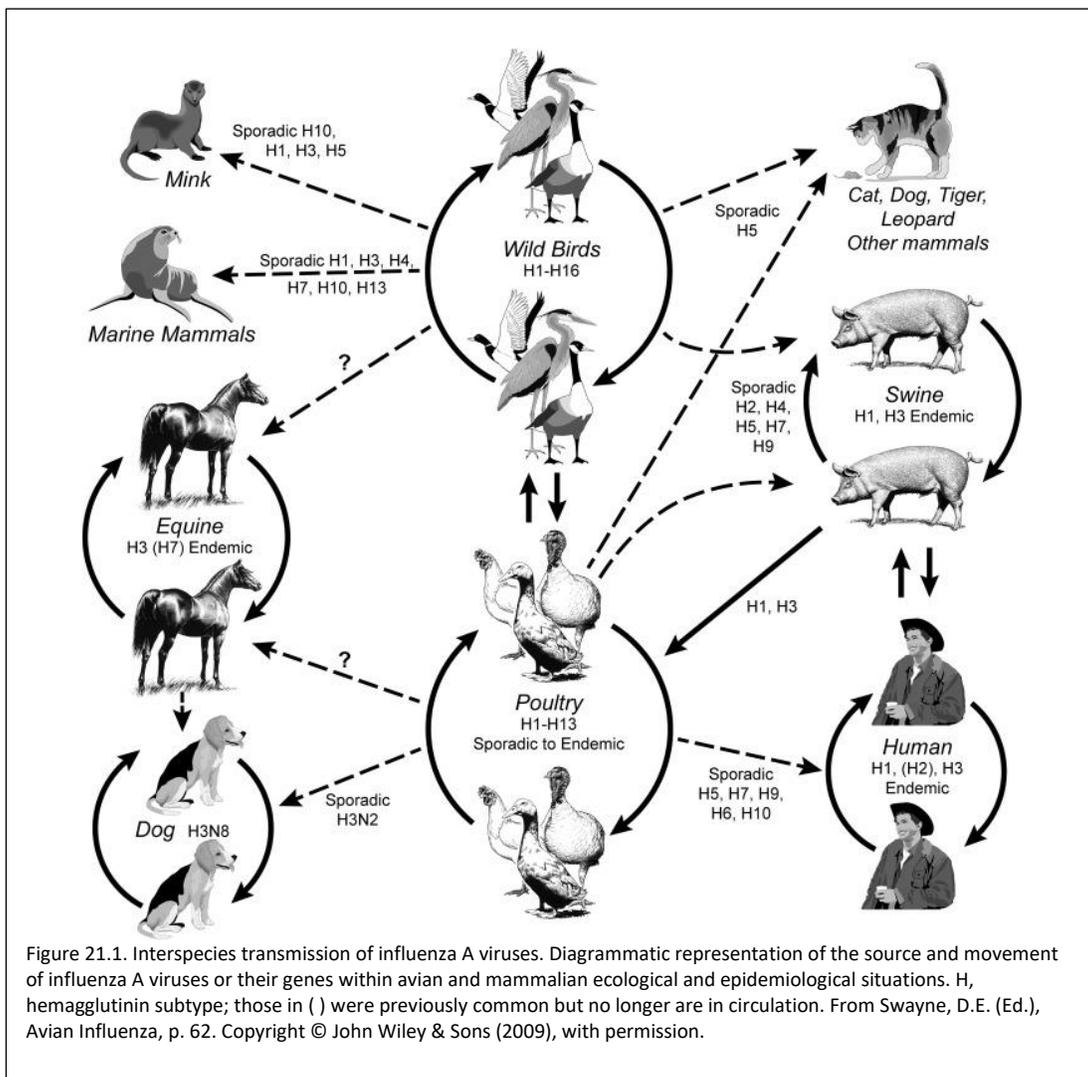
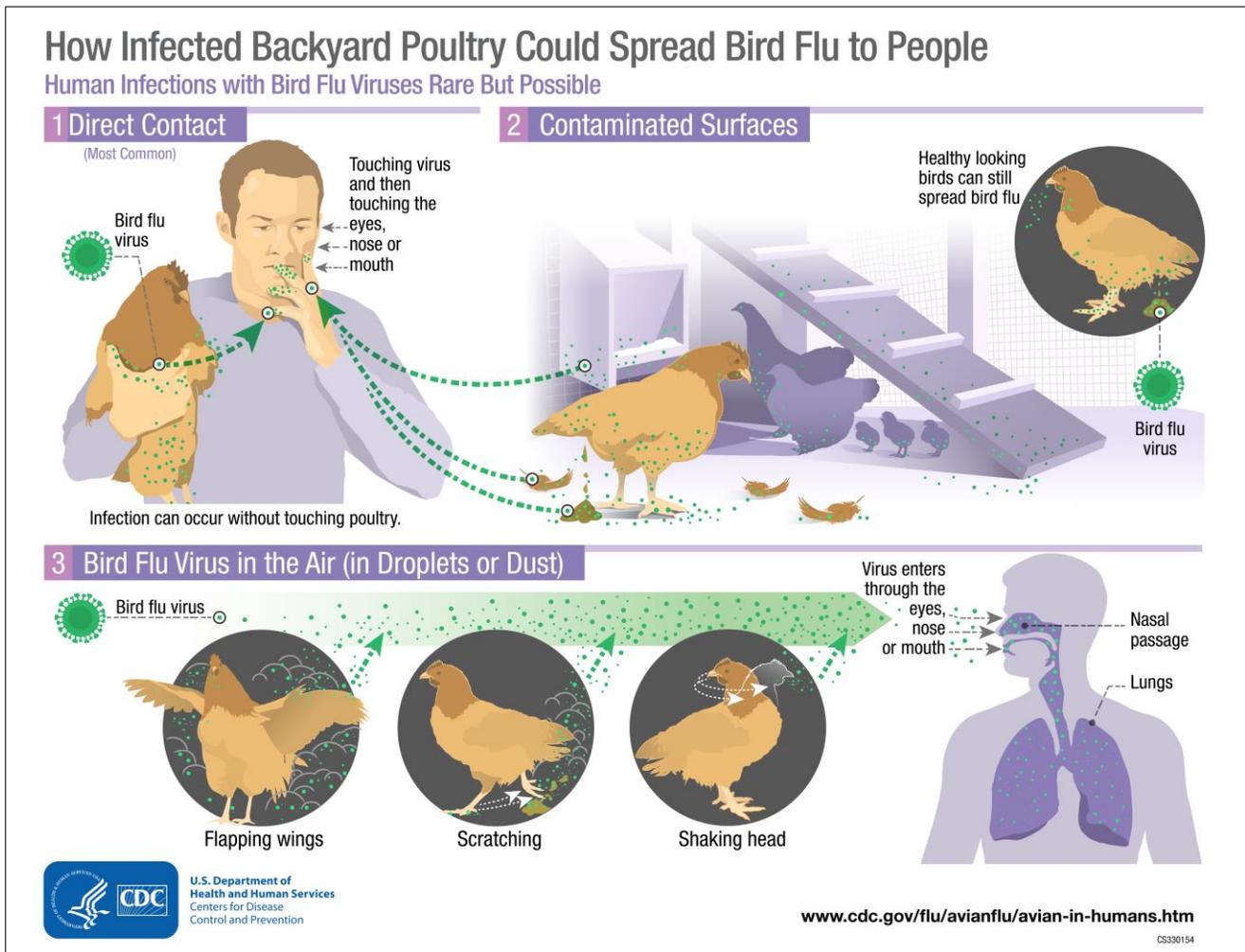


Figure 21.1. Interspecies transmission of influenza A viruses. Diagrammatic representation of the source and movement of influenza A viruses or their genes within avian and mammalian ecological and epidemiological situations. H, hemagglutinin subtype; those in () were previously common but no longer are in circulation. From Swayne, D.E. (Ed.), *Avian Influenza*, p. 62. Copyright © John Wiley & Sons (2009), with permission.

In birds, avian influenza viruses are very contagious, widespread, and vary greatly in how severe they are. Most of them cause little to no disease and are called low pathogenic avian influenza (LPAI) viruses. Most LPAI viruses continue to spread in wild birds, mainly those in wetlands, who are probably the reservoir hosts for these viruses. The feces of the infected birds contain large amounts of virus. The virus from the feces of waterfowl can survive for a long time in cold water and is spread to other birds and animals through the fecal-oral route.

Highly pathogenic avian influenza (HPAI) viruses can develop from certain LPAI viruses and cause serious illness, killing up to 90% to 100% of the infected flock. HPAI spreads rapidly and causes devastation to the poultry industry. When a flock is affected by HPAI, the birds need to be destroyed. Most countries are usually free of these viruses other than doing rare outbreaks. HPAI are not usually found in wild birds other than on occasion near outbreaks in poultry or backyard flocks. Unfortunately, The Asian lineage of H5N1 HPAI viruses has become endemic in poultry in some countries of Asia and the Middle East. Most HPAI viruses found in birds contain the H5 or H7 HA.

Avian influenza can occasionally cross over to mammals, including humans. It usually spreads during close contact with infected poultry. Most illnesses in mammals are mild and limited to conjunctivitis (pink eye) or mild respiratory disease. Some strains do cause serious illness and death. Rare cases have been caused by influenza strains that have had enough adaption to allow it to circulate in humans and have been responsible for the last four major influenza pandemics. The 1918 influenza pandemic was caused by an H1N1 virus with avian influenza origin. The 1957-58 pandemic was caused by H2N2 that originated from an avian influenza A virus and the 1968 pandemic was caused by an H3N2 virus with avian influenza origin. The 2009 influenza pandemic was caused by a novel H1N1 virus with swine and avian origins.



A summary of other avian influenza A viruses that have caused illness in humans:

H5N1: The potential threat from Influenza H5N1 has been described as a “public health crisis” by the World Health Organization (WHO). Since 2003, it has caused at least 864 confirmed human infections in 19 countries with a 53% death rate. Rare human-to-human transmission has been reported. The largest number of cases have been in Egypt (359), Indonesia (200), Vietnam (127), Cambodia (56), and China (53). In December 2021, a case was diagnosed in the United Kingdom in an individual that lived with a large number of domestically kept birds. A fatal case of H5N1 infection was reported in a woman in Canada in January 2014, following her return from a trip to Beijing, China. All other cases have been in Eurasia or the Middle East. Antibody studies in poultry workers suggest that subclinical and mild infection have gone undetected.

H5N6: As of April 9, 2022, avian influenza H5N6 viruses has caused a total of 77 human cases of illness in China since 2014, causing illness ranging mild respiratory symptoms to severe pneumonia and death with a death rate around 43%. Nineteen (19) of cases have occurred since the beginning of 2022. Avian influenza H5N6 infections have been found in wild birds in England but no human cases have occurred there.

H5N8: Infections with H5N8 have been reported in a small number of asymptomatic people in Russia in 2020.

H6N1: One infection with H6N1 was reported in a person with lower respiratory tract disease in Taiwan in 2013.

H7N2: Infections with H7N2 have been reported in a small number of people with conjunctivitis (pink eye), mild upper respiratory tract symptoms, and lower respiratory tract disease in the U.K. and U.S. since 2002. Four infections have been identified in the U.S. since 2002, including 2 that resulted from cat-to-human transmission of an H7N2 virus circulating among cats in 2016.

H7N4: One infection with H7N4 was reported in a person with pneumonia in China in 2017.

H7N7: Infections with H7N7 have been reported in more than 90 people since the first human infection was identified in the U.S. in 1959; although that first infection was associated with hepatitis, most infections have caused conjunctivitis. However, mild upper respiratory tract symptoms, lower respiratory tract disease, severe pneumonia with respiratory failure, and multi-organ failure have been reported, including one death. Most cases were linked with widespread poultry outbreaks of H7N7 in the Netherlands in 2003. Rare human-to-human transmission has been reported.

H7N9: In late March and April 2013, infections of H7N9 in China were reported. Additional yearly epidemic waves occurred during the following four influenza seasons mostly in China or imported from China. A total of 1,568 case have occurred with a death rate around 40%. Since the fall of 2017, few cases have been reported, but concern about re-emergence remain. Rare human-to-human transmission has been reported.

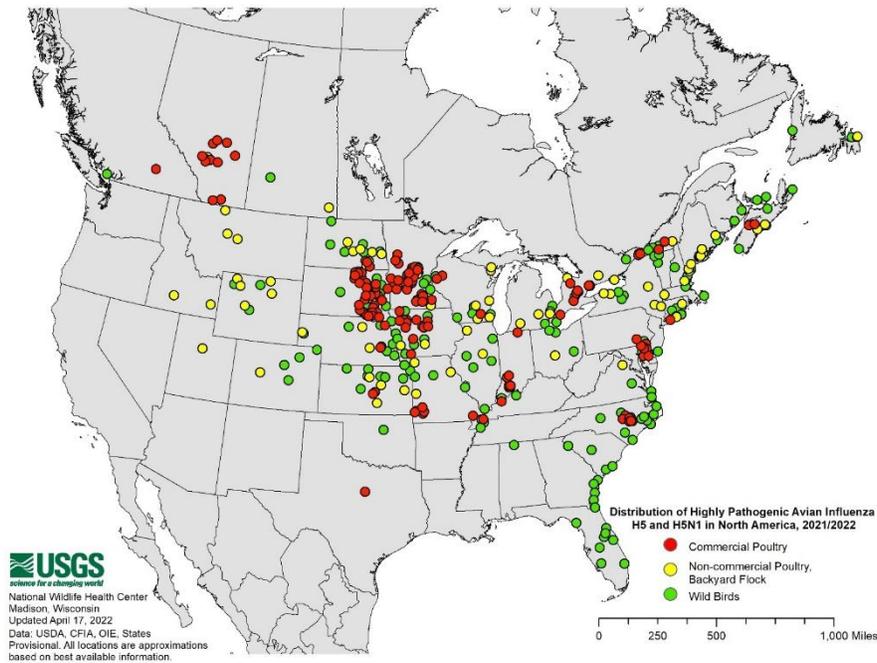
H9N2: This avian influenza virus has cause 95 sporadic cases since 1998, 83 of which were in China. The most effected age group has been under 10 years of age, and there have been two deaths. Antibody studies of poultry workers in China and Egypt suggest between 4.5% and 16% of these workers may have been infected at some time. Avian H9N2 viruses are now endemic in poultry and live-bird markets in Asia and Egypt and have been isolated from pigs. There is evidence of reassortment between H9N2 and H5N1, increasing concern for a developing pandemic virus.

H10N3: Infection with H10N3 was reported in one person with severe pneumonia and respiratory failure in China in 2021.

H10N7: Infection with H10N7 has been reported in a small number of people with conjunctivitis or mild upper respiratory tract symptoms in Egypt in 2004 and Australia in 2010.

H10N8: Infection with H10N8 has been reported in a small number of people with severe pneumonia with respiratory failure, including a few deaths, in China since 2013.

HPAI viruses can be found in the meat and eggs of infected species. Careful food handling and preparation are important when working with wild game birds or raw poultry in endemic or effected areas and all poultry products should be completely cooked before eating. Precautions in cooking and cleaning that are recommended to prevent Salmonella and other potential illnesses from poultry will also kill the avian influenza virus, making it safe to eat. Find chicken food safety here <https://www.fsis.usda.gov/food-safety/safe-food-handling-and-preparation/poultry>.



<https://d9-wret.s3.us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/media/images/20220417%20HPAI%20Distribution%20in%20NA.jpg>

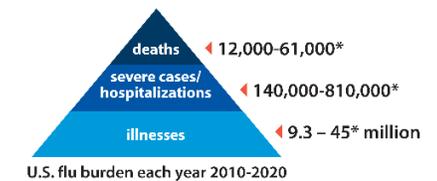
As of April 18, 28,582,060 commercial and backyard flocks have been effected by H5N1 HPAI during the 2022 season. This may have an impact on the cost of poultry, eggs, and on poultry producers. There have been large numbers of wild birds effected, many with no symptoms. It is possible H5N1 could become endemic to our wild birds as it is in other countries.

While the threat to humans in the US is low right now, the ever present fear is that HPAI will reassort with other influenza strains, allowing for human-to-human spread and a new pandemic influenza virus. If this new pandemic influenza virus were to retain the high severity and death rates that have been seen in other human infections caused by HPAI, this could be truly disastrous. The United States federal government does maintain a stockpile of vaccines, including vaccines against A(H5N1) and A(H7N9) avian influenza. Unfortunately, as we found in 2009, enough reassortment and changes can occur that new vaccines need to be created in order to be effective. Preparedness for influenza pandemic is a fundamental part of the national, state, and local planning. <https://www.cdc.gov/flu/pandemic-resources/national-strategy/index.html>.

Influenza is always changing

- Flu viruses change constantly, from season to season and sometimes during the season.
- Flu vaccines must be updated frequently to keep up with these changes.
- Each year, influenza causes millions of illnesses, hundreds of thousands of hospitalizations, and tens of thousands of deaths.

Seasonal flu causes substantial sickness and death

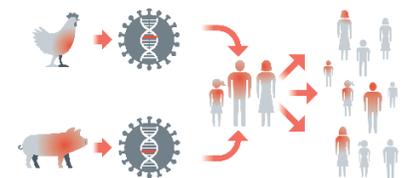


**The top range of these burden estimates are from the severe 2017-2018 flu season. These are preliminary and may change as data are finalized.*

Novel influenza viruses are always emerging

- Most influenza viruses spread among animals more than among people, especially wild birds and pigs.
- A few of these animal influenza viruses can change to cause illness in people, and in rare cases, may cause a pandemic.
- People may have little or no immunity to novel influenza so the consequences can be much greater.

Animal influenza viruses can spread to people



An influenza pandemic can start anywhere and spread globally

- Four influenza pandemics have occurred in the past 100 years, and another could occur at any time.
- The 1918 flu pandemic was the most severe, killing 675,000 Americans and 50 to 100 million people worldwide.
- CDC's influenza laboratory capabilities and epidemiologic networks have strengthened pandemic preparedness by improving influenza surveillance and vaccine strain selection. CDC was able to quickly adapt these systems to use for the COVID-19 pandemic response.

Estimated U.S. deaths from pandemic flu

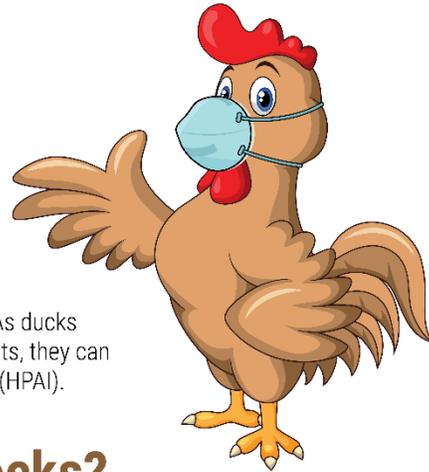


www.cdc.gov/flu

Keeping our Birds Safe

From Avian Influenza (HPAI)

In Michigan, late winter can be worrisome for poultry farmers. As ducks and other migratory waterfowl migrate north from winter habitats, they can carry diseases, most notably highly pathogenic avian influenza (HPAI).



How can we protect our flocks?



Biosecurity and Prevention Measures

- Keep all domestic poultry inside their coop.
- Avoid contact with wild birds, especially migratory waterfowl (ducks, geese, etc.).
- Avoid contact with any other poultry farms, regardless of size.
- Stop or limit the movement of birds to and from your farm.
- Have a dedicated set of boots and clothing to use when taking care of your birds. These should not leave your farm or coop area.
- Place a footbath or boot wash (scrub brush and disinfectant) at the entrance of your coop.



Know the Symptoms

- Lack of appetite
- Significant drop in egg production
- Nasal discharge, sneezing, coughing
- Swollen, purple combs, wattles, legs
- Swollen head, legs
- Bloody diarrhea
- Increased Flock Mortalities
- Neck Torsion



If you suspect Avian Influenza:

- Call MDARD immediately
Daytime: (800) 292-3939
After hours: (517) 373-0440
- Restrict visitors
- Clean and disinfect equipment, clothing and footwear.



Scan to sign up for email alerts about the virus on MDARD's website.



For additional information

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<https://www.michigan.gov/mdard/-/media/Project/Websites/mdard/documents/animals/diseases/Keeping-Our-Birds-Safe-Flyer.pdf?rev=913728455d4048a6a3ddcaa4b2aaf3c3&hash=9FBBFA75B784A4F0E7FFB832FA838144>

Resources:

- www.mi.gov/birdflu (Sign-up to receive updates and alerts about avian influenza in Michigan)
- https://www.canr.msu.edu/avian_influenza/
- <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza>

- The following hotlines are available for reporting concerns:
 - Eyes in the Field (sick or dead bird and mammal observation report) <https://www2.dnr.state.mi.us/ors/Survey/4>
 - If suspect HPAI infections:
 - DOMESTIC BIRDS: 800-292-3939 (daytime); 517-373-0440 (after-hours)
 - WILD BIRDS: 517-336-5030

Recommendations:

- Avoid direct contact with wild birds and observe them only from a distance.
- Prevent contact between domestic and wild birds.
- If you have poultry, don't feed other birds. Otherwise, if you feed birds, clean your feeder properly.
- Use well or municipal water as drinking water for birds.
- Keep waterfowl and other wildlife off your land by removing standing water and preventing access to ponds and basins.
- Do not use untreated or unfiltered surface water to wet or water poultry or to clean equipment, barns, or other facilities.
- Do not walk or drive trucks, tractors, or other equipment through areas where waterfowl or other wildlife feces may be present.

#FEEDSMART
PREVENTING DISEASE AT BIRD FEEDERS

Our own actions can help curb the spread of bird illnesses. If you have observed birds with symptoms near your feeders, immediately clean your feeders, and check-in with your local wildlife agency to see if they are advising temporary removal of feeders. Infected birds may appear lethargic, have swollen eyes and puffy feathers, and may exhibit rapid breathing.

TIP 1 CLEAN YOUR FEEDERS WEEKLY
The most effective way to clean birdfeeders is a combination of washing your feeders with general dish soap and water with a non-abrasive scrubber, and then soaking in a 9:1 bleach solution (i.e., 9 quarts of water to 1 quart of bleach) for at least fifteen minutes. Be sure to clean feeders away from where you prepare food, use gloves when handling the bleach mixture, and thoroughly wash your hands after handling bird feeders. You can also opt to spray empty feeders with the same 9:1 bleach solution. Allow the feeders to completely dry before re-filling, as damp bird seed promotes mold growth.

PRO TIP: To make this process easier, switch out feeders as you clean them so there is always a backup feeder(s) while the others are being cleaned.

TIP 2 CLEAN YOUR BIRD BATHS
Clean your birds baths with the same solution as noted above—feces congregate in these areas too! Water in bird baths should be replaced daily, year-round, to prohibit algal and bacterial growth in standing water.

TIP 3 CLEAN UNDER YOUR FEEDERS
Birds will eat off the ground, and can get sick if they are exposed to fallen seed that has become wet and/or moldy. Using a rake or shovel works, but a shop-vac can also do the trick!

TIP 4 KEEP CATS INDOORS
Cats, just like humans, can transmit disease and bring its infection into your home. Regardless of disease outbreaks, cats should always be kept indoors, there are many studies that have documented the negative impact of free-ranging domestic cats on wild bird populations. It is safer for your cat, for you, and for the birds to keep cats inside.

TIP 5 DO NOT TOUCH OR HAND FEED BIRDS
If you find a sick bird, call your state wildlife agency or wildlife rehabilitator. If your local officials instruct you to dispose of the remains, wear gloves or place a plastic bag over your hand to pick it up. Place the bird in a plastic bag, tie the bag up, and throw it away, following your local officials' instructions. Wash your hands with soap and water when you are finished.

Learn more about keeping wild birds healthy and happy at www.wbfi.org/feedsmart

<https://www.wbfi.org/feedsmart/>

Sources

- Chapter 21 - Orthomyxoviridae, Editor(s): MacLachlan, N., Dubovi, E. Fenner's Veterinary Virology (Fifth Edition), Academic Press, 2017, Pages 389-410, ISBN 9780128009468, <https://doi.org/10.1016/B978-0-12-800946-8.00021-0>.
- Fowl Plague, Grippe Aviaire " Avian Influenza." " November 2015 (Last Updated February 2016)." At https://www.cfsph.iastate.edu/Factsheets/pdfs/highly_pathogenic_avian_influenza.pdf
- CDC. Past Pandemics. <https://www.cdc.gov/flu/pandemic-resources/basics/past-pandemics.html>
- Stephenson, I. Avian influenza: Epidemiology, transmission, and pathogenesis. In: UpToDate, Hirsch, M., Baron, E. (Ed), UpToDate, Waltham, MA. (Accessed on April 18, 2022)
- CDC. Reported Human Infections with Avian Influenza A Viruses. <https://www.cdc.gov/flu/avianflu/reported-human-infections.htm>
- USDA. 2022 Confirmations of Highly Pathogenic Avian Influenza in Commercial and Backyard Flocks <https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian/avian-influenza/hpai-2022/2022-hpai-commercial-backyard-flocks>