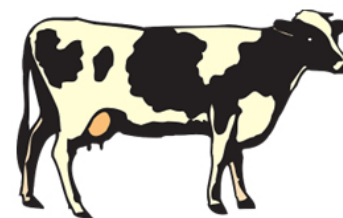


FRI eNews provides updates on research and events at FRI and UW-Madison and other current food safety news.

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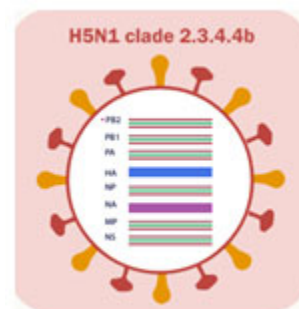


This **special edition** of FRI eNews will focus on the recent and **rapidly evolving discovery of avian influenza (HPAI) H5N1 virus in U.S. dairy cows and milk**. Many thanks to FRI affiliate member **Keith Poulsen**, director of the Wisconsin Veterinary Diagnostic Laboratory and expert in large animal infectious and zoonotic diseases, for his added insights to this newsletter.



Tell me about the HPAI virus that is causing infections in dairy herds.

- All infected dairy herds to date have been confirmed to have the **H5N1 Eurasian lineage goose/Guangdong clade 2.3.4.4b virus**.
- This virus strain belongs to H5N1 clade 2.3.4.4b, which is the clade that has caused widespread outbreaks in birds around the world since October 2020. This clade is now the most common H5N1 virus that is currently circulating in birds worldwide.
- This virus is called a “**highly pathogenic**” virus because it causes severe disease and death in poultry, but is not generally considered to be highly pathogenic in mammals.
- **Wild birds** are more resistant to H5N1 (presumably because of prior exposure to it) than domesticated poultry birds but can still be infected and carry the virus to new locations when they migrate.
- H5N1 viruses have rarely been documented to **infect humans** who have had close contacts with infected wild birds or poultry, but H5N1 viruses are not easily transmitted from one mammal to another.



Where are the dairy herds that have tested positive for H5N1, and how many herds/cows are infected?

- The first signs of the H5N1



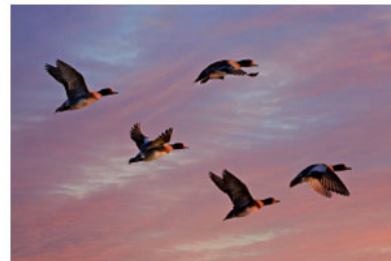
panhandle region in February 2024.

- Infections were next found in dairy herds in nearby states (Kansas and New Mexico).
- H5N1 has now been found in at least 28 dairy cattle herds in eight states (Texas, Kansas, Michigan, South Dakota, North Carolina, New Mexico, Idaho, Kansas). Only a small portion (~10% of cows that are in second lactation or greater and that are more than 150 days in milk) of affected herds become ill, per USDA. (For reference, USDA estimates that there are more than 26,000 dairy herds in the U.S.)



How were the cows infected?

- **Wild migratory birds** are believed to be the **original source** of the virus in cows. H5N1 2.3.4.4.b has been found in wild birds (and commercial poultry flocks) in Texas and other states this year.
- USDA has stated “the investigation to date also includes some cases where the **virus spread was associated with cattle movements between herds.**” (Interestingly, the agency also indicated that the virus appears to have spread from the dairy cattle premises to nearby poultry premises, probably spread by fomites from people.)
- The spread of H5N1 within and among herds means that **bovine-to-bovine transmission is occurring** (probably from fomites in the milking parlor and other equipment that comes into contact with raw milk), according to USDA’s APHIS. (Mammal-to-mammal transmission of H5N1 was suspected before in minks in 2022).



What are the symptoms of H5N1 infection in cows?

- The infection is usually observed in **older cows** in mid-lactation, although some younger cows have also been infected.
- Infected cows consume less feed and show an abrupt drop in milk production. Decreased milk production at the herd level may also be noted.
- Milk from infected cows may be thick, yellow and may resemble colostrum.
- Abnormal stools, lethargy, dehydration, and fever may occur.
- Peak symptoms occur within 4–6 days of onset. The illness in cows usually lasts 7–10 days before recovery, and few, if any, cows have died. This is very different than what is seen in poultry flocks, where infection with H5N1 is fatal.

H5N1 is known as a type of “bird flu,” so is it unusual for H5N1 to infect a mammal?

- No, many different species of mammals, especially wild mammals, have been infected with H5N1.
- Infections have also been noted in domestic cats and dogs. Infections of companion animals with H5N1 clades



Has this virus infected any beef (vs. dairy) cattle? What about other food animals?

- To date, the virus has not been found in **beef cattle herds** (although animals from dairy herds can enter the meat supply chain).
- The virus has been found in ten **baby goats** in Minnesota. The goats were born days after **poultry on the farm had been depopulated because of HPAI** and used the same pasture and water source as the poultry had used. No adult goats were infected, and no further sick goat kids have been reported.
- EFSA concluded that H5N1 clade 2.3.4.4b strains are “**poorly adapted to pigs.**” Pigs have a low susceptibility to infection with H5N1 clade 2.3.4.4b and are “generally of a subclinical nature.”
- The virus **continues to be found in poultry birds**, although as of April 15, USDA APHIS stated that H5N1 cases in poultry appear to be in their typical seasonal decline.



Have any human infections been associated with the H5N1 outbreak in cows?

- To date, one **human** infection has been associated with the H5N1 outbreak in cows.
 - A laboratory-confirmed infection with H5N1 2.3.4.4b occurred in March in an individual at a commercial dairy farm that had contact with (presumably) H5N1-infected cattle.
 - **The only symptom the patient reported was conjunctivitis.** The individual is recovering.
 - No household contacts of the patient reported illnesses.
 - Sequencing of the viruses isolated from **cattle** did not identify changes that would make the viruses more transmissible to or between humans. However, virus isolated from the **human patient in Texas** was reported (in a not-yet-peer reviewed pre-print) to have acquired a mutation in a gene (PB2) which may affect virulence or adaptation in mammals.
- **This human infection is noteworthy as it appears to be the first report of an H5N1 influenza virus transmitted from a mammal to a human, per WHO.**

Could eating or drinking something contaminated with H5N1 virus result in an infection?

- Influenza is considered a respiratory virus and **not a foodborne virus.**
- However, mammals have been infected with H5N1 after eating infected birds or poultry.
- Human infections with avian influenza virus such as H5N1, although rare, can happen when the virus enters a person’s eyes, nose, or mouth, or if it is inhaled, which suggests that eating a food containing viable virus could be a risk.
- Human H5N1 infections have been reported after consumption of food (raw duck blood, in one case) containing the virus but are extremely rare.



How safe are foods derived from cows if the cows were infected with H5N1?

While the virus is shed at high levels in milk, only milk from healthy animals is authorized for interstate distribution in the U.S.

- In addition, all milk authorized for interstate distribution in the U.S. is pasteurized at 161°F (72°C) for at least 15 seconds or 145°F (63°C) for 30 minutes. [FDA](#) and [USDA](#) have affirmed that pasteurization will inactivate bacteria and viruses in milk. D-values for H5N1 in various food matrices have been reported in the literature; for “all liquids,” the D60°C was given as 2.85 min, and D75°C was 0.91 min [in one review](#).



Raw milk:

- Barn cats at the farm where the initial infections in cows were found consumed raw colostrum and milk from the cows and were infected with H5N1 and became sick. In fact, the first sign of the outbreak at the dairy farm may have been the death of numerous barn cats.
- FDA continues to warn against the consumption of raw milk, although the agency says it does not know if H5N1 virus could be transmitted through consumption of raw milk by humans.
- **To date, the herds that have had H5N1 infections have not been linked to raw milk providers.**



Raw milk cheeses:

- FDA recommends that dairy products made from raw milk **from infected or exposed cows** not be used for human consumption.
- It is not known whether 60 days of aging (as is required for raw milk cheeses in the U.S.) destroys the virus.



Other dairy products made from pasteurized milk:

- All dairy products made with pasteurized milk are expected to be safe, per FDA.

Beef:

- Cooking meat to a safe internal temperature kills bacteria and viruses in meat, and numerous experts have said that cooking meat products would kill this virus.



Animal feed/pet foods:

- In South Korea, **H5N1 infections occurred last summer in two cat shelters in Seoul**, leading to the deaths of many cats. The cats at the shelters were kept indoors, making it less likely that the virus came directly from wild birds. However, H5N1 virus was detected in “Balanced Duck” cat food that was fed to the cats at one of the shelters. **The cat food was found to have been made with improperly processed raw duck meat.**



H5N1 virus were found in a sample of food (fresh chicken meat) that had been fed to one of the infected cats.

- A UK newspaper quoted several virology and veterinary experts who **speculated** that **poultry litter could be a source** of the H5N1 virus that has infected U.S. cattle. In the U.S., poultry litter is allowed to be fed to cattle. However, such litter should not contain dead birds and is supposed to be processed to eliminate pathogens.

What are some of the other potential concerns about cows being infected with H5N1?

Is the **exposure of workers to infected cows or potentially contaminated raw milk** a concern?

- CDC has previously issued recommendations for those working with poultry potentially contaminated with H5N1 to reduce the risk of human infection, and these recommendations have been updated to include livestock owners and those handling raw milk **if they are “working with animals or materials potentially infected or confirmed to be infected” with H5N1.**



Will cows herds have to be depopulated like infected poultry flocks have been?

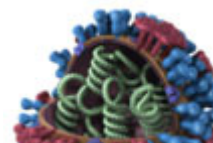
- At this time, USDA APHIS has stated that **depopulation of dairy herds infected with H5N1 is not expected.** This is because (unlike the situation with birds), infected cows are recovering with little or no mortality.

What are the impacts on the dairy industry, the milk supply chain, and milk prices?

- **Movement of dairy cattle is being discouraged or restricted**, depending on the state.
 - The H5N1 infections in dairy herds in North Carolina, Idaho, Michigan, and Ohio appear to be directly related to the transfer of animals from an infected herd in Texas.
 - USDA is not requiring testing of dairy herds, but is **discouraging the movement of dairy cattle if possible and strongly recommends testing before herds are moved** between states. More tests are being validated specifically for this use by National Animal Health Level 1 and other laboratories.
 - However, at least 18 states are now requiring that cows be tested before they can be brought in from states where an H5N1 infection in cows has occurred.
- **No recalls of milk or dairy products** have been issued for H5N1.
- The outbreak is not affecting overall U.S. milk production or milk prices at this point. USDA has not reported an impact on the beef supply.
- No disruptions or barriers to the export of dairy products from the U.S. have been announced at this point.

Other concerns?

- H5N1 viruses mutate and evolve.
 - Humans have only rarely been infected with H5N1 viruses. Since 2003, only 889 cases of human infection with H5N1 viruses; **however, these cases resulted in**



ability to more easily infect humans and to spread between humans in a sustained manner. This could potentially occur by mutation or by recombination with other animal or viruses (which could conceivably occur, for example, if a human was to be infected at the same time with both H5N1 and an influenza virus that circulate in humans each year). Such an event could lead to a **pandemic**.

- No human vaccines are currently available for H5N1 viruses, and seasonal influenza vaccines are not effective against H5N1 viruses.

Final words from authorities and experts:

FDA: "The FDA does not currently have concerns about the safety or availability of pasteurized milk products nationwide."

USDA: "USDA is confident that the meat supply is safe."

CDC: "At this time, CDC considers the human health risk to the U.S. public from HPAI A(H5N1) viruses to be low; however, people with close or prolonged, unprotected exposures to infected birds or other animals, or to environments contaminated by infected birds or other animals, are at greater risk of infection."

WHO: "Since the virus has not acquired mutations that facilitate transmission among humans and based on available information, WHO assesses the public health risk to the general population posed by this virus to be low and for occupationally exposed persons the risk of infection is considered low-to-moderate."

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