

Highly Pathogenic Avian Influenza FAQs

What is highly pathogenic avian influenza (HPAI)?

- Avian influenza is caused by an influenza Type A virus and primarily affects birds. The currently circulating HPAI is an H5N1, so named based on a combination of two groups of proteins on the surface of the influenza A virus: hemagglutinin or “H” proteins, of which there are 16 (H1–H16), and neuraminidase or “N” proteins, of which there are 9 (N1–N9). Many different combinations of “H” and “N” proteins are possible. Each combination is considered a different subtype, and related viruses within a subtype may be referred to as a lineage. ([APHIS](#))
- Avian influenza viruses are classified as “low pathogenic” or “highly pathogenic” based on their genetic features and the severity of the disease they cause in poultry. Most viruses are of low pathogenicity, meaning they cause no signs or only minor clinical signs of infection in poultry.
- The genome of this H5N1 strain has been sequenced. This information confirms that the strain is not well adapted to infect mammals and no markers related to influenza antiviral resistance were found. These facts support the current conclusions that the health risks to humans remain low and that existing vaccines for animals seem to be effective. ([CDC](#))
- HPAI could become a significant public health concern if a strain were to mutate in a way that allowed for easier human-to-human transmission. Currently, there is no genetic or epidemiologic evidence that this has or is likely to occur.

What is the current situation in the US?

- The currently circulating HPAI virus H5N1 has been found in wild birds and in commercial and backyard poultry flocks since January 2022. More than 1300 poultry flocks have tested positive, affecting more than 133 million birds, across 50 states. ([CDC](#))
- Detections of HPAI in poultry flocks are typically higher in the Fall and Spring, when wild birds migrate and come into contact with commercial poultry during the migration process. It is estimated that there are more than 360 million egg-laying chickens in the US. More than 12 million birds were estimated to be affected. ([APHIS](#))
- Sporadically, mammals can become infected. Many species are potentially susceptible and several wild mammalian species including skunks, mice, seals, bears, mountain lions, etc. have also been affected. In addition, there are several reports of infections in domestic cats. While it seems that most cases are fatal, it should be noted that this may be because detection of the HPAI virus is done in carcasses that are found by wildlife officials, which may indicate that other animals are infected but fully recover. ([APHIS](#))
- In late March 2024, HPAI was first detected in dairy cattle in Texas, Kansas and Michigan, likely transmitted from wild birds.

What is the current situation in dairy cattle?

- Confirmed positive dairy herds have been found in several states including California, Colorado, Idaho, Iowa, Kansas, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, South Dakota Texas, Utah and Wyoming. ([APHIS](#))
- Earlier in 2024, at least 180 cattle in a herd of about 4000 animals at a farm in TX showed symptoms, including a significant drop in milk production, a decrease in appetite and rumination, mild respiratory signs, low-grade fever, and thickened "colostrum-like" milk.
- Among samples collected at this dairy farm, Cornell University [reports](#) they detected HPAI in:
 - 95% of raw milk samples
 - 10% of fecal samples
 - 20% of nasal samples

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- Many dead cats and birds on the farm
- The transmission routes to cattle are unknown, though direct contact, oral consumption, inhalation, and via fomites are being investigated. Based on the positive isolates, researchers suspect that the virus replicates well in mammary tissue.
- With proper veterinary care, infected cows recover in a couple of weeks.
- In response to continuing concerns, USDA’s Animal and Plant Health Inspection Service (APHIS) is now requiring certain measures to further limit the spread of the disease. These include mandatory testing of all dairy cattle prior to their interstate movement and mandatory reporting of any detection of Influenza A in livestock.

What is the effect on milk safety?

- An [FDA sampling](#) of 167 dairy products collected at retail found no viable H5N1 virus in any samples. The samples included pasteurized fluid milk and products made from pasteurized milk, such as cheeses, cream cheese, butter, ice cream, and aged raw milk cheese, a product from milk that was not pasteurized.
- Although a [study](#) of 297 pasteurized milk products revealed that viral RNA titers as high as 5.4 log₁₀ plaque forming units/ml with a mean and median at about 3 log₁₀ plaque forming units/ml, no infectious virus was detected. This highlights the limitations of the use of PCR screening of samples and that additional studies are needed.
- The FDA and USDA are confident that the US milk supply is safe. This is because only milk from healthy animals is authorized for distribution and all milk must be pasteurized before entering the market. ([FDA](#))
- The FDA requires pasteurization for all milk and milk products in final package form intended for direct human consumption. In 1987, the agency issued a regulation prohibiting the interstate sale of raw milk. This is outlined in [21CFR1240.61](#), in which the FDA has also published process parameters for milk pasteurization. These require that every particle of milk and milk product is heated in properly designed and operated equipment to one of the temperatures given in the following table, and held continuously at or above that temperature for at least the corresponding specified time ([FDA](#)):

Temperature	Time
145 deg.F (63 deg.C) ¹	30 minutes.
161 deg.F (72 deg.C) ¹	15 seconds.
191 deg.F (89 deg.C)	1 second.

¹ If the fat content of the milk product is 10 percent or more, or if it contains added sweeteners, the specified temperature shall be increased by 5 deg.F (3 deg.C).

Temperature	Time
194 deg.F (90 deg.C)	0.5 second.
201 deg.F (94 deg.C)	0.1 second.
204 deg.F (96 deg.C)	0.05 second.
212 deg.F (100 deg.C)	0.01 second.

- Milk from cows with HPAI symptoms is not entering the human food supply and pasteurization will easily inactivate the virus.
- Milk availability is not impacted since the loss of milk from sick cattle represents a very limited part of the overall supply.
- Under certain rare circumstances, high-temperature/short-time (HTST) pasteurization may not fully inactivate all the virus if the initial load were sufficiently high, however under typical circumstances this is unlikely to be an issue. ([NYT](#))

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What does the literature say about the effectiveness of pasteurization against viruses such as high pathogenic avian influenza:

- A 2021 review ([Pitino, et al.](#)) of 109 primary research articles assessed the impact of pasteurization on viral load or detection of live virus. Influenza viruses were included in this review. In all matrices, including human milk, pasteurization at 62.5 °C was generally sufficient to reduce surviving viral load by several logs or to below the limit of detection.
- Data from three studies by Chmielewski, et al., show thermal inactivation of high pathogenic avian influenza virus (H5N1) has been successful during egg pasteurization processes. It is notable that this occurs at lower temperatures than what is used for milk. ([Thermal inactivation](#), [Egg pasteurization](#), [Liquid egg pasteurization](#))
- [Hessling et al.](#) (2022) reviewed about 50 studies on heat inactivation of human and avian influenza viruses. Although they showed variability in heat sensitivity of influenza viruses in different media, all studies demonstrated substantial reduction (at least 4 log₁₀) of virus at 60 °C within approximately 30 minutes. This condition is below the required vat pasteurization condition of 63°C for 30 minutes.

What are Regulatory Messages?

- The Association of State and Territorial Health Officials hosted a [webinar](#) on April 26, 2024. FDA's Dr. Donald Prater described that milk pasteurization validation studies are underway. Various dairy products are being evaluated. Other comments he made:
 - He acknowledged that the duration of persistence of HPAI in milk is not known at this time but is being studied.
 - FDA's recommendation is that any discarded milk be heat treated in line with required pasteurization parameters.
- On 4/26/24, FDA released [commentary](#) reaffirming the safety of the milk supply. They reported that results of egg inoculation tests on quantitative polymerase chain reaction-positive retail milk samples show that pasteurization is effective in inactivating HPAI. Further, they stated that no live, infectious virus was detected. They also reported that they had no detection of viral fragments in samples of retail powdered infant formula and other powdered milk products marketed as toddler formula. Further analyses continues.

Will beef supply chains be impacted?

- There is no current indication that HPAI is in this supply chain.
- The [USDA FSIS](#) announced that no virus particles were found in its recent sampling of retail ground beef. The samples were collected from states in which dairy cattle herds have tested positive for H5N1 influenza virus.
- FSIS also performed a cooking study with an H5N1 virus which was inoculated into 300g ground beef patties. No virus was present in burgers cooked to 145°F (medium) or 160°F (well done) and there was "substantial reduction" in burgers cooked to 120°F (rare).

Will egg supply chain be impacted?

- The likelihood that eggs from infected poultry are in the retail market is low, because the rapid onset of symptoms in egg-laying poultry means that these birds are removed from farms. ([FDA](#))
- There are potential impacts on the egg supply since outbreaks have led to fewer birds laying eggs, fewer eggs being sold and higher prices.

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What preventive measures should be taken?

- Farmers should implement sound biosecurity measures including
 - Limiting the moving of cattle
 - Proper care and cleaning of mammary tissues
 - Cleaning and disinfection of milking equipment
 - Excluding wildlife and domestic animals from buildings ([APHIS](#))
- The health of dairy cattle should be monitored and if any sick animals are identified, they should be separated from the rest of the herd. Their milk should be discarded, following guidance from state regulatory officials.
- The [CDC](#) has published preventive recommendations for those who may have direct or close contact with sick or dead animals, and their fecal material, litter, or other potentially contaminated items. Guidelines include:
 - Use of PPE - goggles, gloves, boot covers, respirator (e.g., N95 mask), coveralls, and hairnets.
 - Training on how to use PPE.
 - Monitoring for respiratory symptoms and eye redness.
 - Avoiding eating or drinking in potentially contaminated areas.
- Feeding only pasteurized raw milk to other cows or calves.
- Humans should only consume pasteurized milk.

Is there a public health impact on humans?

- There is no evidence of changes in the H5N1 viral genome that would make it more transmissible to humans.
- A very isolated number of people in the US have tested positive for HPAI. Typically, these cases have very close contact with infected domestic animals. CDC reports on these very rare cases [here](#).
- Public health officials across the world are watching disease incidence carefully and are taking some precautions. For example, [Finland](#) is preparing to offer 20,000 vaccines to people at risk of exposure to an avian influenza strain spread.

Additional Resources:

- [CDC Current Situation Summary](#)
- [TAG Avian Influenza Fact Sheet](#)