

Swine Disease Reporting System

Report # 63 (May 2, 2023)

What is the Swine Disease Reporting System (SDRS)? SDRS includes multiple projects that aggregate data from participating veterinary diagnostic laboratories (VDLs) in the United States of America, and reports the major findings to the swine industry. Our goal is to share information on activity of endemic and emerging diseases affecting the swine population in the USA, assisting veterinarians and producers in making informed decisions on disease prevention, detection, and management.

After aggregating information from participating VDLs and summarizing the data, we ask for the input of our advisory group, which consists of veterinarians and producers across the US swine industry. The intent is to provide an interpretation of the observed data, and summarize the implications to the industry. Major findings are also discussed in monthly podcasts. All SDRS reports and podcasts are available at www.fieldepi.org/SDRS. The SDRS projects are:

Swine Health Information Center (SHIC)-funded Domestic Swine Disease Surveillance Program: collaborative project among multiple VDLs, with the goal to aggregate swine diagnostic data and report it in an intuitive format (web dashboards and monthly PDF report), describing dynamics of pathogen detection by PCR-based assays over time, specimen, age group, and geographical area. Data is from the Iowa State University VDL, South Dakota State University ADRDL, University of Minnesota VDL, Kansas State University VDL, and Ohio Animal Disease and Diagnostic Lab.

Collaborators:

Swine Disease Reporting System office: Principal investigators: [Daniel Linhares](#) & [Giovani Trevisan](#); Project coordinator: [Guilherme Cezar](#), Communications: [Edison Magalhães](#), Data analyst: [Srijita Chandra](#).

Iowa State University: Gustavo Silva, Marcelo Almeida, Bret Crim, Kinath Rupasinghe, Eric Burrough, Phillip Gauger, Christopher Siepker, Marta Mainenti, Michael Zeller, Rodger Main.

University of Minnesota: Mary Thurn, Paulo Lages, Cesar Corzo, Albert Rovira.

Kansas State University: Rob McGaughey, Franco Matias-Ferreyra, Jamie Retallick.

South Dakota State University: Jon Greseth, Darren Kersey, Travis Clement, Angela Pillatzki, Jane Christopher-Hennings.

Ohio Animal Disease and Diag. Lab.: Melanie Prarat, Ashley Sawyer, Dennis Summers.

The Ohio State University: Andreia Arruda.

Disease Diagnosis System: A pilot program with the ISU-VDL consisting of reporting disease detection (not just pathogen detection by PCR), based on diagnostic codes assigned by veterinary diagnosticians.

PRRSView and FLUture: Aggregates PRRSV and influenza A virus diagnostic data from the ISU-VDL and reports results, metadata, and sequences.

PRRS virus RFLP and Lineage report: Benchmarks patterns of PRRSV RFLP pattern and Lineages detected at the ISU-VDL, UMN-VDL, KSU-VDL, and OH-ADDL over time by specimen, age group, and US State.

Audio and video reports: Key findings from SDRS projects are summarized monthly in a conversation between investigators and available in the form of an “audio report” and “video report” through [Spotify](#), [Apple Podcast](#), [Google podcast](#), [SwineCast](#), [YouTube](#), [LinkedIn](#), and the [SDRS webpage](#).

Advisory Group: Reviews and discusses the data, providing their comments and perspectives monthly: Mark Schwartz, Paul Sundberg, Paul Yeske, Tara Donovan, Deborah Murray, Brigitte Mason, Peter Schneider, Sam Copeland, Luc Dufresne, Daniel Boykin, Corrine Fruge, William Hollis, Rebecca Robbins, and Thomas Petznick.

In addition to this report, interactive dashboards with aggregated test results are available at www.fieldepi.org/SDRS.

Note: This report contains data up to April 30, 2023.

Communications and information contained in this report are for general informational and educational purposes only and are not to be construed as recommending or advocating a specific course of action.

Topic 1 – Detection of PRRSV RNA over time by RT-qPCR.

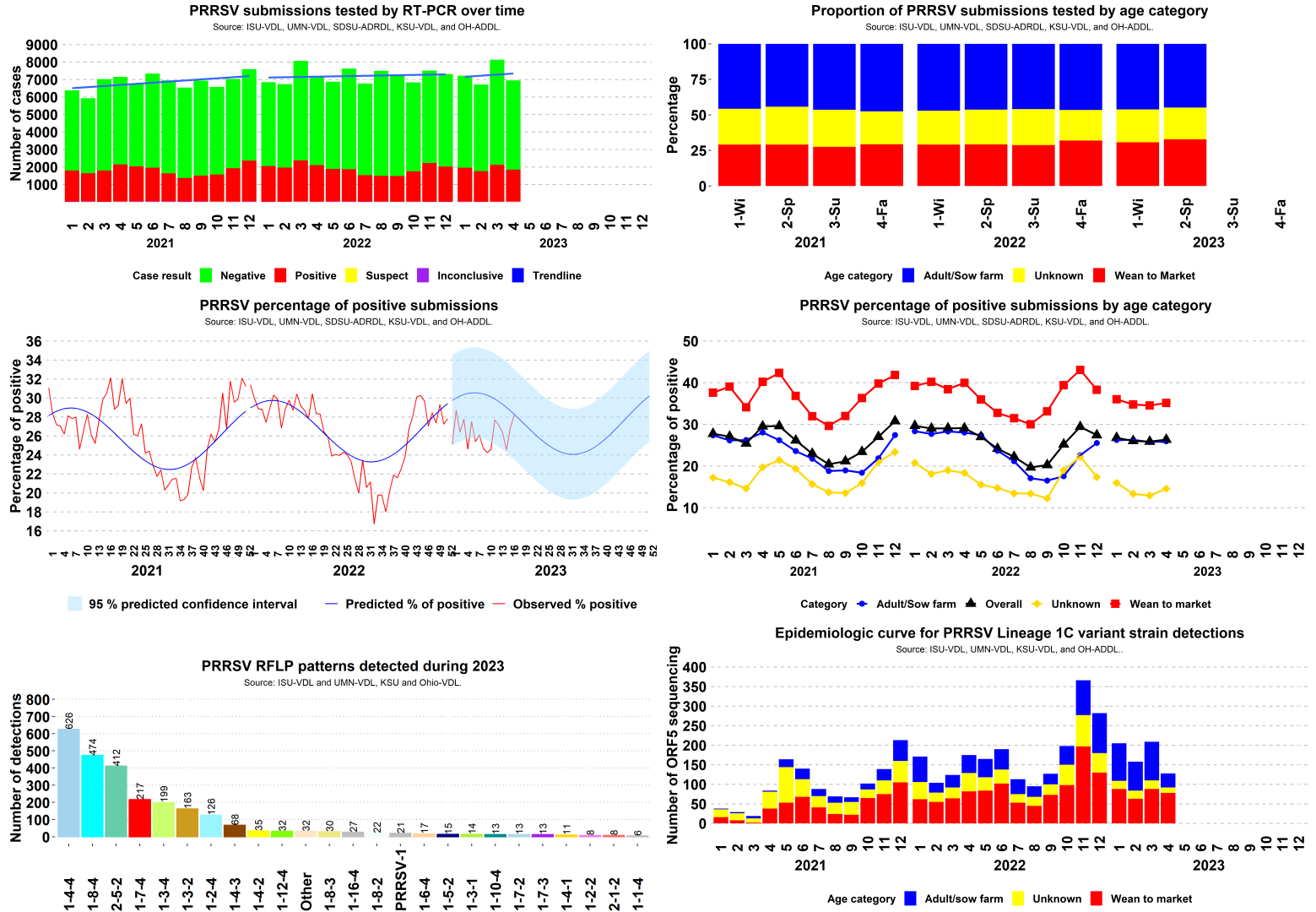


Figure 1. *Top: Left:* Results of PRRSV RT-PCR cases over time; *Right:* Proportion of accession ID cases tested for PRRSV by age group per year and season. *Middle: Left:* Expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based on weekly data observed in the previous 3 years; *Right:* Percentage of PRRSV PCR-positive results, by age category, over time. Wean to market corresponds to nursery and grow-finish. Adult/Sow correspond to Adult, boar stud, breeding herd, replacement, and suckling piglets. Unknown corresponds to not informed site type or farm category. *Bottom Left:* The 25 most frequently detected RFLP patterns during 2023; *Right:* Epidemiological curve of detection for PRRSV Lineage 1C variant strain.

SDRS Advisory Group highlights:

- Overall, 26.34% of 6,951 cases tested PRRSV-positive in April, similar to 25.87% of 8,138 in March;
 - Positivity in the adult/sow category in April was 25.96% (794 of 3,058), similar to 25.77% (954 of 3,702) in March;
 - Positivity in the wean-to-market category in April was 35.13% (802 of 2,283), similar to 34.54% (923 of 2,672) in March;
 - Overall PRRSV-percentage of positive cases was 3 standard deviations from state-specific baselines in KS and OH;
- During April 2023, PRRSV L1C variant strains were detected in MO (51), IA (51), MN (10), NE (7), SD (2), IN (2), OH (1) and OK (1);
 - Analyzing the overall PRRSV sequences performed in the participant’s VDL, the most detected strains in 2023 are L1C variant RFLP 1-4-4, L1H RFLP 1-8-4, and L1A RFLP 1-7-4 (Bonus Page, page 7).
 - The advisory group highlighted that the different strains identified throughout the country with the same classification based on the ORF 5 sequence could vary in terms of clinical outcome. To illustrate, in one example, field veterinarians reported outbreaks with PRRSV L1H 1-8-4 with mild and moderate clinical signs and outbreaks with a strain equally classified as L1H 1-8-4 with severe mortality in the late nursery, prolonged time to stability, and neurological clinical signs.

Topic 2 – Enteric coronavirus RNA detection by RT-qPCR

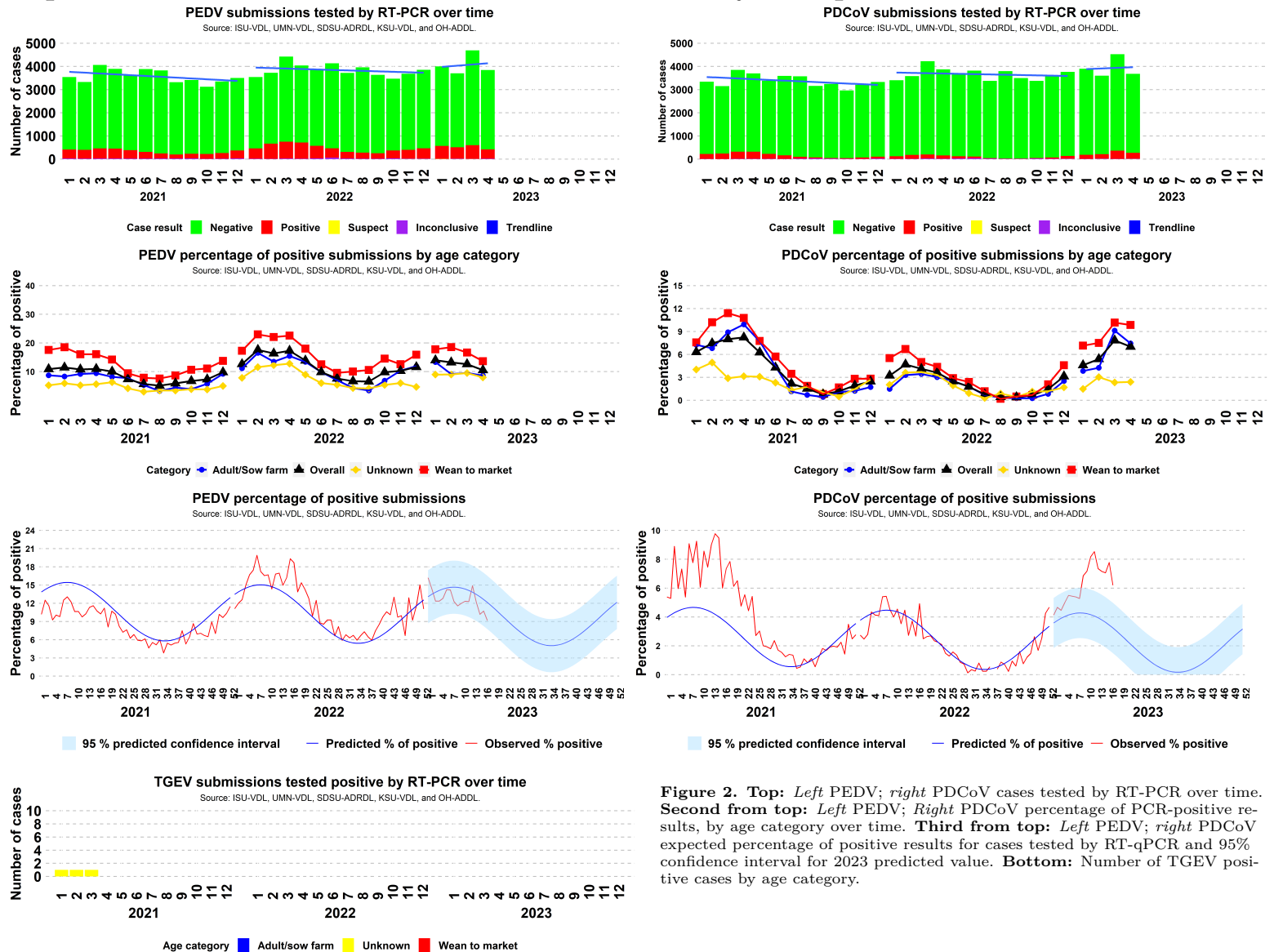


Figure 2. Top: Left PEDV; **right** PDCoV cases tested by RT-PCR over time. **Second from top: Left** PEDV; **Right** PDCoV percentage of PCR-positive results, by age category over time. **Third from top: Left** PEDV; **right** PDCoV expected percentage of positive results for cases tested by RT-qPCR and 95% confidence interval for 2023 predicted value. **Bottom:** Number of TGEV positive cases by age category.

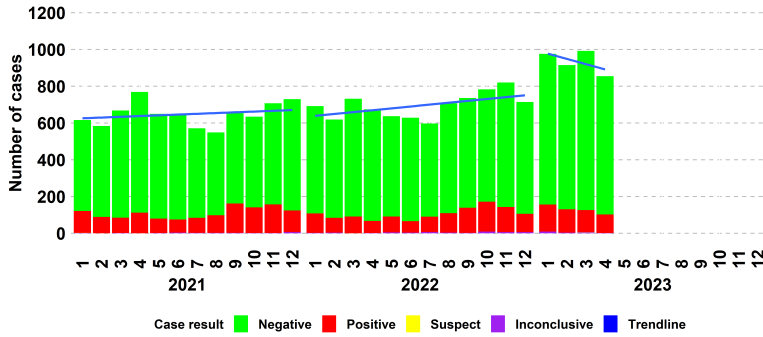
SDRS Advisory Group highlights:

- Overall, 10.52% of 3,842 cases tested PEDV-positive in April, a moderate decrease from 12.61% of 4,688 in March;
 - Positivity in the adult/sow category in April was 8.64% (101 of 1,169), similar to 9.52% (138 of 1,449) in March;
 - Positivity in the wean-to-market category in April was 13.64% (216 of 1,583), a moderate decrease from 16.65% (338 of 2,030) in March;
- Overall PEDV-percentage of positive cases was 3 standard deviations from state-specific baselines in SD, NE, MO, and NC;
- Overall, 7.01% of 3,680 cases tested PDCoV-positive in April, similar to 7.84% of 4,527 in March;
 - Positivity in the adult/sow category in April was 7.44% (83 of 1,116), similar to 9.12% (127 of 1,392) in March;
 - Positivity in the wean-to-market category in April was 9.86% (150 of 1,522), similar to 10.16% (201 of 1,978) in March;
- Overall PDCoV-percentage of positive cases was 3 standard deviations from state-specific baselines in SD, OK, KS, and IL;
- There was 0 positive case for TGEV RNA-PCR in April, 2023 over a total of 3,559 cases tested. It has been 26 months (with a total of 86,957 cases tested) since the last TGEV PCR-positive result;

Topic 3 – Detection of *M. hyopneumoniae* and Porcine Circovirus-2 DNA by PCR.

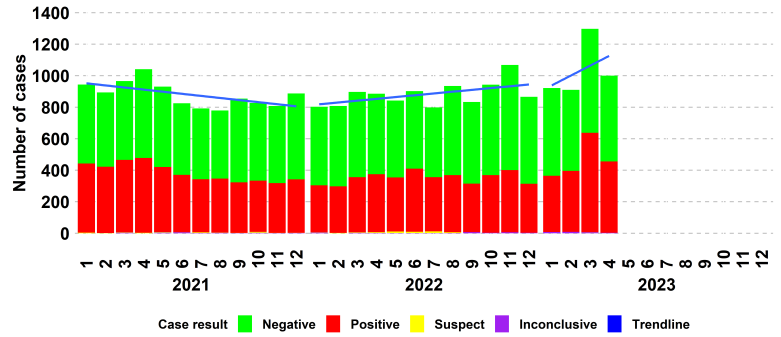
Mycoplasma hyopneumoniae submissions tested by RT-PCR over time

Source: ISU-VDL, UMN-VDL, SDSU-ADRDL, KSU-VDL, and OH-ADDL.



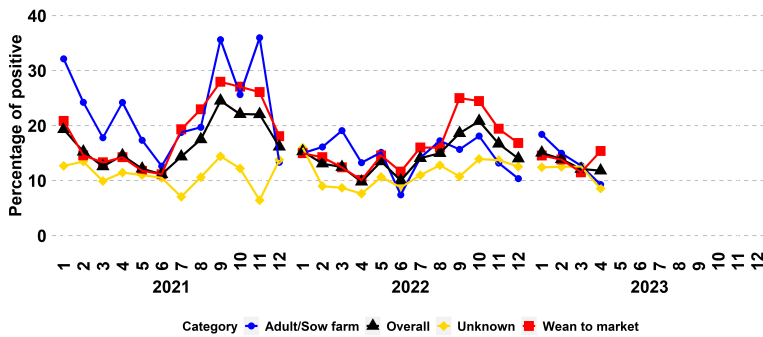
Porcine Circovirus 2 submissions tested by PCR over time

Source: ISU-VDL, UMN-VDL, SDSU-ADRDL, KSU-VDL, and OH-ADDL.



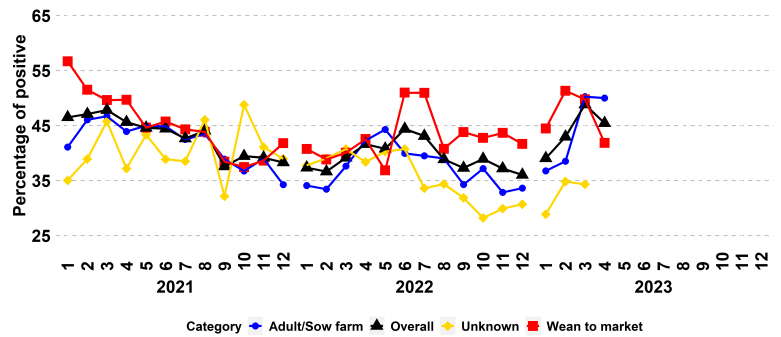
Mycoplasma hyopneumoniae percentage of positive submissions by age category

Source: ISU-VDL, UMN-VDL, SDSU-ADRDL, KSU-VDL, and OH-ADDL.



Porcine Circovirus 2 percentage of positive submissions by age category

Source: ISU-VDL, UMN-VDL, SDSU-ADRDL, KSU-VDL, and OH-ADDL.



Mycoplasma hyopneumoniae percentage of positive submissions

Source: ISU-VDL, UMN-VDL, SDSU-ADRDL, KSU-VDL, and OH-ADDL.

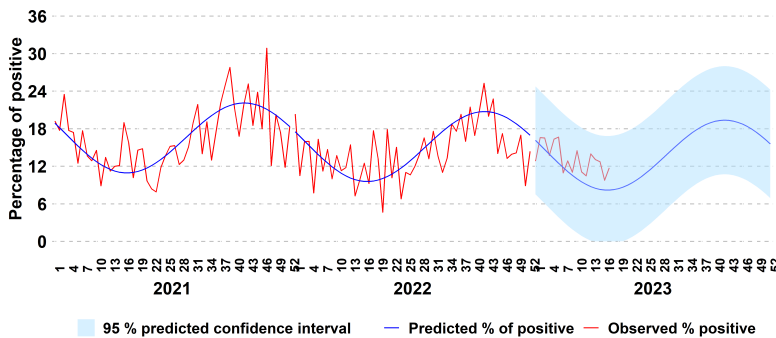


Figure 3. Top: Case results tested by PCR over time. *Left* MHP; *Right* PCV2. **Middle:** percentage of PCR-positive results, by category over time. **Bottom:** expected percentage of positive results for MHP by PCR and 95% confidence interval for 2023 predicted value, based on weekly data observed in the previous 3 years.

SDRS Advisory Group highlights:

- Overall, 11.81% of 855 cases tested *M. hyopneumoniae*-positive cases in April, similar to 12.11% of 991 in March;
 - Positivity in the adult/sow category in April was 9.28% (22 of 237), a moderate decrease from 12.73% (35 of 275) in March;
 - Positivity in the wean-to-market category in April was 15.36% (59 of 384), a moderate increase from 11.5% (53 of 461) in March;
 - Overall MHP-percentage of positive was within state-specific baselines in all 11 monitored states;
- Overall, 45.44% of 997 cases tested PCV2-positive in April, a moderate decrease from 48.84% of 1,292 in March;
 - Positivity in the adult/sow category in April was 50% (309 of 618), similar to 50.25% (398 of 792) in March;
 - Positivity in the wean-to-market category in April was 41.86% (126 of 301), a substantial decrease from 49.75% (198 of 398) in March;
- PCV2 continues to have an increased percentage of positive submissions from sow farms. Processing fluids represented 60% (485 of 808) of the submissions with PCV2 testing and had a positivity of 58%.

Topic 4 – Detection of Influenza A Virus (IAV) RNA by RT-PCR.

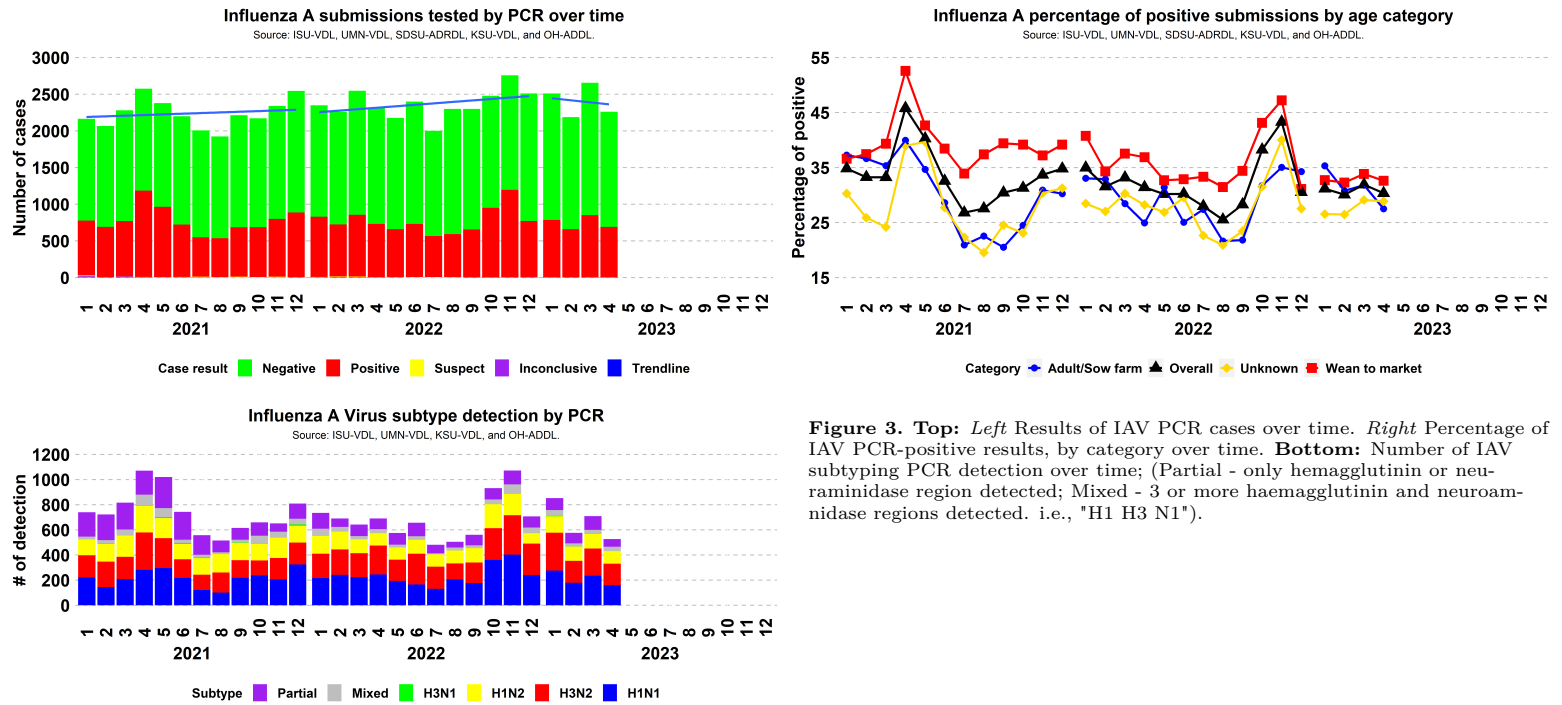


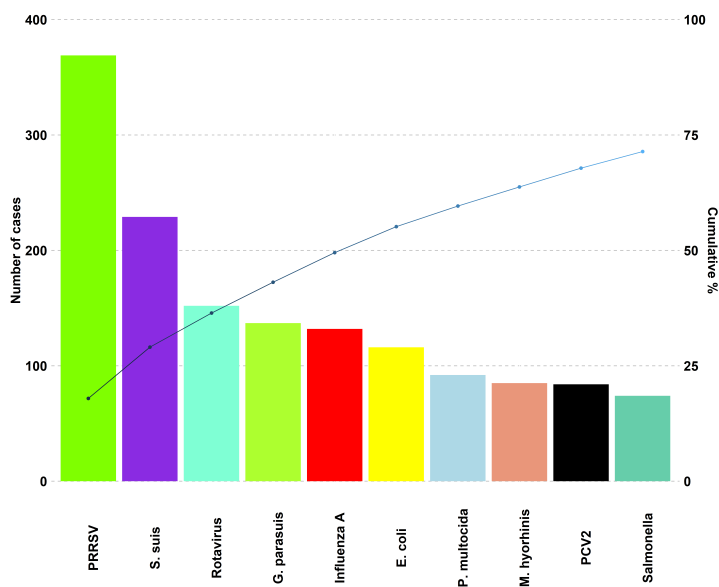
Figure 3. Top: *Left* Results of IAV PCR cases over time. *Right* Percentage of IAV PCR-positive results, by category over time. **Bottom:** Number of IAV subtyping PCR detection over time; (Partial - only hemagglutinin or neuraminidase region detected; Mixed - 3 or more haemagglutinin and neuroaminidase regions detected. i.e., "H1 H3 N1").

SDRS Advisory Group highlights:

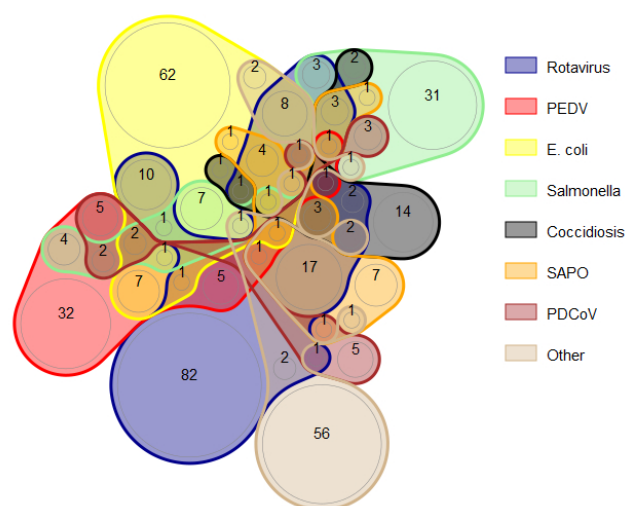
- Overall, 30.35% of 2,257 cases tested IAV-positive cases in April, similar to 31.91% of 2,651 in March;
 - Positivity in the adult/sow category in April was 27.52% (112 of 407), a moderate decrease from 31.81% (167 of 525) in March;
 - Positivity in the wean-to-market category in April was 32.6% (328 of 1,006), similar to 33.84% (419 of 1,238) in March.
- Overall, 6.64% of 527 samples had mixed subtype detection in April, a moderate increase from 4.09% of 709 in March;

Topic 5 – Confirmed tissue cases etiologic/disease diagnosis at the ISU-VDL.

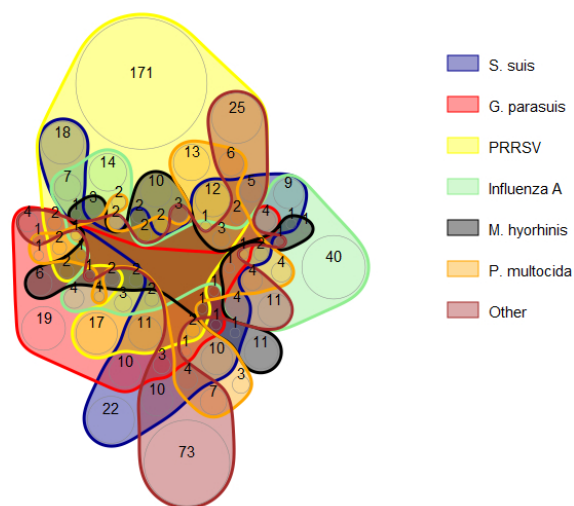
Overall diagnosis



Digestive



Respiratory



Nervous

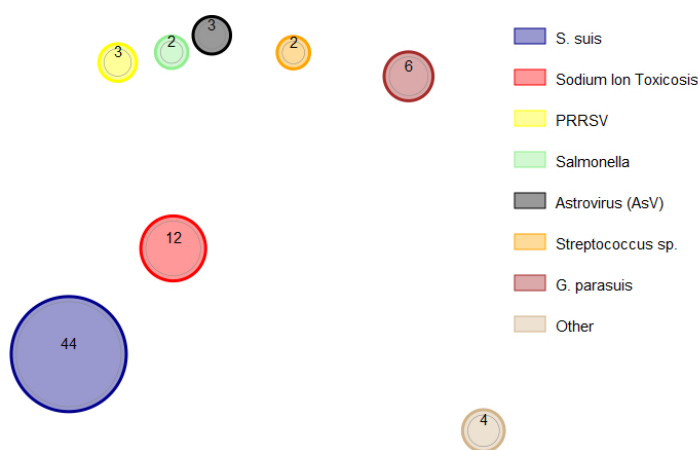


Figure 4. ISU-VDL most frequent overall confirmed tissue disease diagnosis. The presented system is described in the title of the chart. Colors represent one agent; line intersections present diagnosis of 2 or more agents within a submission. Only the most frequent etiology/disease are presented. Less frequent etiology/disease are grouped as “other”. Non-confirmed diagnoses are not presented.

This work is made possible due to the commitment and teamwork from the ISU-VDL diagnosticians who assign standardized diagnostic codes to each case submitted for histopathology: Drs. Almeida, Burrough, Derscheid, Gauger, Harm, Magstadt, Mainenti, Michael, Piñeyro, Rahe, Schumacher, Siepker, Sitticharoenchai, and previous VDL diagnosticians who have contributed to this process.

Note: Disease diagnosis takes 1 to 2 weeks to be performed. The graphs and analysis contain data from March. 1 to April. 24, 2023.

SDRS Advisory Group highlights:

- PRRSV (369) led cases with confirmed etiology, followed by *S. suis* (229), and Rotavirus (152). PRRSV (350 of 1078) led the number of confirmed respiratory diagnoses, Rotavirus (152 of 558) lead the number of confirmed digestive diagnoses, and *S. suis* (44 of 76) led the number of confirmed neurological diagnoses.
- Between the weeks of March 20th and March 27th, there were spikes in the number of Digestive system confirmed diagnosis;
- During March 27th to April 10th, there were spikes in the number of *Lawsonia intracellularis* confirmed diagnosis.

Note: The SDRS is a collaborative project among multiple VDLs in the US swine industry. The VDL collaborators and industry partners are all invited to submit content to share on this bonus page related to disease prevention, control, and management. Stay tuned for more content in future editions.

Dynamic of PRRSV ORF5 sequence detection across the U.S. States

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¹ - Iowa State University, Ames, IA, USA.

Aggregating PRRSV ORF 5 sequence data is determinant to understanding the virus dynamics across the country. Producers and veterinarians can identify epidemiological trends and make data-driven decisions to control pathogens in the field. One example of PRRSV aggregated information is demonstrated in Table 1. Each line of the table represents the U.S. states monitored by the SDRS project and the three predominant strains detected in each, illustrating the dynamic of detection of these strains across the country.

In 2020, PRRSV Lineage 1C variant (L1Cv) RFLP 1-4-4 emerged in Minnesota and quickly spread across neighboring states, causing severe losses in the swine industry. Known as a highly virulent variant with severe clinical outcomes in pigs. Nowadays, the L1Cv is present in most of the U.S. states, with the adversity of in 2023, not only the RFLP 1-4-4 but also 1-3-4 and 1-7-4 have been detected. These are evidence that the virus keeps finding mechanisms to disseminate among production systems.

In 2023, the SDRS detected a high number of sequences assigned as Lineage 1H RFLP 1-8-4. This sequence has been one of the most predominant detected since 2020, and in 2023 is the strain most detected in Nebraska, Oklahoma, and the West Mississippi States (Not listed in Table 1). Also, it is important to realize the importance of L1A RFLP 1-7-4 for specific states such as IL, IN, NC, and OH that still have this strain as the most predominant detected, causing severe clinical signs. The SDRS project keeps monitoring PRRSV sequences to further identify changes in the detection dynamics and emergence of new strains impacting the swine industry.

Table 1. Predominant PRRSV wild type ORF 5 sequences detected across U.S. states.

Ranking of PRRSV strain frequency of detection (Lineage and RFLP)				
States		Most frequent	Second	Third
Overall	2020	L1A 1-7-4	L1H 1-8-4	L1A 1-4-4
	2021	L1Cv 1-4-4	L1A 1-7-4	L1H 1-8-4
	2022	L1Cv 1-4-4	L1H 1-8-4	L1A 1-7-4
	2023	L1Cv 1-4-4	L1H 1-8-4	L1A 1-7-4
Detection per state (2023)				
IL		L1A 1-7-4	L1H 1-8-4	L1H 1-4-3
IN		L1A 1-7-4	L1Cv 1-4-4	L1H 1-8-4
IA		L1Cv 1-4-4	L1H 1-8-4	L1A 1-7-4
KS		L1H 1-16-4	L1E 1-3-2	L1H 1-8-4
MN		L1Cv 1-4-4	L1A 1-7-4	L1Cv 1-7-4
MO		L1Cv 1-4-4	L1Cv 1-3-4	L1C 1-3-2
NE		L1H 1-8-4	L1Cv 1-4-4	L1C 1-3-2
NC		L1A 1-7-4	L1A 1-4-4	L1A 1-10-4 & L1A 1-7-2
OH		L1A 1-7-4	L1C 1-4-4	L1Cv 1-3-4
OK		L1H 1-8-4	L1E 1-3-2	L1A 1-7-4
SD		L1Cv 1-4-4	L1Cv 1-3-4	L1H 1-8-4
East Mississippi River		L1Cv 1-4-4	L6 1-3-4	L1Cv 1-3-4
West Mississippi River		L1H 1-8-4	L1E 1-3-2	L5 2-5-2