H5N1 avian influenza in Texas: Comprehensive regional report

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INTRODUCTION

Avian influenza A(H5N1), commonly known as "bird flu," is a subtype of influenza A virus that primarily infects birds but can occasionally infect humans.[1] Sporadic human infections have been reported worldwide since the virus first emerged as a human pathogen in Hong Kong in 1997.[1,2] Highly pathogenic H5N1 viruses are now widespread in wild birds globally and have caused outbreaks in poultry in many countries, with increasing reports of infection in other animal species.[1]

In the United States, H5N1 has caused outbreaks in poultry and, more recently, in dairy cattle, representing an important shift in the virus's epidemiology.[1] Since 2022, sporadic human infections in the U.S. have occurred primarily after direct or close contact with infected poultry or dairy cows, often in occupational settings without appropriate personal protective equipment. Most reported human infections have been clinically mild, commonly presenting with conjunctivitis, fever, or mild respiratory symptoms, although a few hospitalizations and one death have been reported.[1,3]

Highly pathogenic avian influenza A(H5N1) clade 2.3.4.4b was first confirmed in Texas dairy cattle in March 2024, representing the first documented detection of this virus in dairy cows worldwide and the index event for a large multi-state epizootic in U.S. cattle.[4,5] Texas has since become the critical focal point for understanding bovine infection, limited human disease, and cross-species transmission risks associated with this genotype B3.13 virus.[6,7] While the risk to the general public in Texas remains low, occupational exposure among dairy workers and others in direct contact with infected animals or raw milk constitutes a significant ongoing concern.[1,3]

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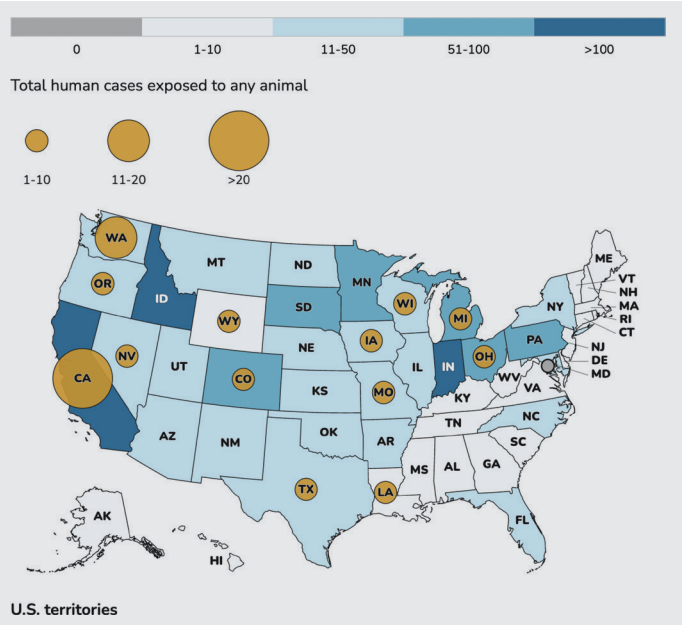

Figure 1. Number of avian flu-affected dairy herds, commercial poultry flocks, or backyard flocks (from CDC, Situation through February 28, 2026).

EMERGENCE AND TIMELINE OF H5N1 IN TEXAS

The H5N1 clade 2.3.4.4b virus reached North America via migratory wild birds in late 2021 and was first detected in Texas dairy cattle in March 2024, after herds reported abrupt production losses and abnormal milk.[4,5] By March 25, 2024, confirmed infections in Texas cows marked an unprecedented jump from wild birds into a large mammalian population, and by March 2025 the resulting epizootic had spread to at least 981 dairy herds in 16 U.S. states.[7]

Early April 2024 investigations on Texas dairy farms showed extensive viral contamination of milk—H5N1 was found in 64% of milk samples but only

2.6% of nasal swabs—indicating a strong preference for mammary tissue.[8] Clinically, affected cows had reduced feed intake, decreased rumen motility, high fever, and a sudden sharp drop in milk yield, often with thick, discolored milk.[4,5] Experimental work with Texas strains confirmed that intramammary infection causes severe necrotizing mastitis with very high viral titers in milk, while overall herd mortality remained relatively low at about 2%, with morbidity under 20%.[4,9]

Human Infections Among Texas Dairy Workers

Texas was also the site of the first documented mammalian-to-human transmission of highly pathogenic H5N1, with multiple infections in dairy farm workers exposed to infected cows and raw milk.[6] Transmission between Texas cattle farms has occurred mainly via movement of infected animals, shared milking equipment, and contaminated fomites, rather than efficient cow-to-cow respiratory spread.[7]

By October 2024, 25 of 46 U.S. H5N1 patients had exposure to infected or presumed infected dairy cattle, with Texas workers making up a substantial portion of these cases. Illness in Texas dairy workers has been largely mild: about 93% developed conjunctivitis, roughly half had fever, and just over one third reported respiratory symptoms, with around one third having conjunctivitis alone. Median illness duration was about four days, no occupationally exposed farm workers were hospitalized in the early phase, and no human-to-human transmission was detected among 97 monitored household contacts.[1]

Viral Characteristics in Texas Isolates

Genomic sequencing of Texas cattle and associated human isolates showed that these viruses belong to clade 2.3.4.4b genotype B3.13 and are closely related to other contemporary Texas epizootic strains.[6,8] The viruses carry several polymerase mutations associated with mammalian adaptation, including PB2 M631L (present in all cattle sequences), PA K497R, and, in some settings, PB2 E627K and D740N, which enhance replication efficiency in bovine and human cells.[6,9] Hemagglutinin from Texas cattle viruses retains strong avian-like α2-3 receptor binding but has acquired slight binding to human-like α2-6 receptors and shows binding to human conjunctival, tracheal, and mammary tissues, helping explain the predominance of conjunctivitis in human cases and the mammary tropism in cows.[6] Airborne transmission remains limited and not yet consistent with sustained human-to-human spread.[1,3]

Cross-Species Events and Environmental Detection in Texas

In Texas, one of the most striking cross-species events has been fatal infection of domestic cats fed raw colostrum and milk from affected cows, revealing that some mammals are far more susceptible than cattle or humans and highlighting the dangers of unpasteurized dairy.[5,6] Beyond cats, the cattle-adapted virus has been detected in contact species such as raccoons, rodents, opossums, and poultry around affected Texas farms, with these animals often showing severe respiratory or neurologic disease and high mortality.[6] Wastewater surveillance across at least ten Texas cities detected H5N1 RNA widely beginning in March 2024, coincident with dairy detections, but without parallel increases in human hospitalizations, suggesting that the wastewater signal predominantly reflected extensive animal shedding rather than widespread human infection.[10]

Texas Public Health Surveillance and Healthcare Guidance

Texas public health authorities, in coordination with CDC, implemented active monitoring of occupationally exposed persons, including dairy workers, veterinarians, and cull crews, for 10 days after their last exposure to infected or suspect animals. Symptomatic exposed persons were recommended to have respiratory specimens (nasopharyngeal or combined nasal–oropharyngeal swabs) collected, with conjunctival swabs added for those with eye symptoms, because conjunctival samples were positive far more often than nasopharyngeal swabs in conjunctivitis-only cases.[1]

Texas clinicians are advised to consider H5N1 in patients with conjunctivitis, influenza-like illness, or unexplained severe pneumonia who have recent contact with dairy cattle, raw milk, poultry, or wild birds, and to initiate oseltamivir promptly when H5N1 is suspected, ideally within 48 hours of symptom onset. Infection-control guidance for Texas hospitals calls for contact and airborne precautions, preferably in negative-pressure rooms, with N95 respirators, eye protection, gowns, and gloves for care of suspected or confirmed cases, especially during aerosol-generating procedures.[11]

Biosecurity, Farm Practices, and Food Safety in Texas

Investigations in Texas and other affected states have documented suboptimal PPE use among dairy workers, with only about 71% using gloves, 60% eye protection, and fewer than half using face masks when working with ill cows, though PPE use improved somewhat after farm-level detections.[1] Recommended farm-level measures in Texas include strict controls on cattle movement between farms, dedicated and thoroughly disinfected milking equipment, rigorous cleaning of parlors, limits on shared workers and vehicles, and wildlife-control measures to reduce bird access to feed and water.[7] A federal order implemented on December 6, 2024, mandates testing of raw milk destined for pasteurization, and bulk milk RT-qPCR surveillance has been promoted as a sensitive approach for early detection of herd infection in Texas and other states.[7] Despite extremely high viral loads in raw milk from infected Texas cows, standard pasteurization effectively inactivates the virus, and FDA has stated that the commercial milk supply remains safe; the major food-safety concern therefore centers on consumption of raw or unpasteurized milk and colostrum.[5,7]

Economic Impact on the Texas Dairy Industry

Texas dairy operations have experienced significant economic losses related to H5N1 through sharp but sometimes transient drops in milk production, culling of sick or low-producing cows, and the costs of enhanced testing and biosecurity. Movement controls, both within Texas and across state lines, have disrupted cattle trade and created logistical challenges for dairy producers reliant on interstate sales and heifer replacement.[7]

Additional financial burdens stem from required raw-milk testing, infrastructure upgrades for improved biosecurity, workforce disruptions when workers fall ill or are quarantined, and the need to maintain consumer confidence in Texas dairy products. Although pasteurized milk is considered safe, negative publicity around H5N1 in cows and raw milk has posed reputational risks that Texas producers and state agencies have had to actively manage.[7]

Risk Assessment and Priority Recommendations for Texas

Current assessments indicate that the risk of H5N1 infection for the general Texas population remains low, given the predominantly mild nature of detected human cases, absence of sustained human-to-human transmission, and effective inactivation of the virus by pasteurization.[1,3,11] However, the risk is clearly elevated for Texas dairy workers, veterinarians, poultry workers, and others with close contact to infected animals or raw milk, particularly in settings where PPE use and farm biosecurity remain inconsistent.[1,3]

Priority recommendations for Texas include:

- **Strengthened surveillance:** Expand bulk-milk testing in Texas herds, maintain active monitoring of exposed workers, and integrate wastewater and wild-bird surveillance to detect geographic expansion early
- **Improved farm biosecurity and PPE:** Mandate and support consistent use of N95 respirators, eye protection, gloves, and gowns for workers handling sick cattle or raw milk; limit inter-farm cattle movements and shared equipment; and improve on-farm disinfection and carcass and waste management

- **Occupational health measures:** Provide education, no-cost PPE, and ready access to testing and antivirals for Texas dairy workers; consider antiviral prophylaxis after high-risk unprotected exposures
- **Public communication and food safety:** Intensify outreach in Texas to discourage raw-milk consumption, explain the effectiveness of pasteurization, and maintain transparent reporting to protect both public health and consumer trust
- **One Health research and preparedness:** Prioritize Texas-based studies on viral evolution in cattle, duration of infection, effectiveness of control measures, and development of cattle vaccines, while advancing human vaccine readiness and antiviral stockpiles in case H5N1 further adapts to humans

Together, these measures are essential to contain H5N1 within Texas animal populations, protect high-risk workers, and reduce the chances that this cattle-adapted virus acquires the additional changes needed for efficient human-to-human transmission

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