NMPF
NATIONAL MILK PRODUCERS FEDERATION

FARMERS ASSURING RESPONSIBLE MANAGEMENT
FARM

HPAI H5N1 Virus Spillover into Dairy Cattle

MAY 2025

WHY IS IT CALLED A SPILLOVER IN DAIRY CATTLE?

A spillover occurs when a virus that typically infects one species—such as waterfowl—crosses over and causes disease in another species, like dairy cattle. This is how highly pathogenic avian influenza (HPAI) H5N1 made its way into U.S. dairy cattle.

A specific genotype of the virus, B3.13, was identified in wild birds in late 2023 and later detected in dairy cattle in Texas by March 2024. Another genotype, D1.1, was first found in wild birds in September 2024 and later appeared in dairy cows in Nevada and Arizona in February 2025.

With wild birds and waterfowl commonly present in dairy environments, this emerging disease has raised concerns. Many are now asking why this is happening and how to better protect dairy cattle. Here's what we know.

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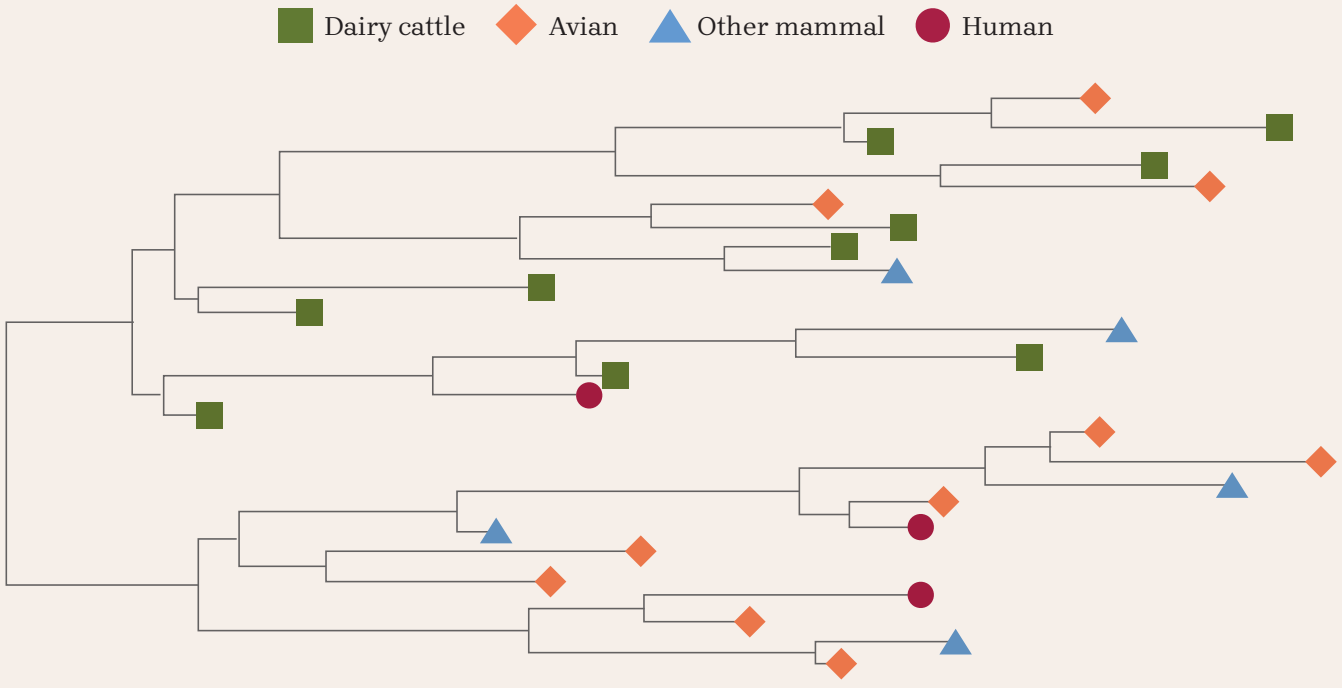
HOW DO WE KNOW H5N1 IN DAIRY CATTLE CAME FROM WILD BIRDS?

Genetic sequencing[1] of the B3.13 and D1.1 viruses found in dairy cattle closely matches strains from wild birds. Similar to a family tree or breed pedigree, each virus sample forms a branch that connects back to a common ancestor, rooted in a wild bird sample (B3.13 or D1.1). The proximity of these branches indicates how closely related the virus samples are in time and location. By mapping these connections, researchers can trace the spread of the outbreak, linking dairy herds across the U.S. and tracking spillover to mammals, poultry, and even humans.

Influenza viruses are known to jump between species, sometimes mutating to adapt to new hosts. This is why ongoing testing and sequencing are critical. Data from recent testing shows that B3.13 has not been detected in wild migratory birds since early 2024—only in dairy cattle, poultry, and other animals living on or near infected farms. Meanwhile, the D1.1 genotype has been found in all four major migratory bird flyways across North America.

1 Viruses, like cattle and people, are made up of genes. Those can be sequenced with special machines to decode the pattern. Scientists can compare the pattern to see how closely it matches other viruses. They can also look for mutations—changes that show the virus is adapting to its mammalian host. Another feature of genetic sequencing is to show the origin of a virus.

Example Phylogenetic Tree



This example phylogenetic tree is drawn to show how virus samples from dairy cattle, avian (wild birds or poultry), other mammals and humans are related to a common ancestor through the lines and branches. This is not an exact replica of the B3.13 or D1.1 virus tree. Visit gisaid.org for actual data.

HOW DID H5N1 INFECT DAIRY CATTLE?

For decades, the U.S. has been monitoring migratory wild birds for HPAI. Since 2022, over 100 different genotypes of H5N1 have been identified in wild birds across North America. Waterfowl, the natural reservoir for HPAI, shed the virus through saliva, nasal secretions, and feces. While some birds remain asymptomatic, others experience large-scale die-offs. H5N1 is particularly lethal to chickens, turkeys, other wild birds, and many mammals, including cats. The more animals that get infected, the greater the opportunity for the virus to replicate and evolve.

The exact pathway that led H5N1 to infect lactating dairy cattle remains unclear. A combination of factors had to align:

- The presence of a specific virus
- Environmental exposure
- The presence of virus receptors in the cow's mammary gland

Some experts have referred to this as "the perfect storm."

What we do know is that the movement of dairy cattle from infected but undetected herds to other states allowed B3.13 to spread to naïve cows. This introduced H5N1 B3.13 into new areas, leading to further spillovers into poultry, wild birds, and some mammals living on or near dairies.

People who have come into contact with sick cows, infected or dead poultry, or their bodily fluids have reported symptoms such as red eyes (conjunctivitis) and respiratory illness. H5N1 has the potential to cause severe disease, and even death, in humans. However, the risk to the general public remains low. Importantly, drinking commercial milk is safe, as pasteurization effectively kills the H5N1 virus.

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HOW CAN WE LESSEN THE IMPACT OF H5N1?

Reducing the impact of H5N1 requires a multi-step approach involving early detection, testing and prevention strategies.

Monitor and Report

Producers should closely watch cattle for signs of illness and contact their herd veterinarian if symptoms appear. Also report any sick or dead wild birds, cats, or wild mammals (such as mice, skunks, and raccoons) to the state veterinarian—even if cattle do not seem sick.

Find and Trace the Virus

The USDA's National Milk Testing Strategy aims to test milk from silos at processing plants as well as farm-level bulk tanks and tankers for H5N1. This approach helped identify the D1.1 genotype in milk.

Prevent Further Spread

For dairies that test positive, USDA and state authorities have implemented cattle movement restrictions and are encouraging enhanced biosecurity measures. To reduce transmission risk:

- Avoid feeding raw milk to calves, cats, and other mammals.
- Workers should wear protective gear, including eye, nose, and mouth coverings, to prevent exposure to milk splashes and avoid touching their faces.
- Research is ongoing to explore additional prevention methods, including potential vaccination strategies for cattle.

HOW CAN WE LESSEN THE IMPACT OF H5N1? (CONTINUED)

H5N1 can spread between dairies through the movement of animals, people, vehicles, equipment, and close-proximity operations. The B3.13 genotype has been transmitted to poultry farms via these same pathways. Meanwhile, the D1.1 genotype has become the dominant strain among migratory wild birds in the U.S. and continues to infect poultry and mammals.

Since wild birds and mammals can still introduce H5N1 to dairy cattle, completely eliminating their presence on and around farms is not a feasible solution. Additionally, attempts to remove wildlife may violate state and federal laws. Producers seeking guidance on managing birds and wild mammals should contact USDA Wildlife Services, the U.S. Fish and Wildlife Service, or their state agriculture and natural resources departments for appropriate management strategies.

Acknowledgements

This resource was created, in part, through USDA APHIS funding to the NMPF and was reviewed by the Dairy H5N1 Technical Committee. The Technical Committee consists of dairy farmers, processor and cooperative representatives, milk haulers, veterinarians, state animal and public health officials, academic researchers, and representatives from the National Animal Health Laboratory Network (NAHLN) and private labs, National Association of Dairy Regulatory Officials (NADRO), National Conference on Interstate Milk Shipments (NCIMS), CDC, FDA, and USDA APHIS Veterinary Services. It may not express APHIS' views.

More Information

- NMPF's H5N1 in Dairy Cattle Homepage
- USDA APHIS H5N1 Homepage
  - Dairy Farm Biosecurity: Preventing the Spread of H5N1
  - Manage Wildlife to Prevent Avian Influenza
- CDC HPAI H5N1: Interim Recommendations for Prevention, Monitoring, and Public Health Investigations
- FDA Investigation of H5N1 in Dairy Cattle Homepage
- GISAID Phylodynamics of Influenza Virus H5N1 Outbreak in the U.S.

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