

Avian Metapneumovirus (aMPV) in the United States: Awareness, Biology, and Control — Lessons Learned from an Emerging Disease, 2023–2026

Steven Clark, DVM, ACPV

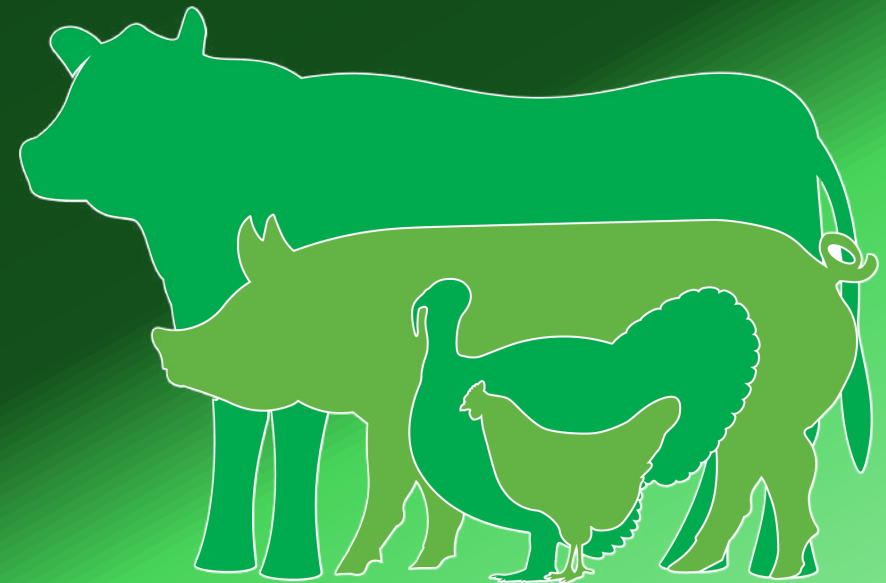
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Head, *ad hoc* aMPV Working Group

AAAP Scientific Symposium. Orlando, FL. July 29, 2026



Why aMPV Matters

- **Rapid** geographic spread
- Respiratory disease with **significant** mortality in affected flocks
- Secondary bacterial **complications**
- Production and economic **impacts**



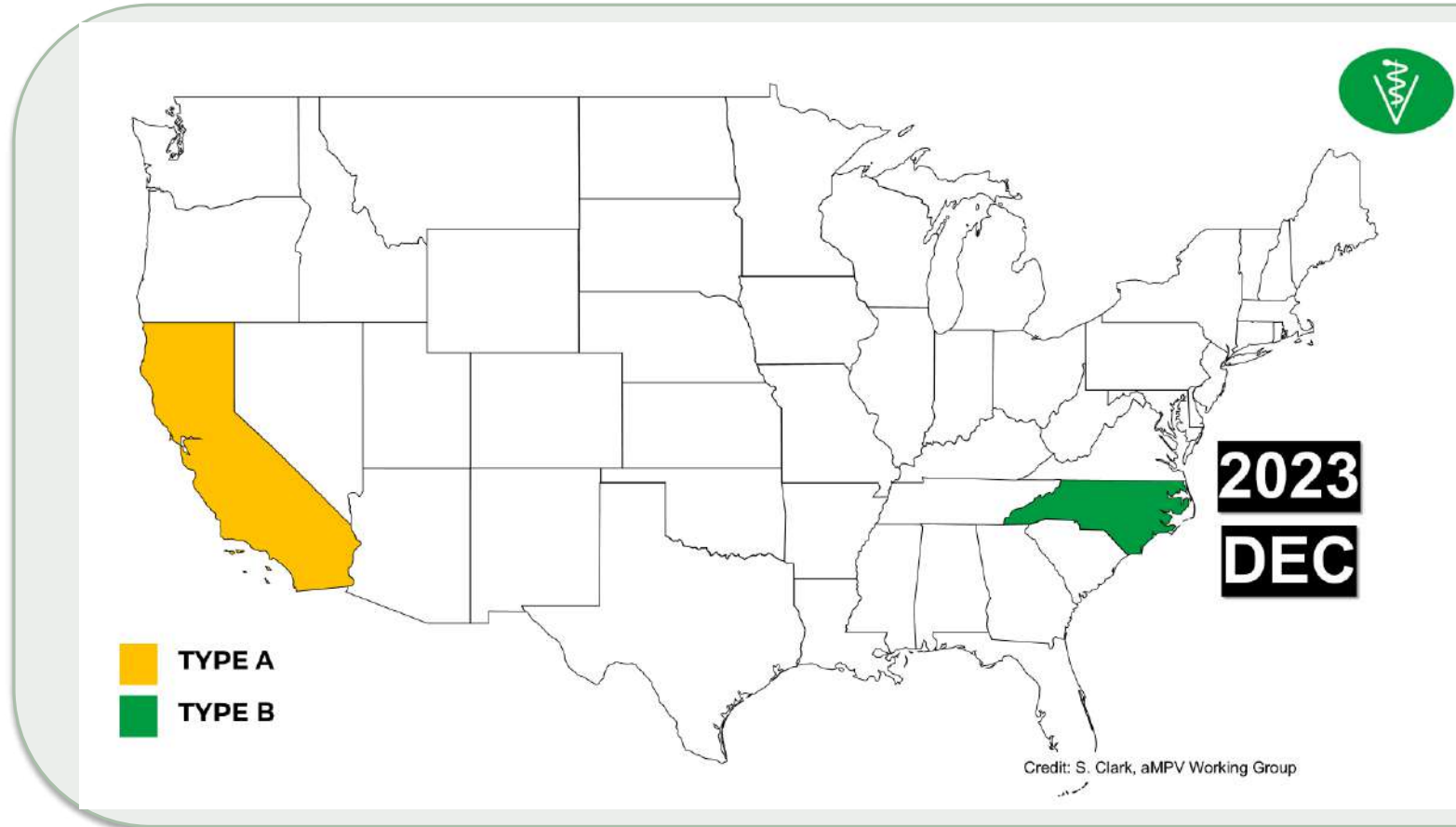
Photo Credit: Summer Lanier (2024)

Within months, what initially appeared to be a regional respiratory disease became a nationwide diagnostic, regulatory, and vaccination challenge

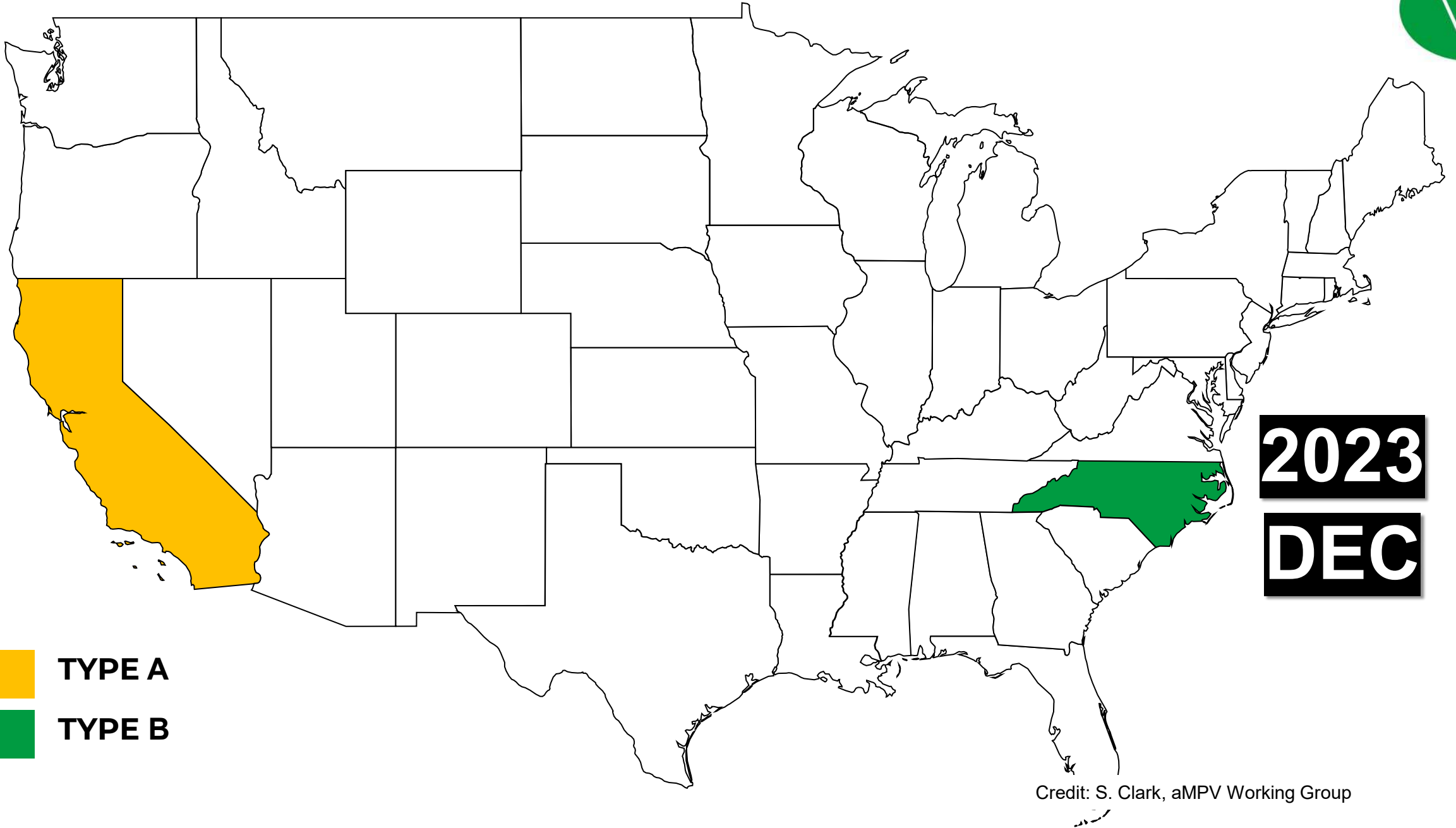
Emergence

Recognition • Spread • Impact

A New U.S. / Canada Pattern Emerged



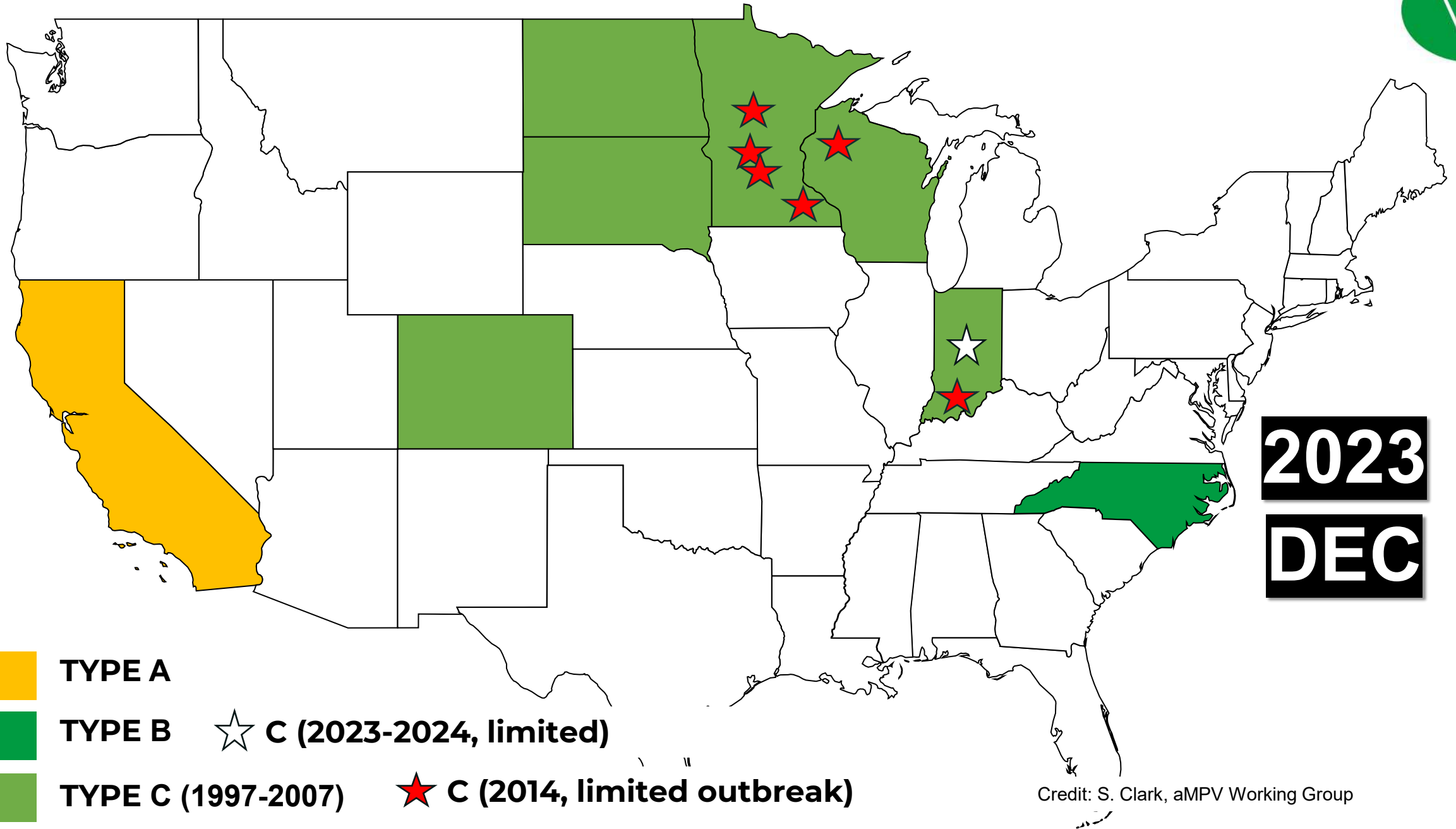
One of the striking features of this event was not simply where cases occurred—but how quickly our understanding evolved as diagnostic capacity expanded



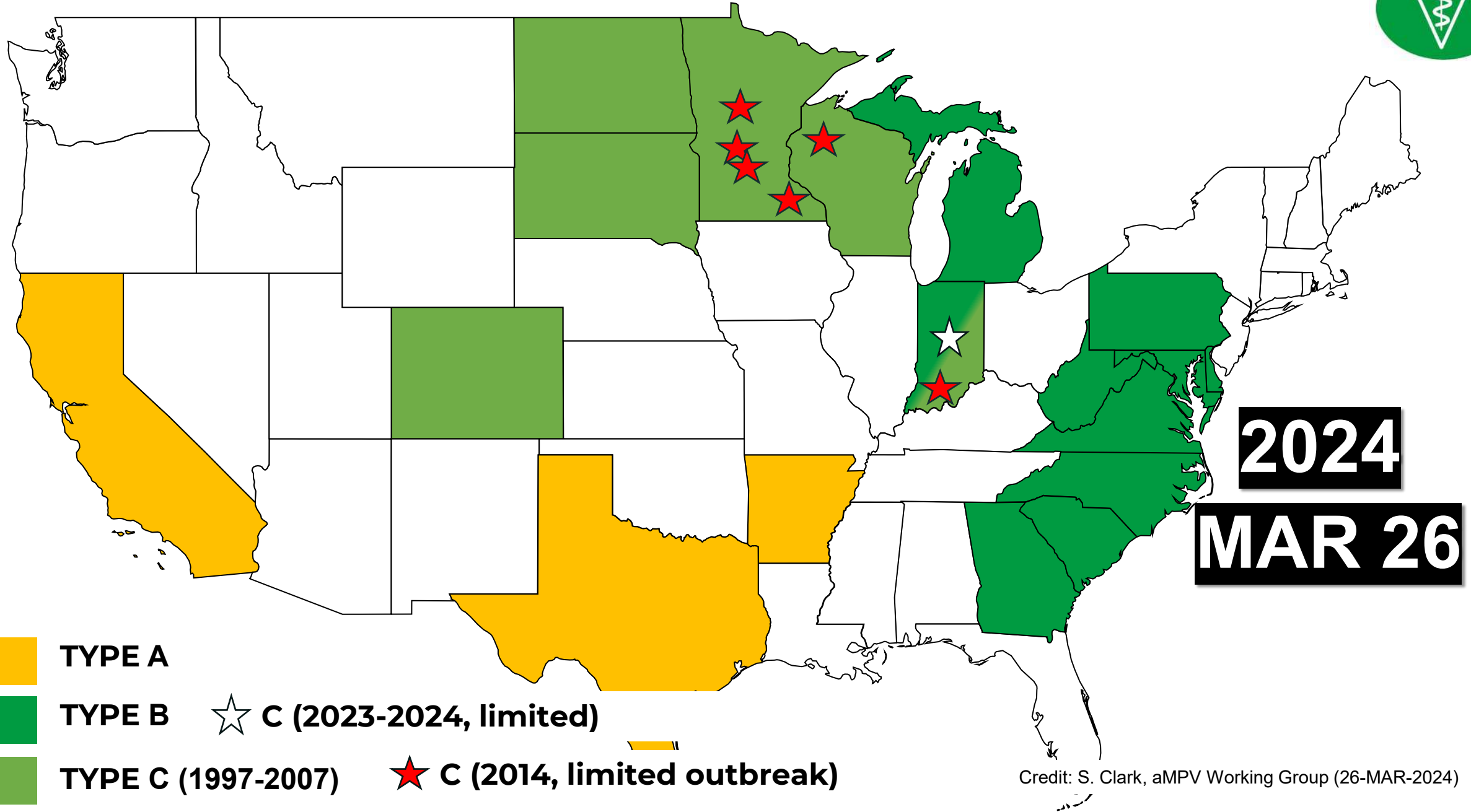
2023
DEC

 **TYPE A**
 **TYPE B**

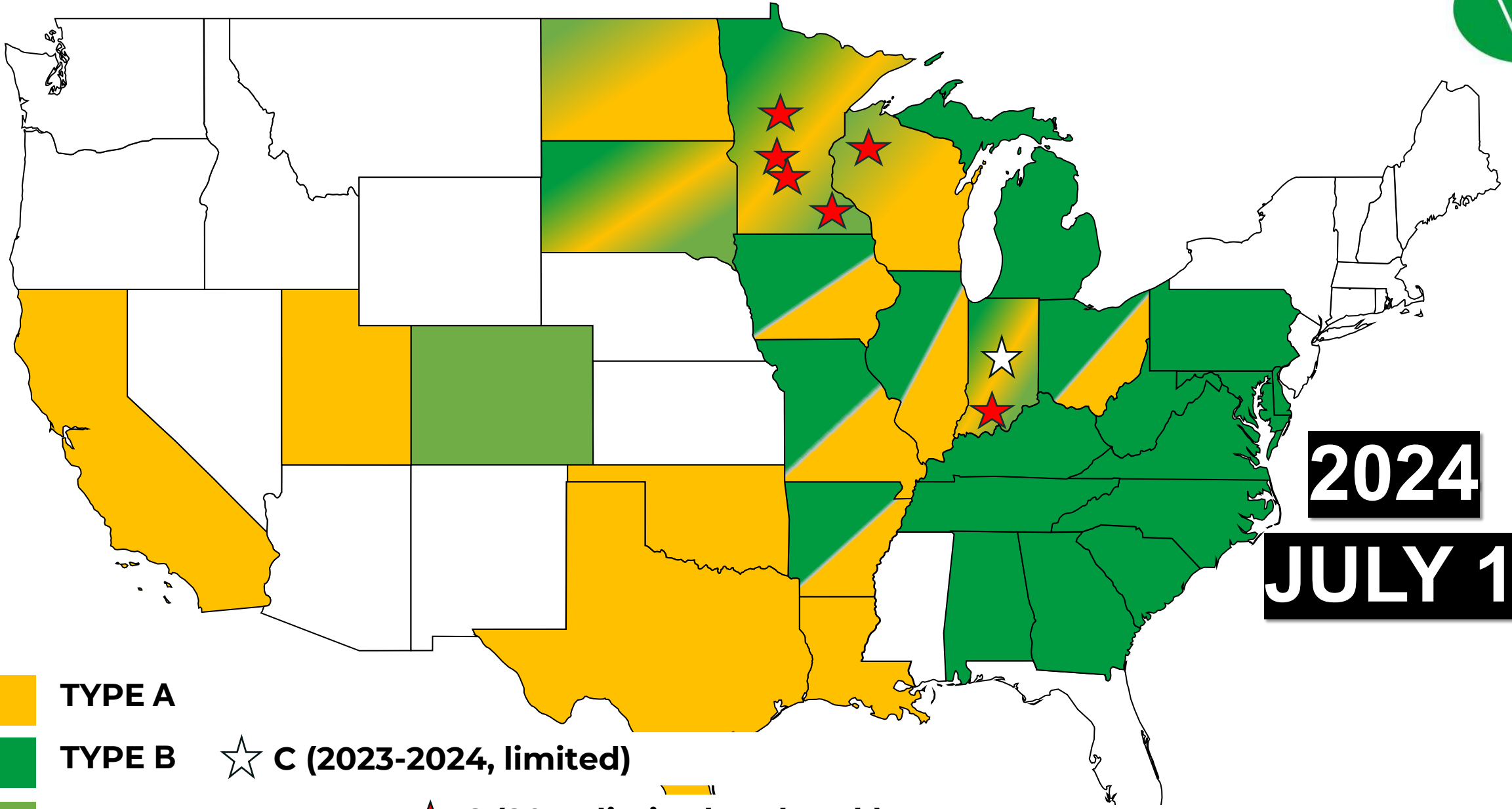
Credit: S. Clark, aMPV Working Group



Credit: S. Clark, aMPV Working Group



TYPE A confirmed in Manitoba (May 2024) and both A and B confirmed in Ontario, Canada (May-June 2024)

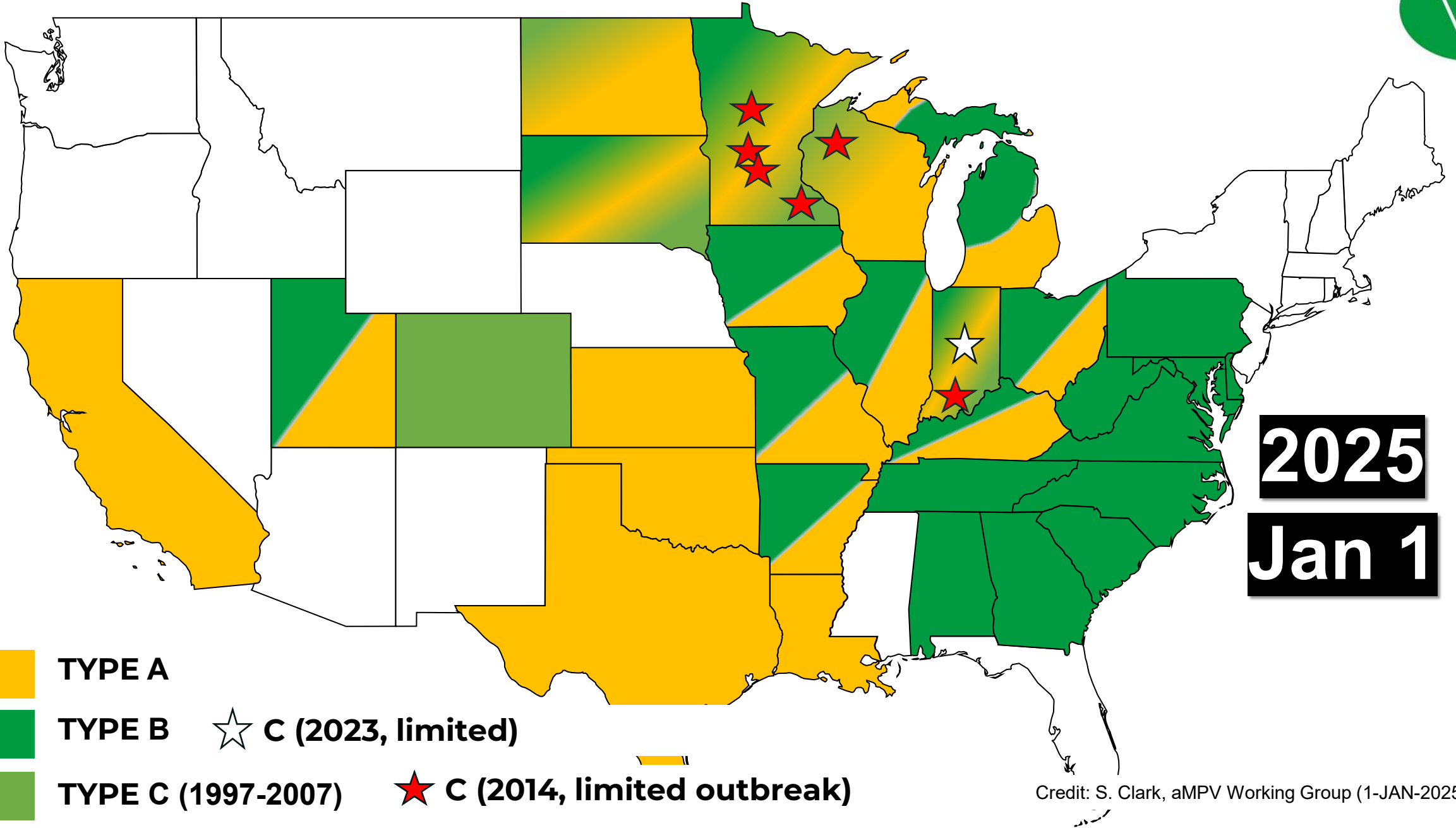


2024
JULY 1

- TYPE A
- TYPE B
- TYPE C (1997-2007)
- ☆ C (2023-2024, limited)
- ★ C (2014, limited outbreak)

Credit: S. Clark, aMPV Working Group (01-JUL-2024)

TYPE A confirmed in Manitoba (May 2024) and both A and B confirmed in Ontario, Canada (May-June 2024)

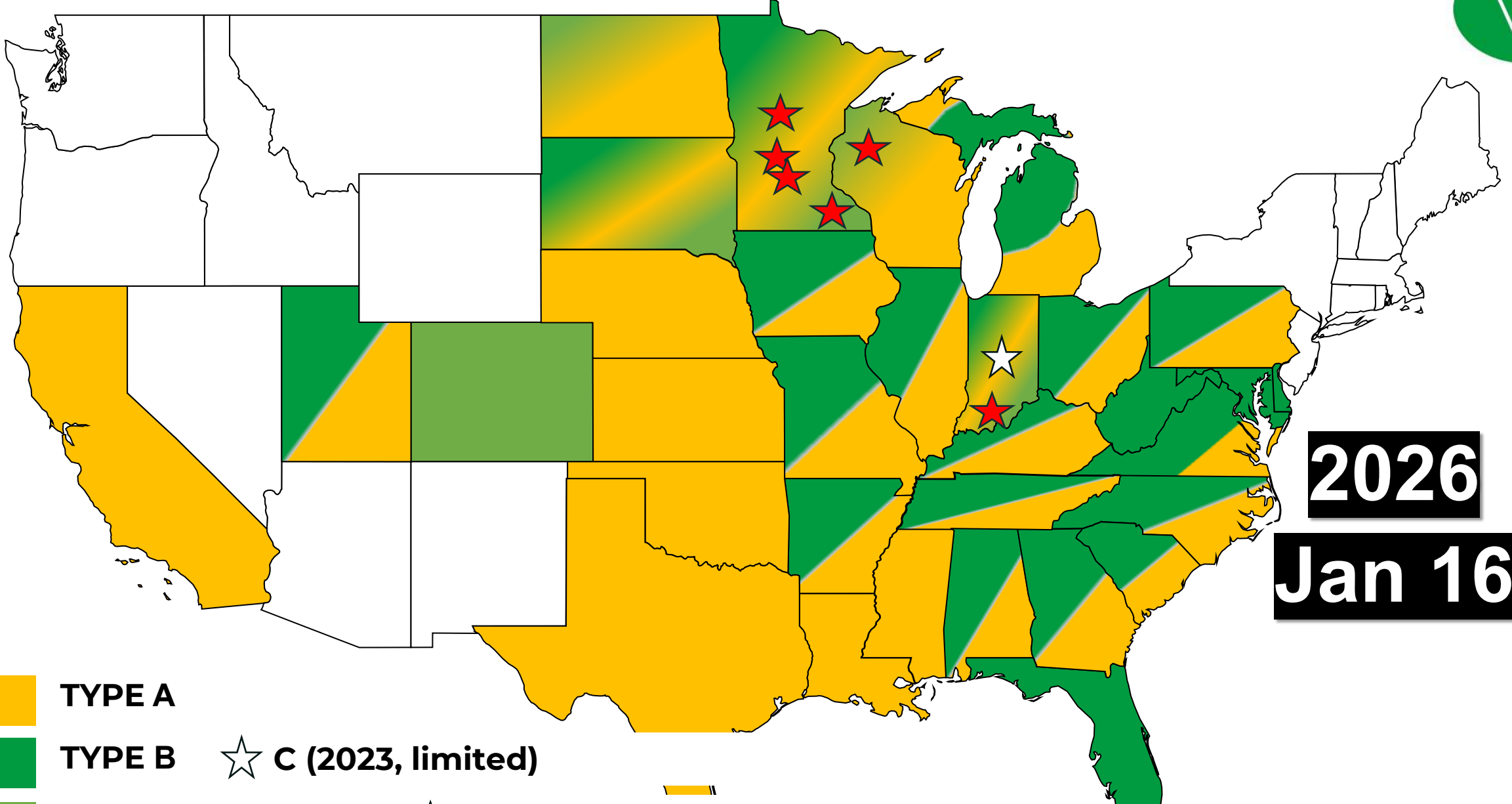


2025
Jan 1

- TYPE A
- TYPE B
- TYPE C (1997-2007)
- ☆ C (2023, limited)
- ★ C (2014, limited outbreak)

Credit: S. Clark, aMPV Working Group (1-JAN-2025)

TYPE A confirmed in Manitoba (May 2024) and both A and B confirmed in Ontario, Canada (May-June 2024)



2026

Jan 16

- TYPE A
- TYPE B
- TYPE C (1997-2007)
- ☆ C (2023, limited)
- ★ C (2014, limited outbreak)

Field Impact Was Immediate

- Excess **mortality**
- Respiratory disease and **swollen heads**
- Secondary **colibacillosis**
- **Egg drop** in breeders and layers



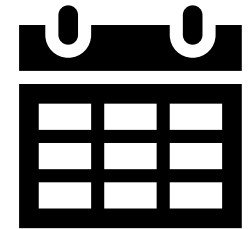
Photo Credit: Dr. Robin Gilbert (2024)

The field signal was not subtle: aMPV could produce sustained, costly disease in commercial systems.

NORTH CAROLINA COMMERCIAL POULTRY FARMS

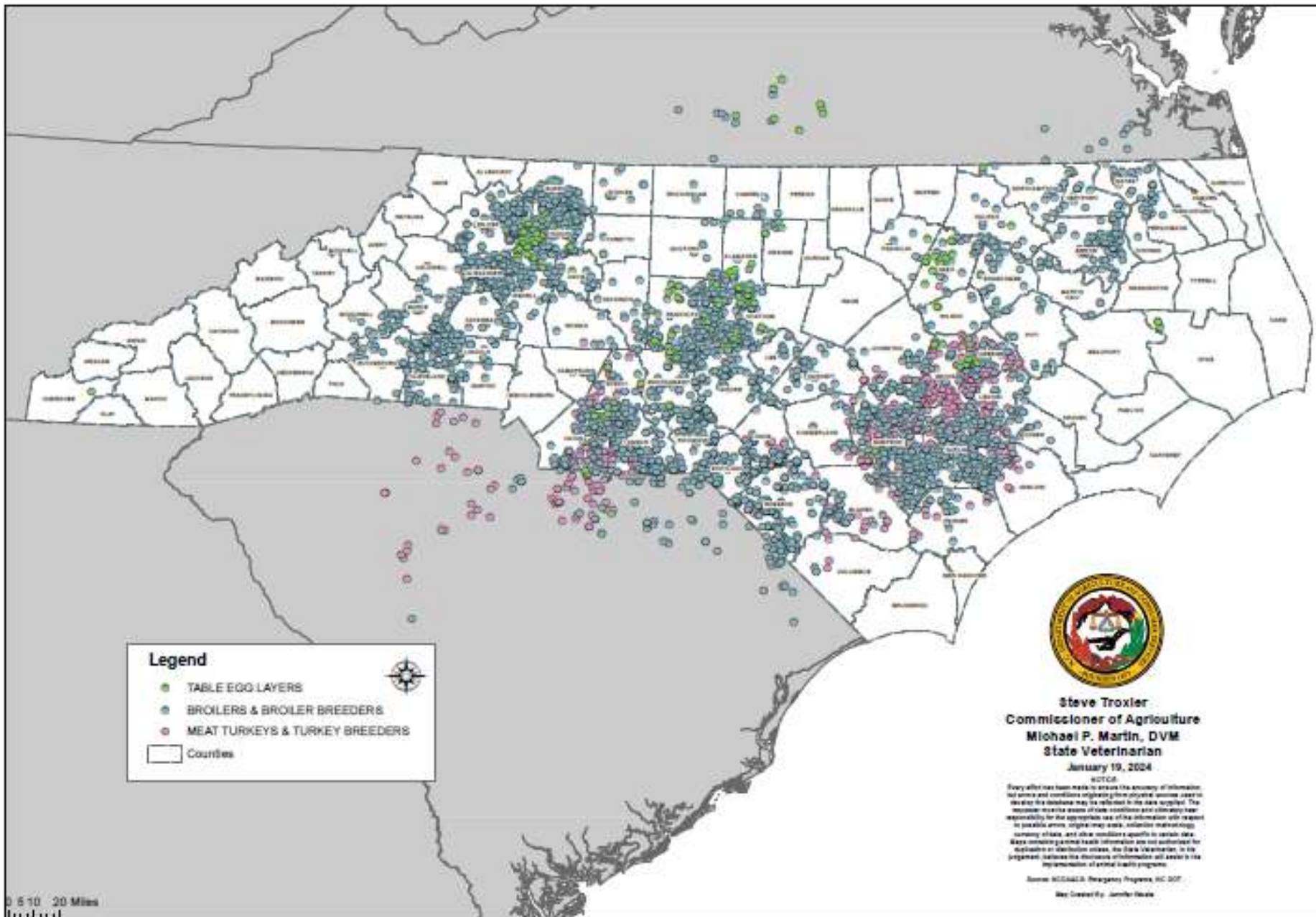


**“AMPV” Aug
– Dec 2023**



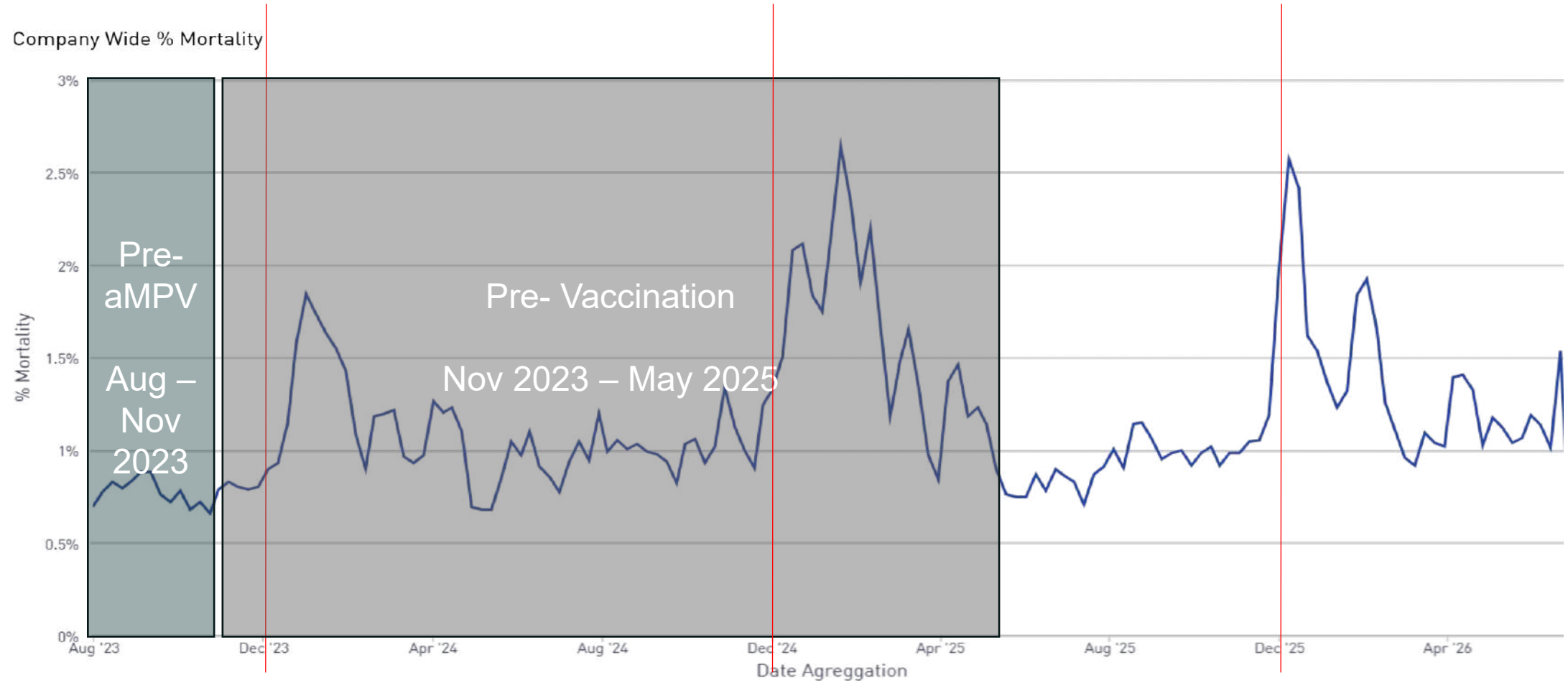
**Acknowledge:
M. Markis, AAAP
2026**

Credit: S. Clark, aMPV Working Group





Weekly Mortality, All Flocks, Linear Graph, Turkeys (Aug 2023 – Jul 2026)



Ecto, Company A (2026)

Recognition to Response: 2023 – 2026

Diagnosis and Recognition

Working Group Communication

Diagnostic Expansion

USDA CVB Vaccine Permitting

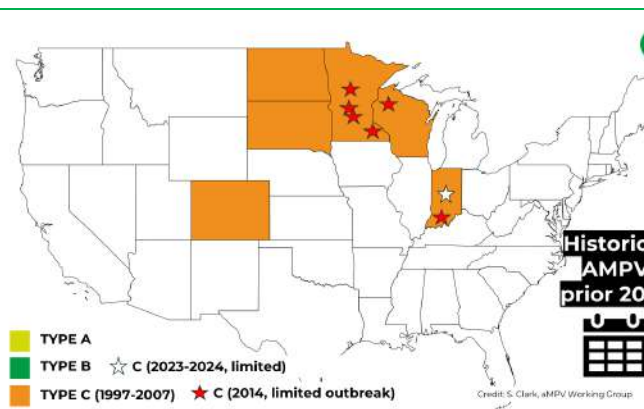
Field Vaccination

Continued Surveillance



The U.S. response developed while the disease event was still unfolding

Recognition to Response: 2023–2026



AMPV Diagnostics Available

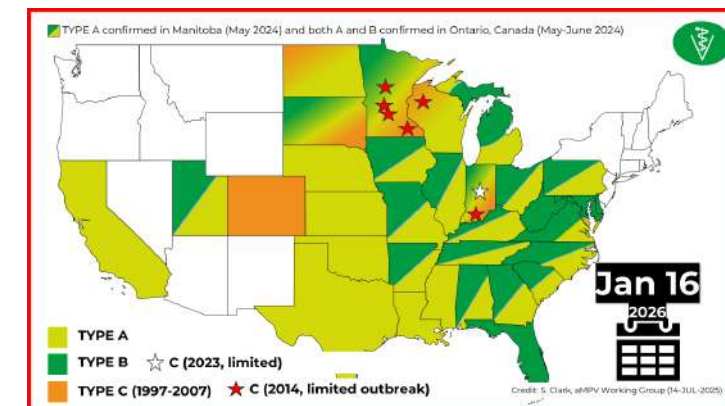
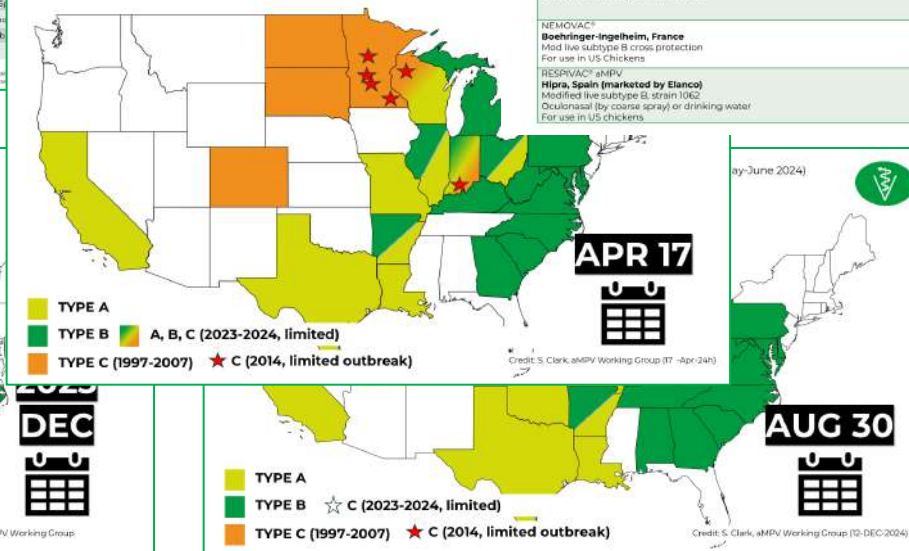
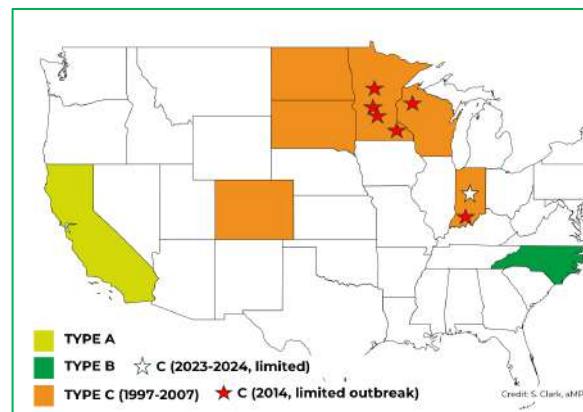
Auderve (Dr. Mike Marks)	RT-qPCR (A,B,C,D), BioCheck ELISA VI
Dea SSU lab (Dr. Robert Beckstead)	VI and molecular capabilities
Clomson (Dr. S. Lakshmi and Kakani)	Necropsy, Histopathology, RT-PCR (A,B,C), Idexx ELISA
GPIN Georgia (Dr. Louise Dubou-Zavali)	Idexx and BioCheck ELISA serology, PCR
ISU (Dr. B. Casper & Sato)	Idexx ELISA, qPCR, NGS, Vi, Necropsy & Histopathology
Mississippi State University PRDL (Dr. N. Manginay)	Idexx ELISA serology, RT-PCR (A,B,C)
NCVDS (Dr. Aziz & Wyse)	Necropsy, Histopathology, Sample Collection & Distribution
NWSL (Dr. Timothee)	In-house real-time RT-PCR (A,B,C) in-house ELISA (A,B,C); Vi in support of control for virus monitoring efforts
Ohio ADOL (Anne E. Parkinson)	Idexx ELISA, PCR
PA-DLS (Dr. Neil & Lighty)	Necropsy, Histopathology, Sample Collection & Distribution; PCR (A,B,C), Idexx ELISA
PDAC (Dr. Holly Sellers)	PCR (A,B,C), RT-PCR (A,B,C) Idexx, BioCheck ELISA, Vi, Necropsy, Histopathology
Purdue ADOL SBAC (Dr. G. Burcham & G. Loeke)	Idexx ELISA, aMPV PCR
SDSU (Dr. Sunil Mox and Tamer Sharafeldin)	Idexx RT-PCR (A,B,C,D), NGS, Necropsy; VI Idexx ELISA, ISH
UMN (Dr. Porter & Voss)	RT-PCR (A,B,C), Idexx ELISA, In-house RT-PCR (C), In-house ELISA (C), Necropsy
University of Missouri (Dr. Ladman)	NWSL RT-PCR (A,B,C), RT-PCR (A,B,C), Vi



USDA Approvals: Import of aMPV Vaccines

Mod Live – Imported	Inactivated/Killed – Imported	Experimental Autogenous
Vaxinov® SHS Vaxinov, Italy Live attenuated subtype B For the active immunization of chickens against Swollen Head Syndrome* For use in US Turkeys and Chickens	TUD-3 Boehringer Ingelheim, France Killed/inactivated vaccine Trivalent vaccine (aMPV) (PMK3/NDV) For use in US Turkeys and Chickens	HSD/Merck Cambridge, USA US origin subtype A (chickens, B (turkey) Inactivated subtype A vaccine Inactivated subtype B vaccine Inactivated subtype A + B vaccine For use in US Turkeys and Chickens
Poulvac® TST Zoetis, Spain Mod live subtype A For use in US Turkeys and Chickens	HIPRAVIR® TST Hipra, Spain Killed/inactivated ... aMPV Type B chicken origin strain with proven cross-protection against Type A ... indicated for use in both chickens and turkeys For use in US Turkeys and Chickens	Ceva, USA US origin, turkeys Inactivated subtype A + B vaccine For use in US Turkeys and Chickens
AVIFA RII Boehringer-Ingelheim, France Mod live subtype B cross protection For use in US Turkeys and Chickens		Vaxinov, USA US origin, turkeys Inactivated subtype A vaccine Inactivated subtype B vaccine Inactivated subtype A + B vaccine For use in US Turkeys and Chickens
NEMOVAC® Boehringer-Ingelheim, France Mod live subtype B cross protection For use in US Chickens		
RESPIVAC® aMPV Hipra, Spain (marketed by Elanco) Modified live subtype B strain 1062 Ocular/nasal (by coarse spray) or drinking water For use in US chickens		May be used in all poultry for use in chickens and turkeys. *USDA PERMITTED VACCINES* as of March 8, 2024 *USDA PERMITTED VACCINES* who are valid for 1 year.

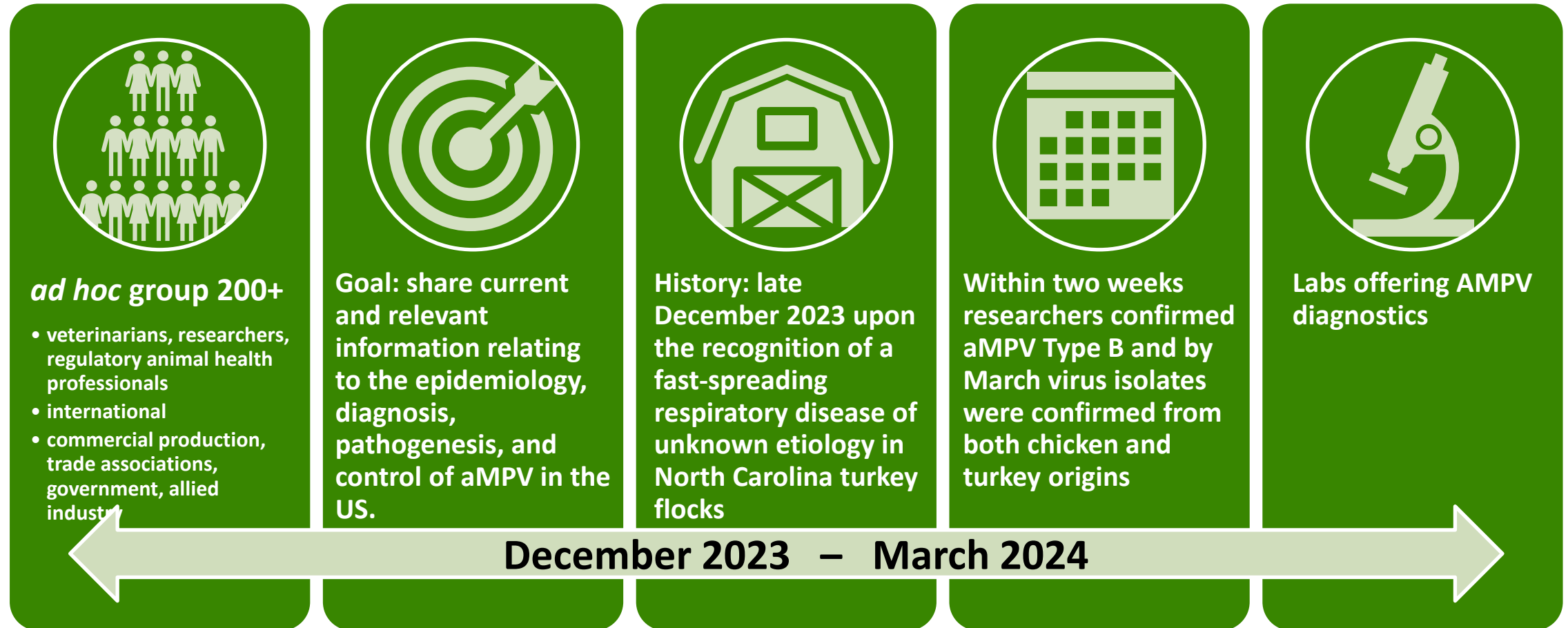
Credit: S. Clark, aMPV Working Group (8-Mar-2025)



Pre-AMPV Dec-2023 April-2024 Aug-2024 Feb 2025 Jan-2026



Emergence: What We Learned



The response to an emerging disease can be as important as understanding the disease itself.

Biology

Understanding the Disease

Efficient Spread Drives Flock-Level Disease

- Respiratory transmission
- Close-contact amplification
- High-density production systems
- Movement of people, equipment, and air as risks

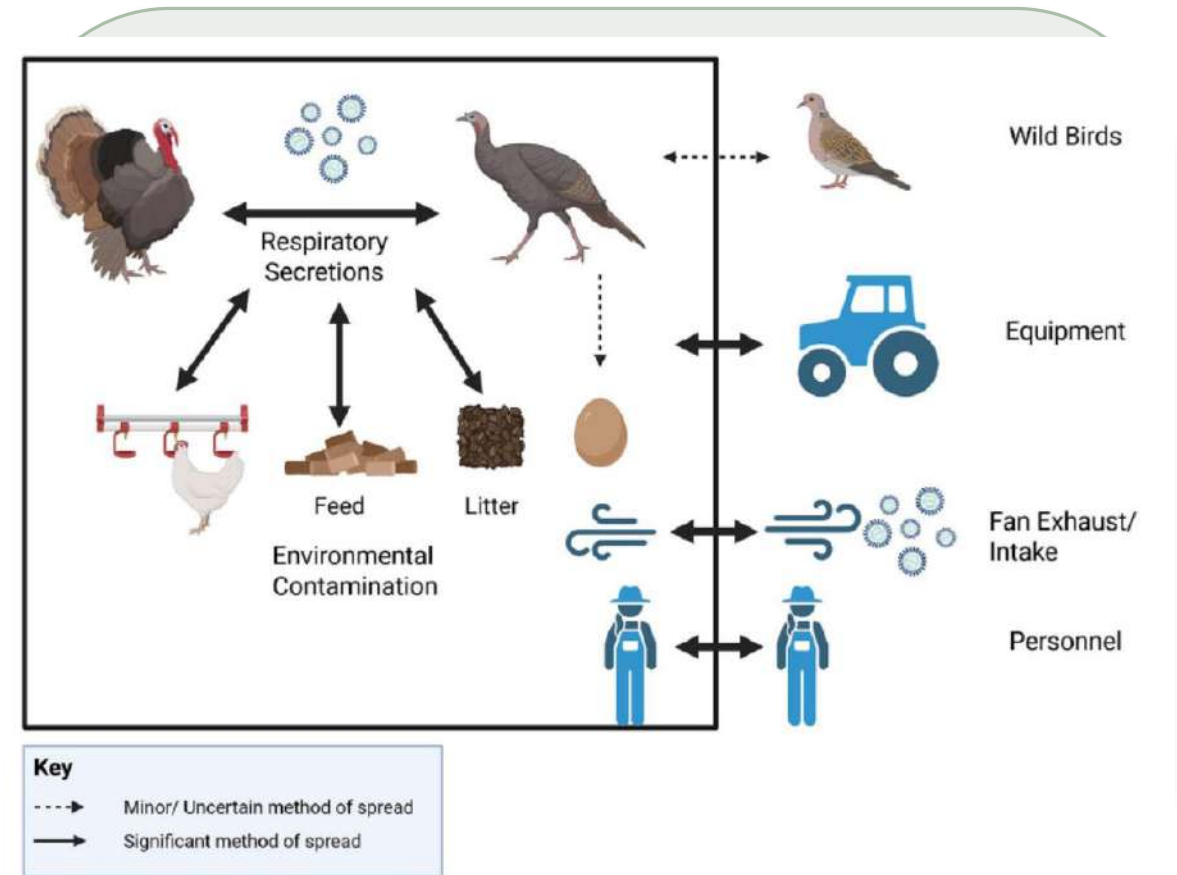


Figure: Adapted from Clontz & Hoerr, *Avian Diseases*, 2025.

Once introduced, aMPV can move efficiently through susceptible barn, flock, geographic area.

Respiratory Damage Opens the Door

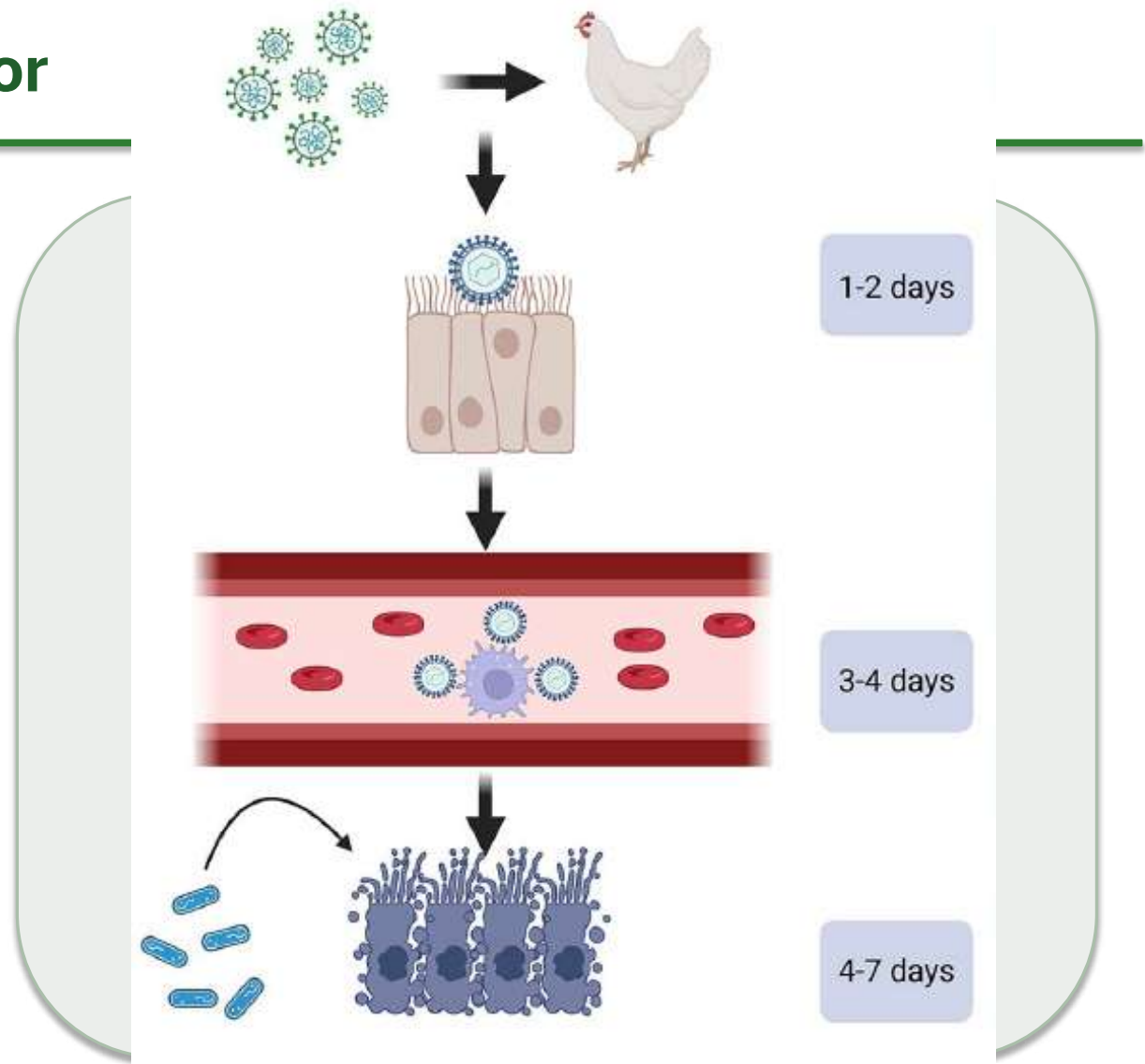
Infests & replicates (1–2 days)

Suppress local immunity & induces inflammation (3-4 days)

Loss of mucociliary clearance (4–7 days)

Predisposition to secondary bacterial pathogens, *E. coli*

Figure: Adapted from Clontz & Hoerr, *Avian Diseases*, 2025.



Weakens respiratory defenses, allowing secondary bacterial disease to magnify losses.

Clinical Presentation Is Variable



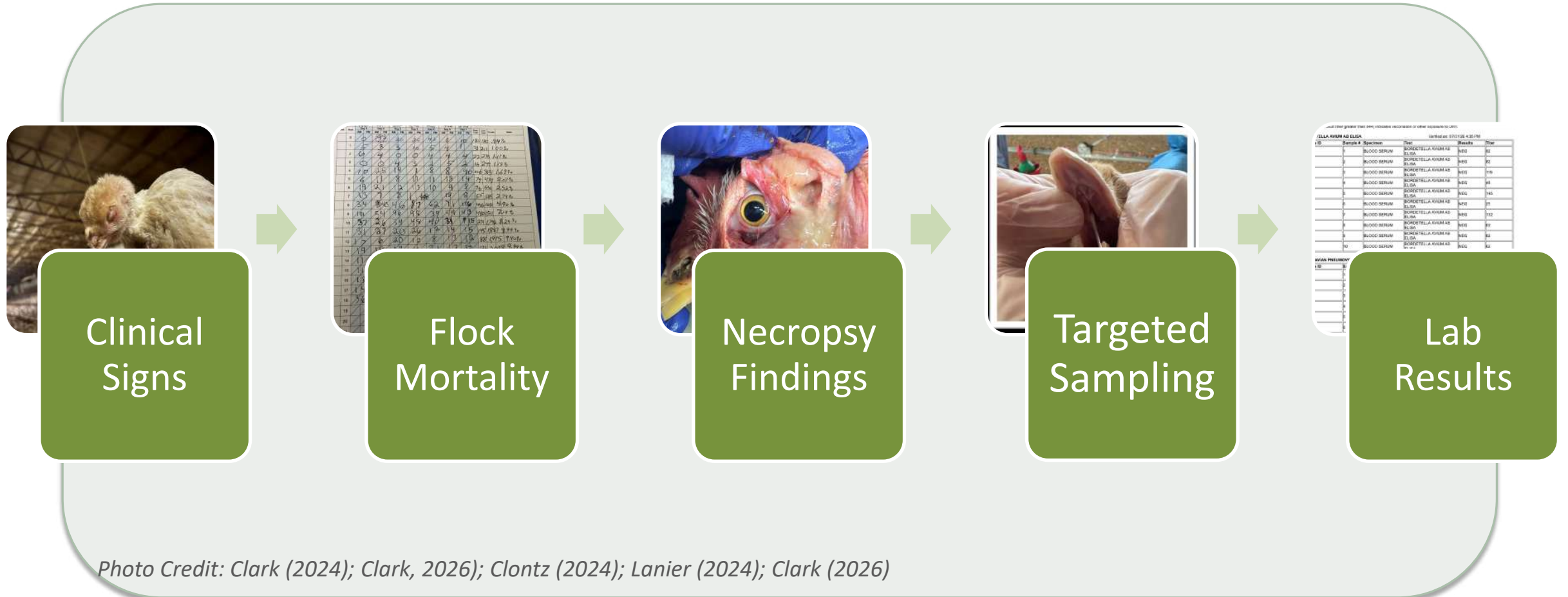
Photo Credit: Clark (2026); Gilbert (2024); Lanier (2024); Campbell (2024)

Clinical signs raise suspicion. Laboratory confirmation establishes diagnosis.

Diagnostics

Building Diagnostic Confidence

Building the Diagnosis



Confidence comes from aligning clinical signs, lesions, sampling and lab findings.

Quality Begins with Sampling

- Select **actively** affected, recently symptomatic birds
- Sample **early** in the clinical course
- Use **appropriate** respiratory sites and swabs
- Submit **enough** birds to represent the flock

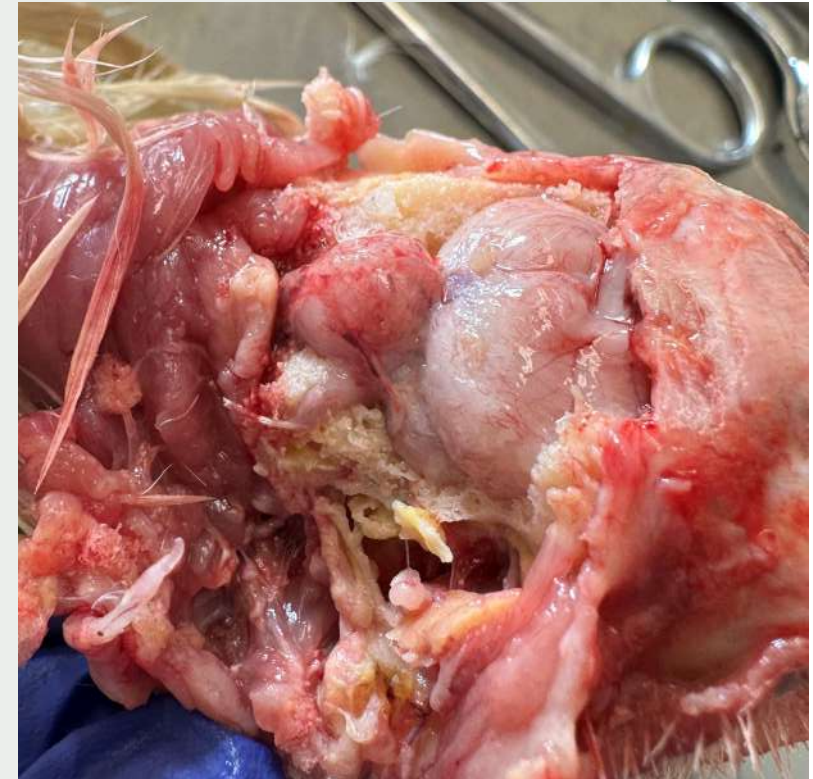
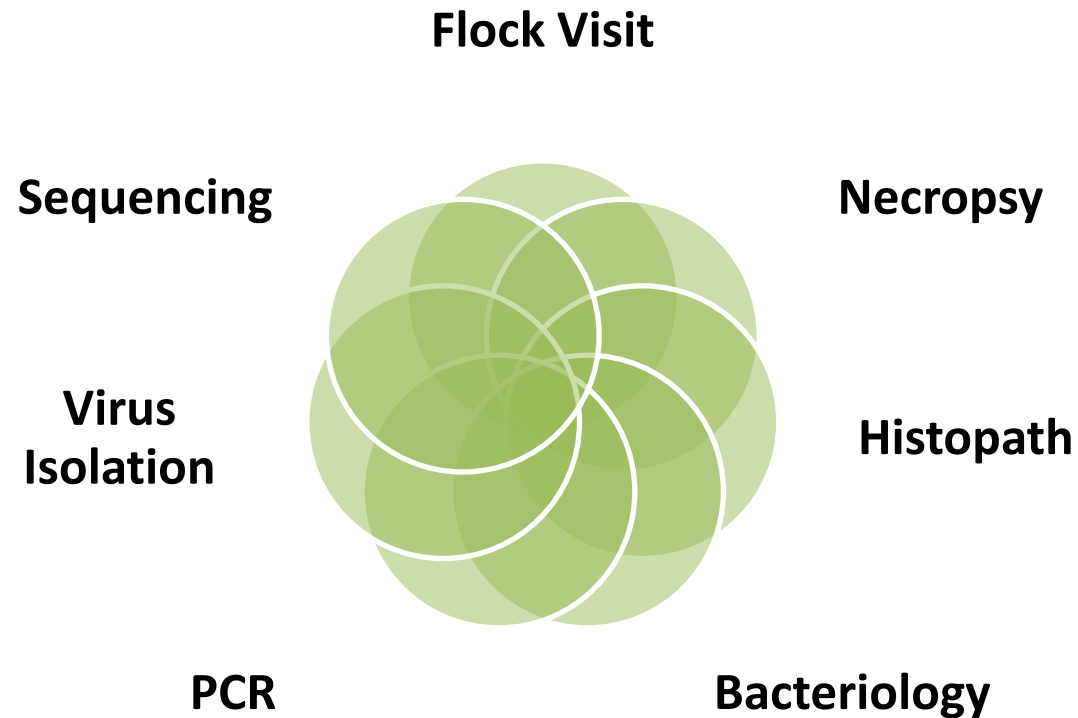


Photo Credit: Clontz (2024)

Laboratory results are only as good as the birds selected and the samples submitted.

Diagnostic Testing: Different Tools, Different Questions



Each diagnostic tool answers a different question; the strongest interpretation combines them.

Diagnostic Capacity Expanded Rapidly

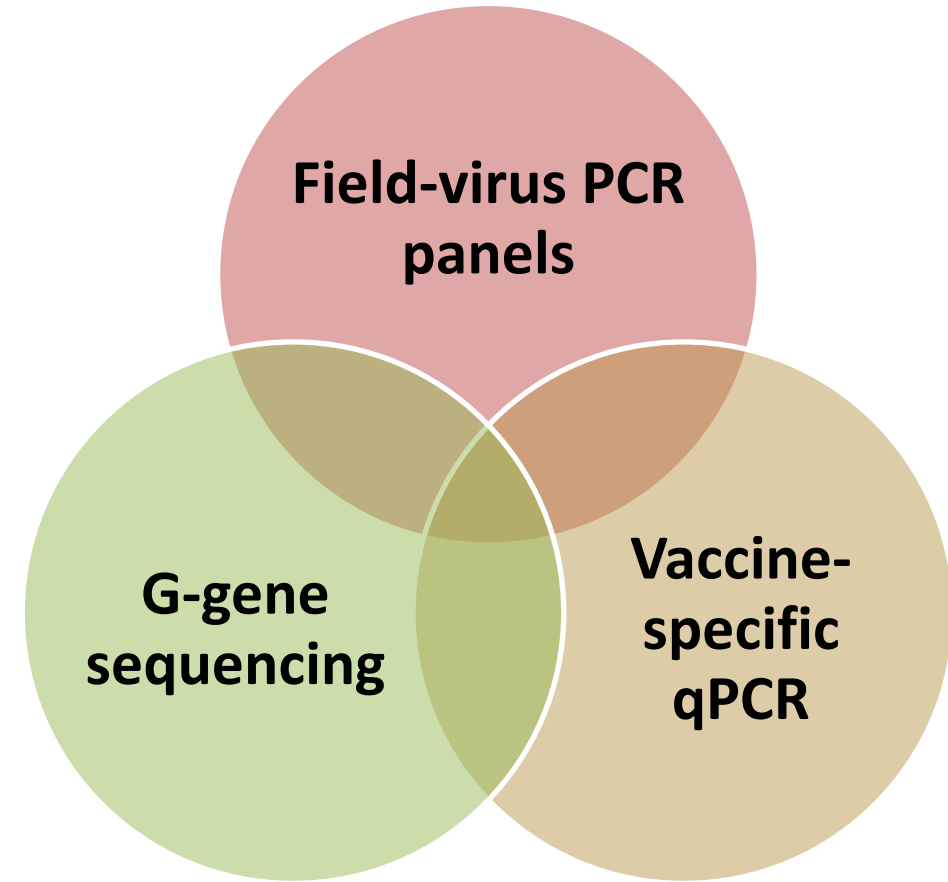
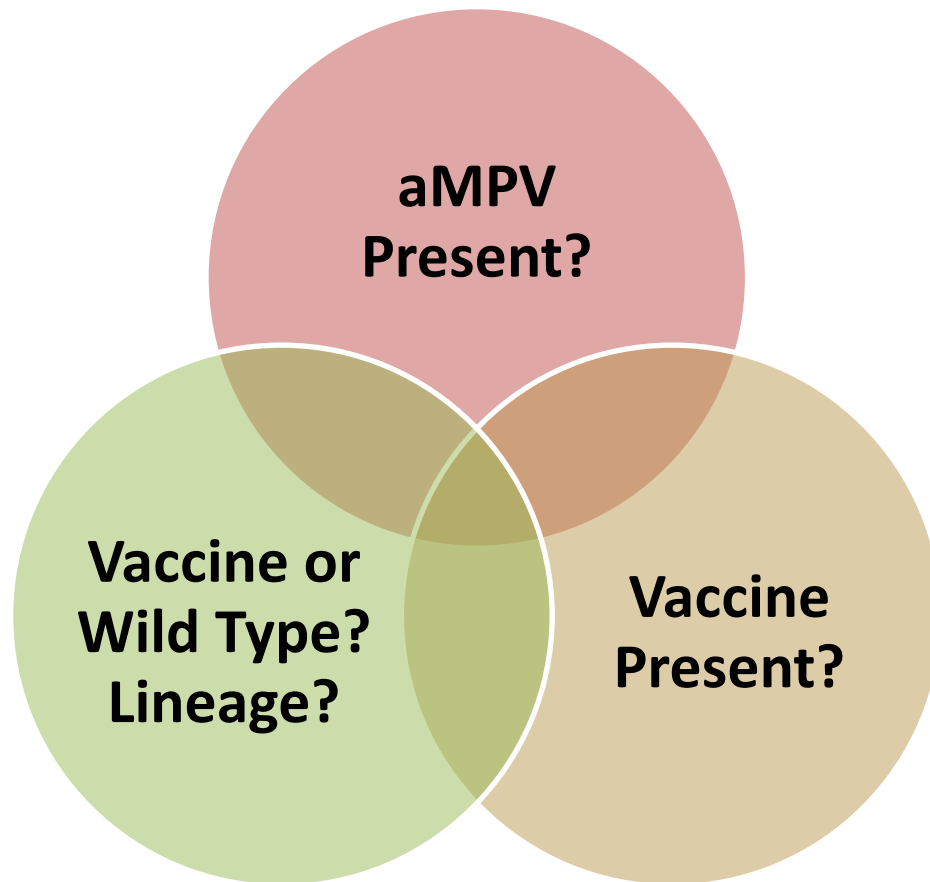
Addendum Available Upon Request

Lab	Contact	Necropsy/ Histopath	ELISA	PCR	Other
Alabama AVDL, Auburn, AL	Walz	Yes	Idexx	Yes	
AviServe, DE	Markis		BioChek, Idexx	RT-qPCR	VI, VN
Boehringer-Ingelheim	Dougherty-McComb			Yes	
Ceva	Sellers			Yes	VI
Clemson, SC	Lakshmi & Kakani	Yes	Idexx	Yes	
Elanco	Gustin			Yes	
GPLN, GA	Dufour-Zavala	Yes	BioChek, Idexx	Yes	
ISU, IA	El-Gazzar, Sato, Carnaccini	Yes	Idexx	DIVA RT-PCR+G-gene	VI, VN, NGS, WGS
MSU PRDL, MS	N. Manginsay	Yes	Idexx	Yes	
MU VMDL	McAdams & Uprety	Yes	Idexx	Yes	NGS, WGS
NC VDL – Rollins, NC	Trybus	Yes	Idexx	Yes	
NVSL, Ames, IA	Torchetti		NVSL	RT-qPCR	VI
OSU ADDL, OH	Parkinson	Yes	Idexx	Yes	
PADLS, PA	Niel & Lighty	Yes	Idexx	Yes	
PDRC, UGA GA	Raccoursier & Chrzastek	Yes	BioChek, Idexx	DIVA RT-qPCR+WGS	VI, NGS, WGS
Purdue ADDL SIPAC, IN	Burcham & Lossie	Yes	Idexx	Yes	
SDSU, SD	Mor & Sharafeldin	Yes	Idexx	Yes	VI, NGS, ISH
Texas TVMDL, TX	Hensley	Yes	Idexx	Yes	VI
UD ADDL, DE	Ladman	Yes		Yes	VI
UMN, MN	Rovira & Patnayak	Yes	Idexx	Yes	VI, NGS
USDA SEPRL ARS	Kapczynski & Spackman			Yes	VI, NGS
VA-Harrisonburg	Quercia	Yes	Idexx		
Vaxxinova	Ortega-Heinly			DIVA RT-qPCR	
VDP, NC	Clontz	Yes	BioChek	Yes	VI
Whitbeck Lab, AR	Whitbeck		BioChek	Yes	
Zoetis	Shepherd			DIVA RT-qPCR	

Rapid expansion of diagnostic capacity converted scattered field observations into a national picture.

PCR: Detection Is Not Always Differentiation

Acknowledge: El-Gazzar, AAAP 2026



PCR approaches differ -- some ask whether the virus matches a vaccine, while sequencing asks what genetic signature is present.

aMPV DIVA Diagnostic Approaches: Vaccine-Specific qPCR vs. G-Gene Sequencing

Feature	Vaccine-Specific qPCR	Full Length G-Gene Sequencing
Diagnostic Method	Vaccine-strain-specific qPCR	PCR + G-gene sequencing
Primary Purpose	Detect vaccine virus	Differentiate vaccine and field viruses through genetic characterization
Positive Result	Vaccine strain detected	Sequence identifies virus lineage/strain
Negative Result	Suggests detected virus is not vaccine strain (likely field virus)	Requires sequence comparison for interpretation
Field Virus Identification	Indirect	Direct genetic characterization
Genetic Information	Limited	Extensive
Detect Emerging Variants	No	Yes
Supports Epidemiology	Limited	Strong
Best Application	Routine diagnostic differentiation	Surveillance, outbreak investigation, viral evolution monitoring

Diagnostics: What We Learned

- U.S. PCR **development**
- Thoughtful **sampling** before submission
- **Match the test to the question**
- Interpret PCR in clinical and vaccination **context**
- **Retain** sequence information when greater resolution is needed



University



Government



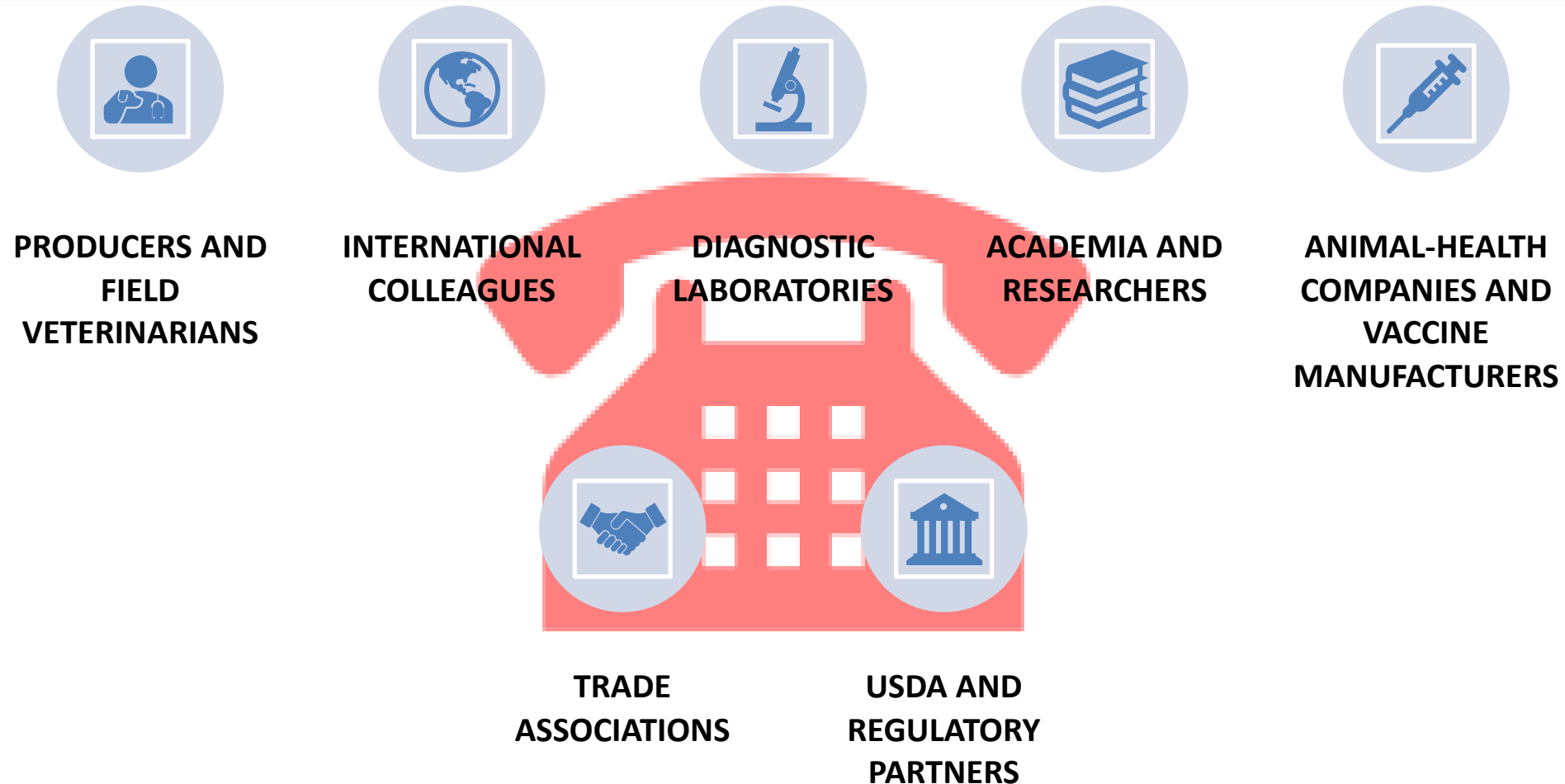
Commercial

"Diagnostics have evolved from simply detecting virus to understanding disease."

Collaboration

Working Together

Building a National Collaborative Network



No single organization had all the answers, but the network could assemble a more complete picture.

Communication Accelerated Response

- Broader **awareness**
- Earlier targeted **sampling**
- Faster **diagnostic** development
- **Regulatory** listening and permitting
- More informed **vaccination**

Compliance
(*USDA, State
Agencies*):
What Worked



"The 'challenge' wasn't intent — it was that outbreak speed exceeded process design."

Communication shortened distance between observation, interpretation and action.

Response

Putting Knowledge into Practice

USDA-CVB Permitted aMPV Vaccines

Vaccine Evaluation



INITIAL EVALUATION
OPENNESS



SUBSEQUENT RISK
REASSESSMENT



INDUSTRY URGENCY
CONTINUED

Legitimate USDA Concerns

Disease Continued To Spread

**Acknowledge:
USDA CVB's
timely
authorization
of vaccine
import permits
provided the
U.S. poultry
industry with
an important
additional tool
for aMPV
control.**

USDA-CVB Permitted aMPV Vaccines



Mod Live – Imported	Inactivated/Killed – Imported	Experimental Autogenous
Vaxxon® SHS Vaxxinova, Italy Live attenuated subtype B (turkey origin) “For the active immunization of chickens against Swollen Head Syndrome.” For use in US Turkeys and Chickens	TUR-3 Boehringer Ingelheim, France Killed /inactivated vaccine Trivalent vaccine (AMPV/ PMX3/ NDV) For use in US Turkeys and Chickens	MSD/Merck Cambridge, USA US origin subtype A (chicken), B (turkey) Inactivated subtype A vaccine Inactivated subtype B vaccine Inactivated subtype A + B vaccine For use in US Turkeys and Chickens
Poulvac® TRT Zoetis, Spain Mod live subtype A (turkey origin) For use in US Turkeys and Chickens	HIPRAVIAR® TRT Hipra, Spain Killed/inactivated ... aMPV Type B chicken origin strain with proven cross-protection against Type A ... indicated for use in both chickens and turkeys. For use in US Turkeys and Chickens	Ceva, USA US origin, turkeys Inactivated subtype A + B vaccine For use in US Turkeys and Chickens
AVIFFA RTI Boehringer-Ingelheim, France Mod live subtype B cross protection (turkey origin) For use in US Turkeys and Chickens		Vaxxinova, USA US origin, turkeys Inactivated subtype A vaccine Inactivated subtype B vaccine Inactivated subtype A + B vaccine For use in US Turkeys and Chickens
NEMOVAC® Boehringer-Ingelheim, France Mod live subtype B cross protection (chicken origin, strain PL21) For use in US Chickens		
RESPIVAC® aMPV Hipra, Spain (marketed by Elanco) Modified live subtype B, strain 1062 (chicken origin) Oculonasal (by coarse spray) or drinking water For use in US chickens		USDA-CVB permitted products shown as of June 2026. Information compiled from USDA-CVB permits and manufacturer communications. Credit: S. Clark, aMPV Working Group

Early Field Vaccination Programs

Photo Credit: Huvepharma (2026); P. Harmond (2025); C. Bandurruga (2025)



Program design mattered, but application quality often determined whether the intended program was delivered.

Vaccine Application Matters

Photo Credit: BVS (2025)

1. Preparation

- maintain viability
- proper handling
- correct dilution

2. Application

- droplet size
- bird coverage
- calm birds
- fans off

3. Management

- vaccinate before challenge
- booster before immunity wanes

Aim for perfection in:



Prep



Application

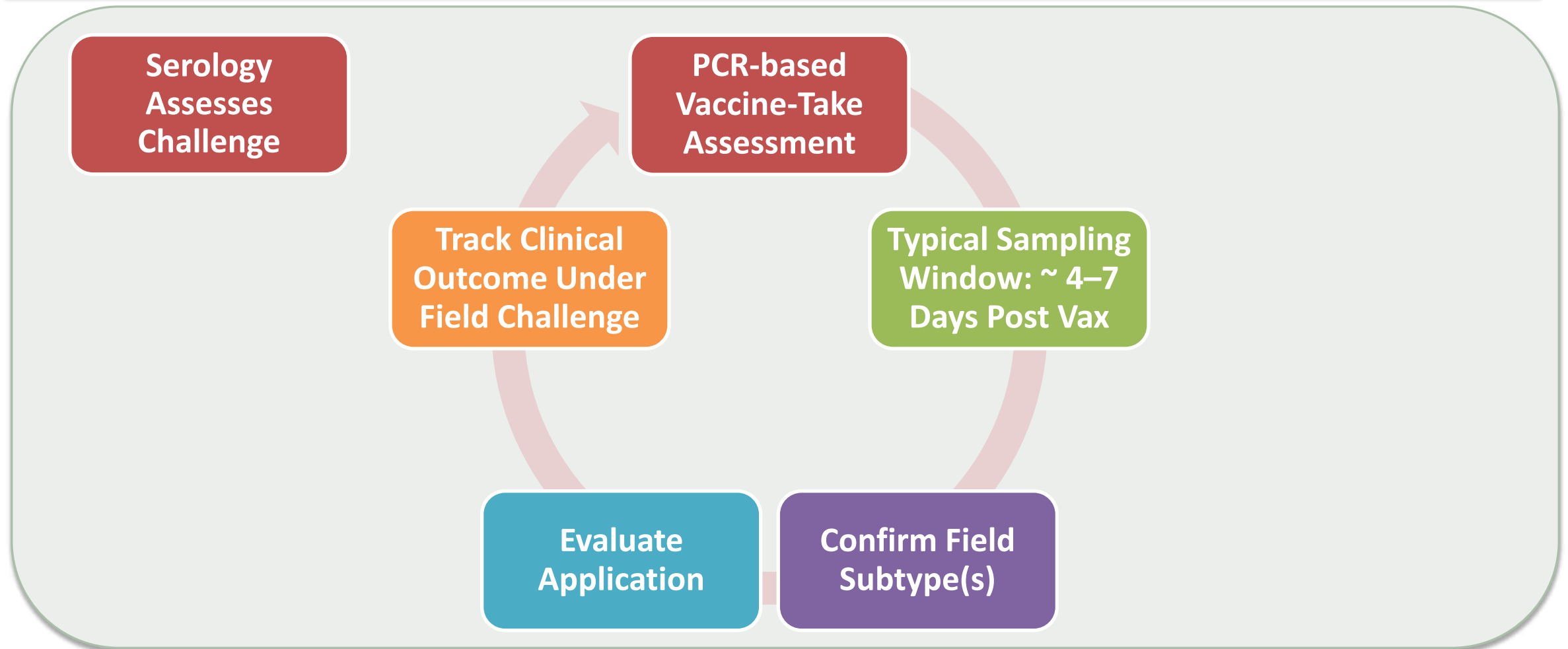


Management

Slow progress is still progress!

"A perfectly good vaccine can perform poorly if it's applied poorly."

Evaluating Vaccination Programs

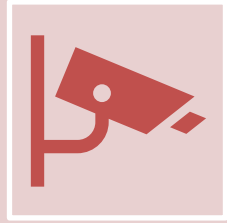


Evaluation should confirm both vaccine “take” and that the overall program improved field outcomes.

Lessons Learned

Guiding Future aMPV Control

Lessons Learned: Where Do We Go From Here?



Continued
Surveillance



Integrated Disease-
Control Strategies



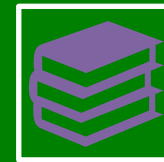
Evolving Diagnostics



Continued
Collaboration



Virus Characterization



Lessons learned
continue to guide
aMPV control

Acknowledgements



**Producers &
Veterinarians**



**Diagnostic
Laboratories**



**Academia &
Researchers**



**USDA CVB &
Government
Partners**



**Animal-health
Companies**



**aMPV Working
Group**



**Trade
Associations**



Response is an on-going collective effort

A large indoor turkey farm with many turkeys in cages. The turkeys have white feathers and blue and red heads. They are in a large room with metal bars and red feeders. The text "Emerging diseases are inevitable." is overlaid on the image.

Emerging diseases are inevitable.

Working together is a choice.

Emerging diseases are inevitable.

Working together is a choice.

