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H5N1 Hits Dairy Cow Population in Europe: Understanding the Friesland (Netherlands) Farm Case

Public Health * Global Health * Animals

Introduction: The Shattering of a Bovine Paradigm

In January 2026, the European veterinary community confronted a pivotal shift in the epidemiological landscape of Highly Pathogenic Avian Influenza (HPAI). The Dutch Food and Consumer Product Safety Authority (NVWA) reported the detection of antibodies against the H5N1 virus in a dairy cow in the province of Friesland, confirmed through serological testing by Wageningen Bioveterinary Research (WBVR).[3] This event represents the first documented evidence of H5N1 infection in dairy cattle on the European continent. Unlike the explosive bovine outbreaks observed in the United States beginning in March 2024 -- where the reassortant B3.13 genotype adapted to replicate efficiently in the bovine mammary gland[1][10] -- the Dutch case presented as a retrospective serological footprint in a single animal, devoid of active viral shedding at the time of detection.[3]

For decades, the biological dogma surrounding Influenza A viruses (IAV) maintained a rigid demarcation of host ranges, assuming cattle were largely refractory to natural avian influenza infection due to receptor distribution. While the American crisis shattered that assumption, Europe remained buffered for nearly two years. The detection on January 23, 2026, in Noardeast-Frysl n demonstrates that under high environmental viral loads along the East Atlantic Flyway, local European clade 2.3.4.4b wild bird lineages can breach the bovine species barrier.[3] Because authorities detected the immune system's memory rather than live virus, the finding indicates the animal was infected, mounted an adaptive response, and cleared the pathogen -- a "dead-end" spillover that nonetheless requires a fundamental recalibration of public health and veterinary surveillance across the European dairy sector.

Anatomy of the Spillover and the US Comparative Baseline

The detection in Noardeast-Frysl n was not the product of random screening, but the culmination of a targeted "source and contact" investigation triggered by sentinel mortality on the farm.[4]

* Phase 1: The Feline Sentinel Event (Late December 2025): The dairy farmer noted acute neurological and respiratory illness in two farm cats. The domestic cat (Felis catus) is exceptionally susceptible to HPAI H5N1, developing neurotropic encephalitis and respiratory failure after preying on infected wild birds or ingesting contaminated raw milk.[3][5][19][20] One cat died rapidly, and post-mortem testing on December 24, 2025, confirmed HPAI H5N1.[4]

* Phase 2: Herd Investigation and Negative PCR (January 15, 2026): Veterinary officials sampled the clinically healthy dairy herd. Real-time polymerase chain reaction (RT-PCR) tests on milk and nasal swabs returned negative across the entire

herd, confirming no active viral shedding.[3][4]

* Phase 3: Initial Serological Confirmation (January 23, 2026): Initial blood screening identified a cow positive for H5N1-specific antibodies, validated by WBVR.[3][4] Retrospective clinical review revealed that during late December, when the cats fell ill, this cow experienced acute mastitis, respiratory distress, and malaise before recovering.[4]

* Phase 4: Full-Herd Serology and National Retrospective Screening (May-June 2026): Subsequent detailed serosurveillance of the Friesland index farm reported in Eurosurveillance sequenced HPAI H5N1 clade 2.3.4.4b genotype DI.2.1 from the sentinel cat and detected H5N1-specific serum antibodies in 34 of 72 lactating dairy cows (47.2%), milk antibodies in 14 of 70 cows (20.0%), and serum antibodies in 24 of 38 youngstock (63.2%), confirming sub-clinical intra-herd spread despite negative RT-qPCR results.[4] In parallel, retrospective WBVR and Royal GD screening of more than 3,000 archived Dutch dairy cattle blood samples and regional bulk milk found zero antibodies or viral RNA on other farms.[7][12]

Whether the cat and cow were co-exposed to a shared environmental point source (such as waterfowl-contaminated feed or water) or linked via a farmyard trophic cascade -- in which the cow shed virus into unpasteurized milk consumed by the cat -- the containment of sub-clinical exposure to a single index farm without onward inter-farm spread contrasts sharply with the US experience.[5][9][10] In American herds, the B3.13 reassortant generates exceptionally high viral titers in milk, turning shared milking clusters into mechanical fomites that inoculate teat canals and drive clinical mastitis and intra-herd attack rates of 10% to over 20%.[1][2][11]

| Epidemiological Feature | | US Outbreak (Genotype B3.13) | | Netherlands Case (European Lineage) |

| Detection Benchmark | | March 2024 (Active viral isolation) | | January 23, 2026 (Convalescent serology) |

| Primary Transmission | | Mechanical fomite (Milking equipment, cow-to-cow) | | Environmental point-source spillover (Wild birds) |

| Intra-Herd Exposure | | High active morbidity (10% to >20% of lactating herd) | | Sub-clinical seropositivity in 47.2% of cows and 63.2% of youngstock on index farm; 0 spread to other farms |

| Clinical & Milk Status | | Thick yellow colostrum-like milk; high PCR+ titers | | Retrospective mastitis & respiratory malaise; PCR- at sampling |

| Sentinel & Zoonotic Profile | | High feline mortality; human dairy worker conjunctivitis | | Fatal H5N1 in sentinel farm cat; zero human cases reported |

Virological Mechanisms and Immunological Forensics

The species barrier separating avian reservoirs from mammalian hosts is governed by the biochemistry of viral entry. Influenza A viruses initiate infection when surface Hemagglutinin (HA) proteins bind to host sialic acid (SA) receptors. Avian influenza strains preferentially bind alpha-2,3-linked sialic acids (SA 2,3), abundant in waterfowl intestinal tracts, whereas mammalian-adapted viruses target

alpha-2,6-linked sialic acids (SA 2,6) in the upper respiratory tract. Histological investigations triggered by the 2024 bovine panzootic revealed a critical anatomical paradox: alveolar epithelial cells in the bovine mammary gland densely express both SA 2,3 and SA 2,6 receptors, enabling mouth-to-teat or environmental mammary invasion.[8][13][28]

In the Friesland cow, environmental ingestion or teat contact with bedding soiled by migratory waterfowl allowed the local European H5N1 strain to reach permissive mammary SA 2,3 receptors, triggering localized viral mastitis.[14] However, lacking the specific polymerase adaptive mutations (such as PB2 adaptations) required for sustained high-titer shedding and mechanical cattle-to-cattle transmission, the infection terminated as a biological dead end.[14][31][32]

Validating this historical infection required multi-tiered immunological forensics at WBVR.[15] Following innate mammary inflammation, mammalian humoral immunity transitions from acute IgM production (days 3-7) to durable IgG seroconversion (days 10-14+).[9][16][17][18] Because viral RNA had already been cleared, diagnosticians paired broad screening with subtype-specific neutralization:

| Diagnostic Tier | | Assay Methodology | | Target Analyte | | Friesland Case Result & Interpretation |

| Virological | | RT-PCR (Milk & Swabs) | | H5N1 Viral RNA | | Negative: Confirmed absence of active shedding or replication.[3] |

| Tier 1 Screening | | Blocking ELISA | | Anti-Nucleoprotein (NP) Abs | | Positive: Confirmed prior exposure to an Influenza A virus.[15] |

| Tier 2 Confirmation | | Hemagglutination Inhibition (HI) | | Anti-H5 Surface Protein Abs | | Positive: Definitively confirmed H5-specific seroconversion.[15] |

| Genomic | | Whole-Genome Sequencing | | Viral Genome Segments | | Not Applicable: No residual viral RNA available to sequence.[4] |

European Biosecurity, Trade, and Food Safety

The Friesland detection tested the European Union's regulatory resilience under the Animal Health Law (Regulation (EU) 2016/429). Under World Organisation for Animal Health (WOAH) guidelines, an isolated serological finding in non-poultry livestock does not revoke a nation's HPAI-free status for poultry nor halt international dairy exports, provided commercial milk undergoes pasteurization.[21] Prompt quarantine, contact tracing, and whole-herd screening by the NVWA verified that no onward transmission occurred, preventing unilateral trade disruptions to the Dutch dairy sector.[23][24]

Nevertheless, Friesland's water-rich agricultural landscape -- where grazing herds share pastures and drainage ditches (sloten) with migratory waterfowl -- exposes a persistent biosecurity gap.[22][23] While the European Food Safety Authority (EFSA) and Dutch agricultural federations (LTO) recommend bio-exclusion measures and targeted bulk-tank milk screening, a single convalescent cow is easily diluted in a 1,000-cow bulk tank, underscoring the necessity of passive sentinel surveillance (investigating farm cat mortalities and treatment-refractory mastitis).[1][25]

From a consumer perspective, commercial dairy supplies remain protected by a robust

thermal firewall. H5N1 is an enveloped virus whose outer lipid bilayer and surface glycoproteins are rapidly denatured by standard High-Temperature Short-Time (HTST) pasteurization (72 deg C for 15 seconds).[26][27] Both the NVWA and the National Institute for Public Health and the Environment (RIVM) confirmed that pasteurized milk from the affected region posed zero consumer risk.[6][27] Conversely, the fatal infection of farm cats highlights the acute danger of consuming unpasteurized raw milk or fresh raw-milk cheeses, where viable viral particles can persist for weeks.[19][29][30] While widespread bovine vaccination across Europe's 100 million cattle is currently unwarranted, maintaining mammalian H5N1 candidate vaccine banks remains essential if European lineages acquire transmissibility adaptations.[33]

Conclusion: Looking for the Ashes Alongside the Fire

The serological detection of HPAI H5N1 in a Friesland dairy cow marks a significant milestone in European veterinary epidemiology. Follow-up Eurosurveillance and national retrospective testing showed that while sub-clinical genotype DI.2.1 exposure occurred extensively within the index herd, the event remained contained to a single farm with no active shedding or onward farm-to-farm epidemic, permanently retiring the assumption that European dairy herds are insulated from clade 2.3.4.4b.[3][4][7] By pairing rapid investigation of sentinel feline mortality with multi-tiered serological forensics, Dutch authorities demonstrated that effective One Health surveillance must look not only for the active fire of PCR-positive outbreaks, but also for the immunological ashes of silent cross-species incursions.

Updates... (Nov 22, 2026): Replaced the off-topic 2023 LTO poultry link (#25) with LTO Nederland's May 15, 2026 Friesland dairy-herd investigation summary, clarified publication/update dates for Rijksoverheid (#23), EMA (#33), and EFSA (#22), and enriched all 33 references with exact CrossRef and PubMed publication dates alongside the June 2026 Eurosurveillance index-herd findings.

References & Primary Sources

* [1] Alvarez, J., Boklund, A., Dippel, S., et al. (EFSA Panel on Animal Health and Welfare). (Dec 2025). Risk of infection of dairy cattle in the EU with highly pathogenic avian influenza virus affecting dairy cows in the United States of America (H5N1, Eurasian lineage goose/Guangdong clade 2.3.4.4b. genotype B3.13). EFSA Journal. https://doi.org/10.2903/j.efsa.2025.9801

* [2] Oregon State University Extension Service. (Apr 19, 2024). The recent incidences of avian influenza in cattle (EM 9575). Oregon State University. https://extension.oregonstate.edu/catalog/em-9575-recent-incidences-avian-influenza-cattle

* [3] Friese koe heeft antistoffen tegen vogelgriep, eerste geval in Europa. (2026, January 23). Headliner Friesland. https://friesland.headliner.nl/item/friese-koe-heeft-antistoffen-tegen-vogelgriep-eerste-geval-in-europa-lc-116902

* [4] Ballmann, M. Z., Bordes, L., Bouwman, K. M., Engelsma, M. Y., et al. (Jun 25, 2026). Detection of antibodies against avian influenza in European dairy cattle, the Netherlands, January 2026. Eurosurveillance, 31(25). https://doi.org/10.2807/1560-7917.ES.2026.31.25.2600464

* [5] CIDRAP. (Apr 29, 2024). Analysis of cow, cat H5N1 avian flu samples raises

concerns about spread to other animals. Center for Infectious Disease Research and Policy, University of Minnesota. https://www.cidrap.umn.edu/avian-influenza-bird-flu/analysis-cow-cat-h5n1-avian-flu-samples-raises-concerns-about-spread-other

* [6] Antistoffen vogelgriep aangetroffen in melkkoe. (2026, January 23). Pluimveeweb. https://www.pluimveeweb.nl/artikel/1447002-antistoffen-vogelgriep-aangetroffen-in-melkkoe/

* [7] Ballmann, M. Z., Germeraad, E. A., Mars, M. H., & Santman-Berends, I. (Jan 1, 2026). Serologische screening van rundvee op antilichamen tegen aviaire influenza virus. Wageningen Bioveterinary Research / Royal GD. https://doi.org/10.18174/713793

* [8] Gorden, P. J., Magstadt, D. R., Baker, A. L. V., & Arruda, B. L. (Apr 8, 2025). Viral Mastitis Associated with Influenza A in Dairy Cattle. Veterinary Clinics of North America: Food Animal Practice. https://doi.org/10.1016/j.cvfa.2025.02.010

* [9] Sreenivasan, C. C., Thomas, M., Kaushik, R. S., & Wang, D. (Jun 17, 2019). Influenza A in Bovine Species: A Narrative Literature Review. Viruses, 11(6), 561. https://doi.org/10.3390/v11060561

* [10] Caserta, L. C., Frye, E. A., Butt, S. L., Laverack, M., et al. (Oct 17, 2024). Spillover of highly pathogenic avian influenza H5N1 virus to dairy cattle. Nature. https://doi.org/10.1038/s41586-024-07849-4

* [11] Baker, P., Moyer, M., Bai, Y., Stafford, L., et al. (Nov 16, 2024). Intramammary infection of bovine H5N1 influenza virus in ferrets leads to transmission in suckling neonates. bioRxiv. https://doi.org/10.1101/2024.11.15.623885

* [12] Buczkowski, H., Ducatez, M. F., et al. (EFSA, ECDC, & EURL). (Jul 1, 2026). Avian influenza overview March-May 2026. EFSA Journal. https://doi.org/10.2903/j.efsa.2026.10196

* [13] Nelli, R. K., Harm, T. A., Siepker, C. L., Groeltz-Thrush, J. M., et al. (Jul 2024). Sialic Acid Receptor Specificity in Mammary Gland of Dairy Cattle Infected with Highly Pathogenic Avian Influenza A(H5N1) Virus. Emerging Infectious Diseases, 30(7). https://doi.org/10.3201/eid3007.240689

* [14] Kelvin, A. A., Baker, P., Ghosh, S., & Schultz-Cherry, S. (Aug 12, 2025). Influenza infection of the mammary gland. Journal of Virology. https://doi.org/10.1128/jvi.01940-24

* [15] Fabri, N., Santman-Berends, I., Roos, C., et al. (Mar 12, 2025). No indication of highly pathogenic avian influenza infections in Dutch cows. JDS Communications. https://doi.org/10.3168/jdsc.2024-0703

* [16] Lee, B. W., Bey, R. F., Baarsch, M. J., & Larson, M. E. (Feb 1995). Class specific antibody response to influenza A H1N1 infection in swine. Veterinary Microbiology, PubMed PMID 7740762. https://pubmed.ncbi.nlm.nih.gov/7740762/

* [17] Robinson-McCarthy, L. R., Simmons, H. C., Graber, A., Marble, C., et al. (Aug 25, 2025). Dairy cattle herds mount a characteristic antibody response to highly pathogenic H5N1 avian influenza viruses. Journal of Virology. https://doi.org/10.1128/jvi.00621-25

* [18] Lang, Y., Shi, L., Roy, S., Gupta, D., et al. (Apr 15, 2025). Detection of antibodies against influenza A viruses in cattle. Journal of Virology. https://doi.org/10.1128/jvi.02138-24

* [19] Shanta, R. N., Akther, M., Prodhan, M. A., Akter, S., et al. (Aug 25, 2025). Adaptation and Outbreak of Highly Pathogenic Avian Influenza in Dairy Cattle: An Emerging Threat to Humans, Pets, and Peridomestic Animals. Pathogens, 14(9), 846. https://doi.org/10.3390/pathogens14090846

* [20] Gomez, J. F., Bemis, I. G., Shittu, I., Gray, G. C., et al. (Sep 17, 2025). Outbreak of highly pathogenic avian influenza a(H5N1) among house cats: A case series involving oseltamivir treatment. One Health, 101211. https://doi.org/10.1016/j.onehlt.2025.101211

* [21] World Organisation for Animal Health (WOAH). (Oct 22, 2025). High Pathogenicity Avian Influenza (HPAI) in Cattle. WOAH. https://www.woah.org/en/high-pathogenicity-avian-influenza-hpai-in-cattle/

* [22] European Food Safety Authority (EFSA), ECDC, & EURL; Barbezange, C., Buczkowski, H., Ducatez, M., et al. (Mar 2026). Avian influenza overview December 2025-February 2026. EFSA Journal. -- https://doi.org/10.2903/j.efsa.2026.10015

* [23] Rijksoverheid (Government of the Netherlands) (Jul 22, 2024; updated 2026). Wat moet ik als veehouder doen om mijn koeien te beschermen tegen vogelgriep? Rijksoverheid. -- https://www.rijksoverheid.nl/onderwerpen/vogelgriep/vraag-en-antwoord/maatregelen-rundveehouders

* [24] Nederlandse Voedsel- en Warenautoriteit (NVWA). (Dec 30, 2025). Maatregelen bij vogelgriep. NVWA. https://www.nvwa.nl/onderwerpen/vogelgriep/maatregelen

* [25] LTO Nederland (May 15, 2026). Resultaat van onderzoek HPAI-virus op melkveebedrijf in Friesland. LTO Nederland. -- https://www.lto.nl/resultaat-van-onderzoek-hpai-virus-op-melkveebedrijf-in-friesland/

* [26] Schafers, J., Warren, C. J., Yang, J., Zhang, J., et al. (Jan 30, 2025). Pasteurisation temperatures effectively inactivate influenza A viruses in milk. Nature Communications. https://doi.org/10.1038/s41467-025-56406-8

* [27] CIDRAP. (Jul 1, 2024). More evidence pasteurization inactivates H5N1 avian flu virus in milk. Center for Infectious Disease Research and Policy, University of Minnesota. https://www.cidrap.umn.edu/avian-influenza-bird-flu/more-evidence-pasteurization-inactivates-h5n1-avian-flu-virus-milk

* [28] Shi, J., Kong, H., Cui, P., Deng, G., et al. (Aug 8, 2025). H5N1 virus invades the mammary glands of dairy cattle through mouth-to-teat transmission. National Science Review, 12(9), nwaf262. https://doi.org/10.1093/nsr/nwaf262

* [29] CIDRAP. (Oct 9, 2025). Researchers: Live H5N1 avian flu can survive in raw-milk cheese for up to 6 months. Center for Infectious Disease Research and Policy, University of Minnesota. https://www.cidrap.umn.edu/avian-influenza-bird-flu/researchers-live-h5n1-avian-flu-can-survive-raw-milk-cheese-6-months

* [30] Blondin-Brosseau, M., Zhang, W., Gravel, C., Harlow, J., et al. (Nov 19, 2025). Survival of influenza virus H1N1 and murine norovirus in raw milk cheeses. Applied and Environmental Microbiology. https://doi.org/10.1128/aem.01881-25

* [31] Mostafa, A., Nogales, A., & Martinez-Sobrido, L. (Jul 5, 2025). Highly pathogenic avian influenza H5N1 in the United States: recent incursions and spillover to cattle. npj Viruses. https://doi.org/10.1038/s44298-025-00138-5

* [32] Mostafa, A., Naguib, M., Nogales, A., Barre, R., et al. (Nov 13, 2024). Avian influenza A (H5N1) virus in dairy cattle: origin, evolution, and cross-species transmission. mBio. https://doi.org/10.1128/mbio.02542-24

* [33] European Medicines Agency (EMA) (Mar 1, 2022; updated Apr 14, 2023). Avian influenza (bird flu). EMA. -- https://www.ema.europa.eu/en/human-regulatory-overview/public-health-threats/avian-influenza-bird-flu