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Introduction and Spread of Avian Metapneumovirus in the United States

AMPV Alert: Navigating the Rapid Spread of Avian Metapneumovirus in North American Poultry Farms

The introduction of Avian metapneumovirus (aMPV) into the United States was suspected in late 2023, with subtype A detected in California and subtype B in North Carolina. By January 2024, the rapid dissemination of aMPV was confirmed in both states, and within four months, it had spread to most poultry-producing regions nationwide. Ongoing calculations are being conducted by individual states and trade associations* to determine the exact number of poultry affected and the related economic impacts. By mid-summer, infections extended into Nebraska, Utah, Iowa, South Dakota, and Manitoba, Canada.

Impact on Poultry

aMPV is affecting all categories of poultry, including turkeys, broiler chickens, egg layers, and breeder poultry. Among these, turkeys are the most significantly impacted. Turkey breeders are experiencing egg production declines ranging from 20% to 100%, lasting 2 to 4 weeks. This decrease in egg production is leading to a national shortage of poults. In commercial turkey flocks, mortality rates can be severe, approaching 100%, with clinical disease persisting for up to three weeks. Broiler breeders show a moderate reduction in egg production of 5% to 10%, while broiler mortality is relatively mild, with recovery occurring within 7 to 10 days. The disease in egg-laying chickens is less severe and likely underdiagnosed. Secondary infections, including *Escherichia coli*, cholera (*Pasteurella multocida*), ORT (*Ornithobacterium rhinotracheale*), and MG (*Mycoplasma gallisepticum*), complicate the clinical disease in all poultry species.

Avian Metapneumovirus (aMPV) rose from years at the bottom of the ranking to #1 and reported 2,355 cases, in the recent USAHA annual turkey health survey.[1] It was #38 in 2023. aMPV is closely associated with secondary issues including, lack of drugs, colibacillosis, ORT and *Bordetella*. The introduction of Avian metapneumovirus (aMPV) into the United States was suspected in late 2023, with subtype A detected in California and subtype B in North Carolina. By January 2024, the rapid dissemination of aMPV was confirmed in both states, and within four months, it had spread to most poultry-producing regions nationwide (Figure).

One example shared by a large turkey company demonstrates the dramatic effects on flock mortality associated with aMPV. The first suspected case of aMPV clinical disease occurred in November 2023. Over the next three months, average weekly company-wide flock mortality increased by 113% above the prior 12-month company average, with one week peaking at a 208% increase. Following the winter introduction, average weekly flock mortality has remained 65% higher than pre-outbreak levels.[2] Flock monitoring has revealed that 98% of all flocks are now infected with aMPV.

[1] Clark, SR and L. Chiai. Current Health and Industry Issues Facing the US Turkey Industry. Proceedings 128th Annual Meeting of the USAHA, Virtual; Committee on Poultry and Other Avian Species. Pending Publication. Presented Sep 30, 2024.

[2] Nov 29, 2023 – Feb 26, 2024, average weekly company-wide flock mortality was 1.28%, and the prior 12-month company (Nov 28, 2022 – Nov 20, 2023) average was 0.60%, and week of Jan 1, 2024, peaked at 1.85%. Following the winter introduction, average weekly flock mortality is 0.99% (March – September 2024) compared to before the disease introduction in 2023.

Steven Clark, DVM | Huvepharma, Inc. | iPh 201-741-2836 | steven.clark@huvepharma.us

Epidemiology

As part of epidemiology investigations, USDA Wildlife Services tested 100 peridomestic species around aMPV positive farms and did not find a single positive (David Marks, personal communication, Sept 11, 2024). In addition, USDA ARS tested around 400 samples from Eastern states migratory birds and all negative for aMPV A, B, and C (David Surez, personal communication, Sept 11, 2024).

USDA ARS is continuing researching into the rapid spread of the virus (Darrell Kapczynski, personal communication, Sept 17, 2024). **PCR of turkey samples from Eastern North Carolina, collected September 2023, have tested positive for aMPV documenting the first case of subtype B in the US (publication pending)**. The virus phylogenetic analysis within each subtype shows >96% similarity, even among the most distant isolates examined. Specifically, the phylogenetics of subtype B, all of the US isolates tested to date are >99% similar. Comparing US subtype B isolates against the foreign B isolates, similarity drops to 96-97 %. based on the G protein. The subtype A is close to the Mexico strain. The subtype B strain is still being studied. Comparison of US subtype A sequences versus US subtype B sequences, there is only 59-60% sequence similarity, **highlighting the need for separate vaccines against the different subtypes**. The virus can be detected in drinker water samples and litter and exhaust fans and circulating fans from infected farms (publication pending).

Vaccination

The poultry industry urgently requires <u>both live and killed</u> [inactivated] vaccines for Avian metapneumovirus (aMPV) subtypes <u>A and B</u> for both <u>chickens and turkeys</u>. As of September 28, 2024, there are no USDA-approved live vaccines for aMPV, and only three special approvals for inactivated (killed) vaccines. One (Hipra[3]) is an import permit for an inactivated vaccine and two vaccine manufacturers (Merck/Cambridge[4] and Ceva[5]) are domestically producing experimental autogenous vaccine, with US-origin subtype B isolates, to control outbreaks of aMPV in poultry farms in the US.

On February 5, 2024, USDA-CVB issued CVB Notice No. 24-03: CVB Notice: Veterinary Vaccines and Veterinary Diagnostic Products Targeting Avian Metapneumovirus (all subtypes). Notice 24-03 stated CVB would accept "applications for both modified live and inactivated [killed] products, the preference for use will be the latter." But on June 11, 2024, published CVB Notice No. 24-10. "This Notice supersedes Notice 24-03." The June Notice limited applications to autogenous products and "imported developmental products", and diagnostics, but excluded importing modified live vaccines. It is understood that one or more companies made an application to import a live vaccine under 24-03 but were later declined. CVB said during the Listening Sessions that an internal risk assessment determined the risk too high to import any live vaccine. USDA CVB announced aMPV

[3] USDA CVB has granted a Special Import Permit for the HIPRA vaccine against Avian Metapneumovirus: HIPRAVIAR® TRT on July 26th, 2024 (No. VB-283390). "… subtype B chicken origin strain, 1062, with proven cross-protection against subtype A, in injectable emulsion. In countries where the product is registered, it is indicated for use in both for chickens (breeders and layers) and turkeys." (Laboratorios Hipra S. A. memo, US - HIPRA introduction, 2024).

[4] Merck Animal Health launches experimental autogenous vaccine for avian metapneumovirus type B

[5] Ceva producing aMPV experimental autogenous vaccine using US-origin isolate - Modern Poultry

Listening Sessions, starting July 22, which are scheduled virtual calls to answer industry and state official questions regarding the manufacture of Avian Metapneumovirus (aMPV) vaccines.

Killed vaccine usage is limited to the protection of breeders and egg laying flocks against disease causing loss of egg production. For optimum protection, global studies and experience has shown that killed vaccines must be primed with live vaccine administration. Killed vaccines are not practical or effective for commercial meat turkeys or broilers. There is documented cross-protection using either A or B subtype vaccines.

Turkeys are more susceptible to aMPV than chickens, therefore live vaccines are produced specifically labeled for use in either meat turkeys or broiler chickens. Colleagues admit that the realistic development and approval timeline for a domestic live virus vaccine is 2 to 4 years, albeit CVB said reviews will be expedited. One of the immediate recognized hurdles is the scale-up of virus production.

Control Measures

Secondary bacterial infections and associated mortality can be partially managed with prescribed medications. Enhanced sanitation of drinking water and improved barn ventilation are critical measures that must be practiced. Live vaccines are proven, around the world, to be a successful part of any aMPV program; USDA approved live vaccines are a need. Recently approved inactivated vaccines will be evaluated in breeder birds.

Conclusion

The ongoing spread of aMPV across major poultry-producing regions in the United States and Canada highlights the need for immediate and effective vaccination strategies. The disease continues to circulate among poultry in all the states, although cycling between low and high mortality rates, especially in turkey flocks. Regulatory bodies are encouraged to expedite the review and approval of suitable vaccines, in collaboration with industry's development, to mitigate the severe impacts on poultry health and production.

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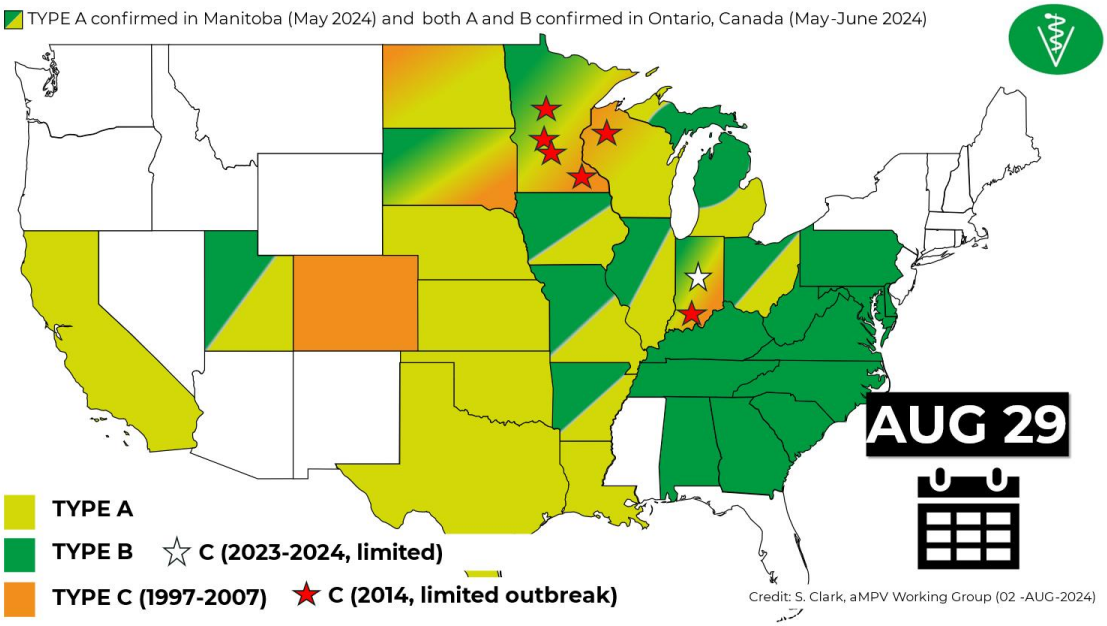
Figure 1. Map of aMPV cases in poultry.



*For further information, contact the National Turkey Federation (NTF), the National Chicken Council (NCC), and the United Egg Producers (UEP).

As the **Head of the aMPV Working Group**, I wanted to provide a brief description: an *ad hoc* group of 200+ poultry veterinarians, researchers, regulatory and animal health professionals, mostly USA participants, from commercial production, trade associations, government, and allied industry. The goal is to share current and relevant information relating to the epidemiology, diagnosis, pathogenesis, and control of aMPV in the US. I've been organizing teams calls every couple week. We started late December 2023 upon the recognition of a fast-spreading respiratory disease of unknown etiology in North Carolina turkey flocks. Within two weeks researchers confirmed aMPV Type B and by March virus isolates were confirmed from both chicken and turkey origins. Now a list of labs offers diagnostics for aMPV. Since its presumed introduction last year, Type B is confirmed in a majority of poultry states along the east coast, and Type A in west coast and central states. aMPV has been diagnosed in turkeys, broiler chickens, egg layer chickens, turkey breeders and chicken breeders.

Acknowledgements: Thank you to all participants of the aMPV Working Group! For more information contact steven.clark@huvepharma.us

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Steven Clark, DVM | Huvepharma, Inc. | iPh 201-741-2836 | steven.clark@huvepharma.us