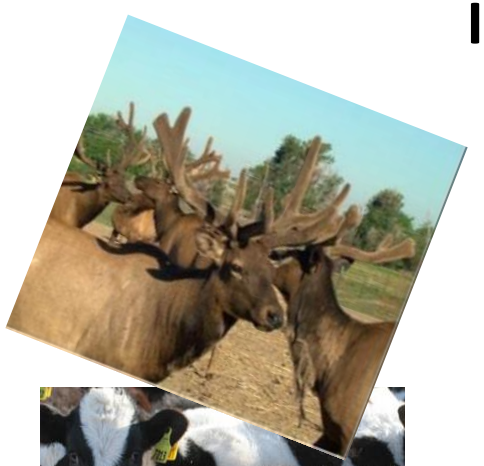


Influenza A in Swine Collaborations: a Pioneering Multi-Agency One Health Partnership

2009-2021

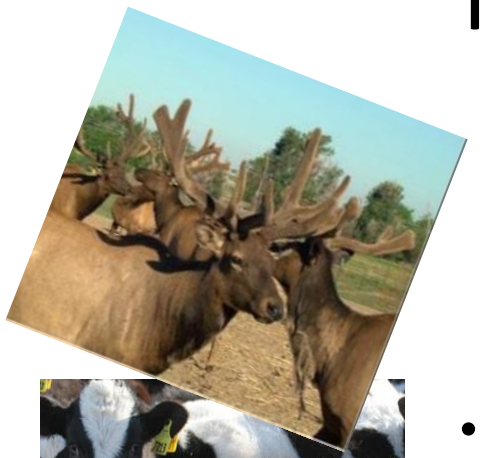
John Korslund DVM

One Health Coordinator (acting)

Office of Interagency Collaboration

Strategy and Policy Unit

Veterinary Services

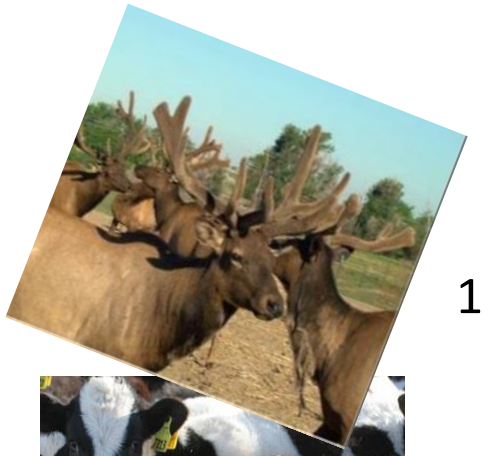


Influenza A in Swine Collaborations: a Pioneering Multi-Agency Partnership in One Health

2007-2021

Partners:

- USDA-APHIS-VS-NVSL and NAHLN
- VS commodity and surveillance staffs
- USDA ARS
- CDC Influenza Division
- Multiple State animal and public health units and their umbrella organizations
- Swine commodity groups

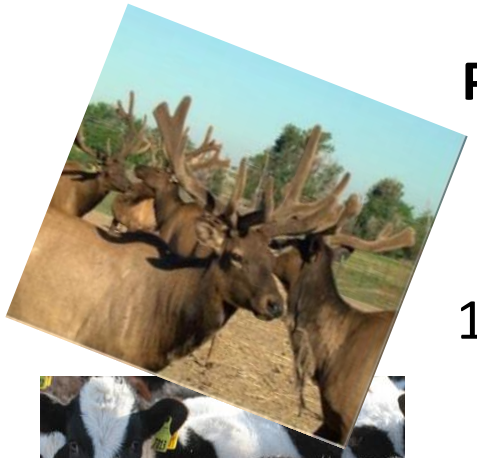


Influenza A in Swine Collaborations: a Pioneering Multi-Agency Partnership in One Health

Surveillance Objectives

1. Monitor genetic evolution of endemic IAV in swine to better understand endemic and emerging influenza virus ecology;
2. Make influenza isolates from swine available for research and establish a data management system to facilitate genetic analysis of these isolates and related information; and
3. Select proper isolates for the development of relevant diagnostic reagents, updated diagnostic assays, and vaccine seed stock products.





Influenza A in Swine Collaborations: a Pioneering Multi-Agency Partnership in One Health

Additional Outcomes:

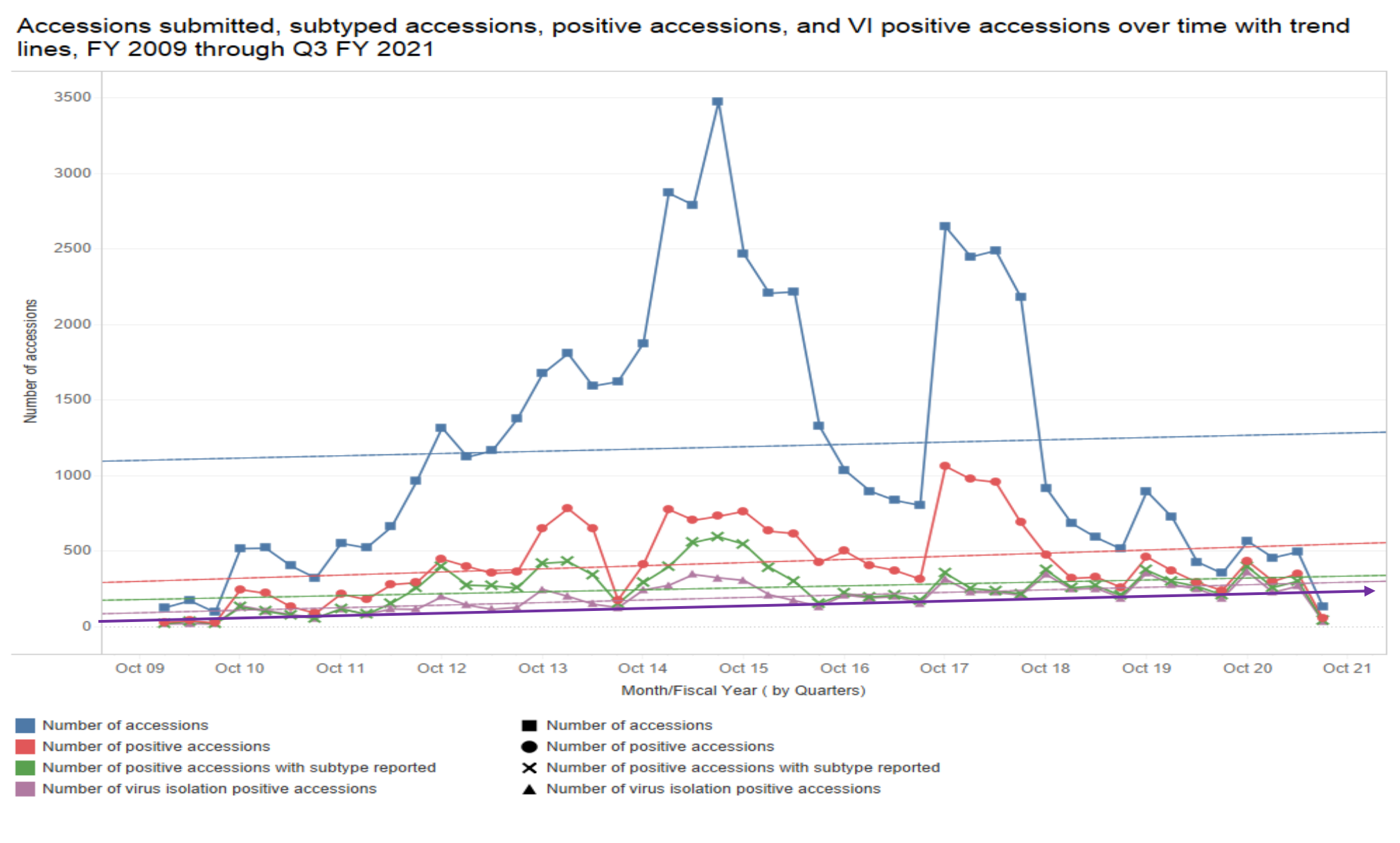
1. Joint AH-PH investigations of variant influenza (swine origin) influenza cases in humans
2. Outstanding laboratory and policy staff collaborations re: influenza as a shared virus (poultry also brought into discussions)
3. Greater understanding among producer, veterinary and public health groups re: influenza in swine
4. International leadership in multi-species influenza molecular epidemiology and analysis



The Process

- ***Utilize producer submitted sick pig samples***
- ***Reimburse NAHLN's for eligible Matrix CT workups:***
  - ***Data submission to USDA***
  - ***VI and subtyping PCR***
  - ***H and N sequencing, with GenBank data submission***
  - ***sample submission to NVSL***
- ***NVSL performs WGS on selected samples***
- ***ARS utilizes VS data and GenBank sequences for detailed analytics***
- ***CDC Influenza Division and Lab collaborate with ARS, NVSL and VS in data exchange, case investigations, monthly seminars***
- ***Cost shared – producers, labs, VS, ARS, CDC***

12 years of growth- from 0 to 100 sequenceable samples per month



USDA IAV-S Viral Repository

- Maintained at NVSL
- Available for researchers and commercial vaccine - reagent production
- Linked to GenBank accession #’s for referencing of genotype

- **Table 5. Total number of subtyped isolates available through repository from 2009-Present**
- **Subtyped isolates available through repository**

H3N2	2,462
H3N1	22
H1N1	3,173
H1N2	2,941
Mixed	302
TOTAL	8,9008,

Case Collaboration

CDC Influenza Lab Shared Report – recent world H1 variants

Influenza A(H1)v virus summary – reported January to September 2021

Country	Subtype	State	Age (yrs)	Sex	Onset date	Exposure	Confirmed/ Reported	Isolate available	HI test (date)	Strain name
Germany	H1N1v (1C.2.1) EA avian	Mecklenburg-Western Pomerania	17	M	18-Apr-2021	Exposure to swine	Robert Koch Institute	no	no	A/Mecklenburg-Vorpommern/1/2021
Canada	H1N1v (1A.3.3.2) pdm09	Manitoba	?	?	2021	Exposure to swine	Public Health Agency of Canada	yes	Yes (6/6/2021)	A/Manitoba/02/2021
	H1N2v (1A.1.1) Alpha	Manitoba	?	?	2021	Exposure to swine				A/Manitoba/01/2021
Denmark	H1N1v (1A.3.3.2) pdm09	Zealand	73	F	21-Jan-2021	No exposure to swine reported	IHR National Focal Point, Denmark	no	no	A/Denmark/1/2021
USA	H1N1v (1A.3.3.3) Gamma	North Carolina	55	M	24 Nov 2020	Exposure to swine	IHR National Focal Point, USA	yes	Yes (4-19-21)	A/North Carolina/15/2020
	H1N1v (1A.3.3.3) Gamma	Wisconsin	7	F	31 Mar2021			yes	Yes (4-19-21)	A/Wisconsin/03/2021
	H1N1v (1A.3.3.2) pdm09	Iowa	68	M	8 Apr 2021			yes	Yes (7-20-21)	A/Iowa/02/2021
	H1N2v (insufficient data)	Ohio	6	M	24 Mar 2021			VNR	No	A/Ohio/1/2021
	H1N1v (1A.3.3.3) Gamma	Wisconsin	40	F	07/29/2021			yes	pending	A/Wisconsin/04/2021
	H1N1v (1A.3.3.3) Gamma	Wisconsin	89	F	08/03/2021			VNR	no	A/Wisconsin/05/2021
	H1N2v (1B.2.1) delta 2	Iowa	12	M	08/23/2021	unknown		yes	pending	A/Iowa/3002865294/2021
China	H1N1v (1C.2.3) EA Avian	Shandong	2	M	1-Jan-2021	No exposure to swine reported	National Health Commission, China	no	no	A/Shandong/00204/2021
Taiwan	H1N2v (1A.1.1) Alpha	Taiwan	5	F	12-Mar-2021	Exposure to swine	Department of Disease Control	pending	pending	A/Taiwan/1/2021

*Blue font indicates new data since February 2021

CDC Lab - phylogenetic tree – human variants' location within swine phylogeny

Evolutionary Relationships Among Influenza A(H1)v HA, 2021
1B.2.1 (Delta 2)

H1v candidate vaccine virus

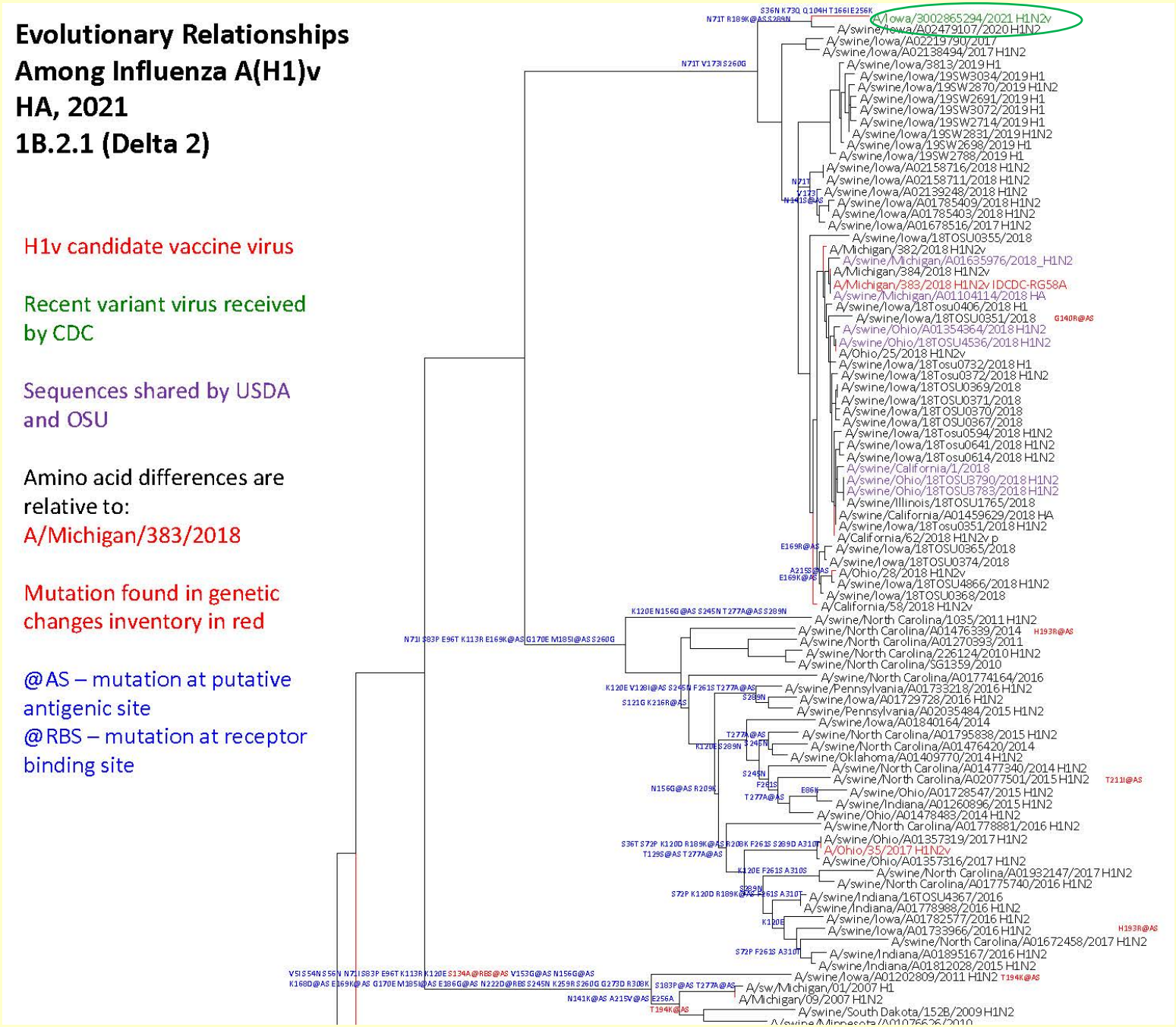
Recent variant virus received by CDC

Sequences shared by USDA and OSU

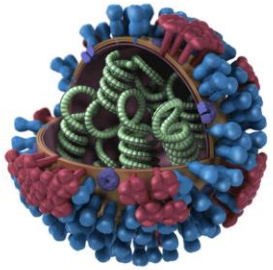
Amino acid differences are relative to:
A/Michigan/383/2018

Mutation found in genetic changes inventory in red

@AS – mutation at putative antigenic site
@RBS – mutation at receptor binding site



USDA ARS
Applied Research for animal and public health



Swine Influenza Virus Surveillance

Q3 FY2021 (April – June)

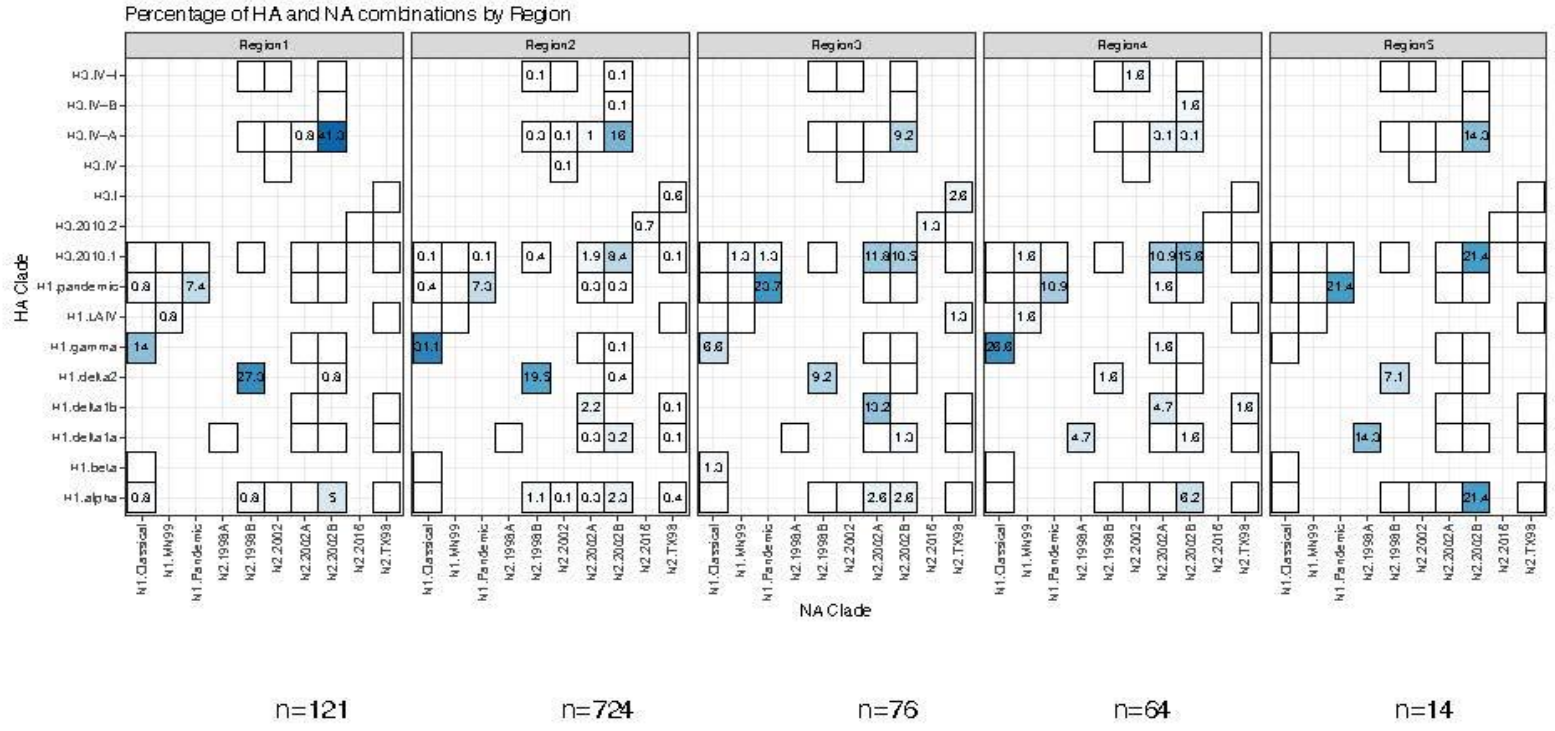
Prepared: Sept 10, 2021

USDA-NADC Team
USDA-NVSL
USDA-NAHLN Laboratories
USDA-SPRS
US Swine Producers and Veterinarians

USDA

Data Parsing for Improved Understanding

Regional Data: **Apr 2020 – Mar 2021**



Lessons Learned:

- Don’t do this!! ⟶
- Patience with stakeholders
- Talk through differences
- Seize upon opportunities
- Mutual respect always
- Look to add collaborators