

Swine Disease Reporting System

Report # 59 (January 03, 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 (USA), and reports the major findings to the swine industry. Our goal is to share information on 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](#).

Iowa State University: Gustavo Silva, Marcelo Almeida, Bret Crim, Kinath Rupasinghe, Eric Burrough, Phillip Gauger, Christopher Siepker, Panchan Siththicharoenchai, 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, William Hennessy, 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.

FLUture: Aggregates influenza A virus (IAV) 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](#), [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, Scott Dee, Brigitte Mason, Peter Schneider, Sam Copeland, Luc Dufresne, Daniel Boykin, Corrine Fruge, William Hollis, and Rebecca Robbins.

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 December 31, 2022.

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.

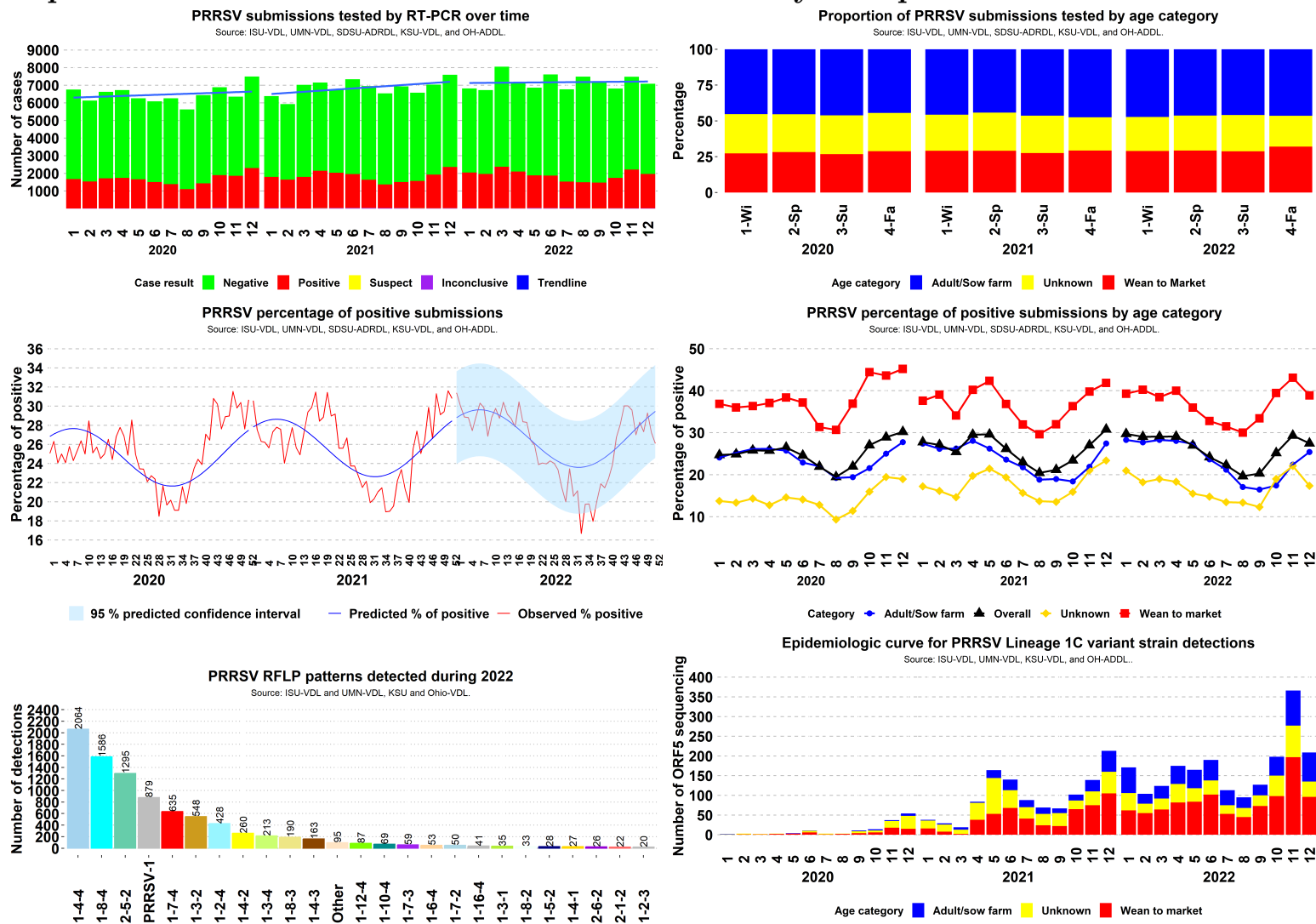


Figure 1. *Top: Left:* Results of PRRSV RT-PCR cases over time; *Right:* Proportion of accession ID cases tested for PRRSV by age group per year and season. *Middle: Left:* Expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based 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 2022; *Right:* Epidemiological curve of detection for PRRSV Lineage 1C variant strain.

SDRS Advisory Group highlights:

- Overall, 27.46% of 7,086 cases tested PRRSV-positive in December, similar to 29.32% of 7,482 in November;
- Positivity in the adult/sow category in December was 25.41% (840 of 3,306), a moderate increase from 22.41% (775 of 3,459) in November;
- Positivity in the wean-to-market category in December was 38.88% (813 of 2,091), a moderate decrease from 43.09% (1,088 of 2,525) in November;
- Overall PRRSV-percentage of positive cases was 3 standard deviations from state-specific baselines in NE and MO;
- The advisory group highlighted that several PRRSV outbreaks occurred in November with the Lineage 1C variant strain, which contributed to the high activity of this strain in IA. Outbreaks have been concentrated in grow-finish sites and had increased lateral outbreaks that seem to have leveled off in December. Even though there was a decrease in PRRSV detection in growing sites in December, the high activity in November increased the pressure of infection in sow farms that continued to have increasing detection in December.

Topic 2 – Enteric coronavirus RNA detection by RT-qPCR

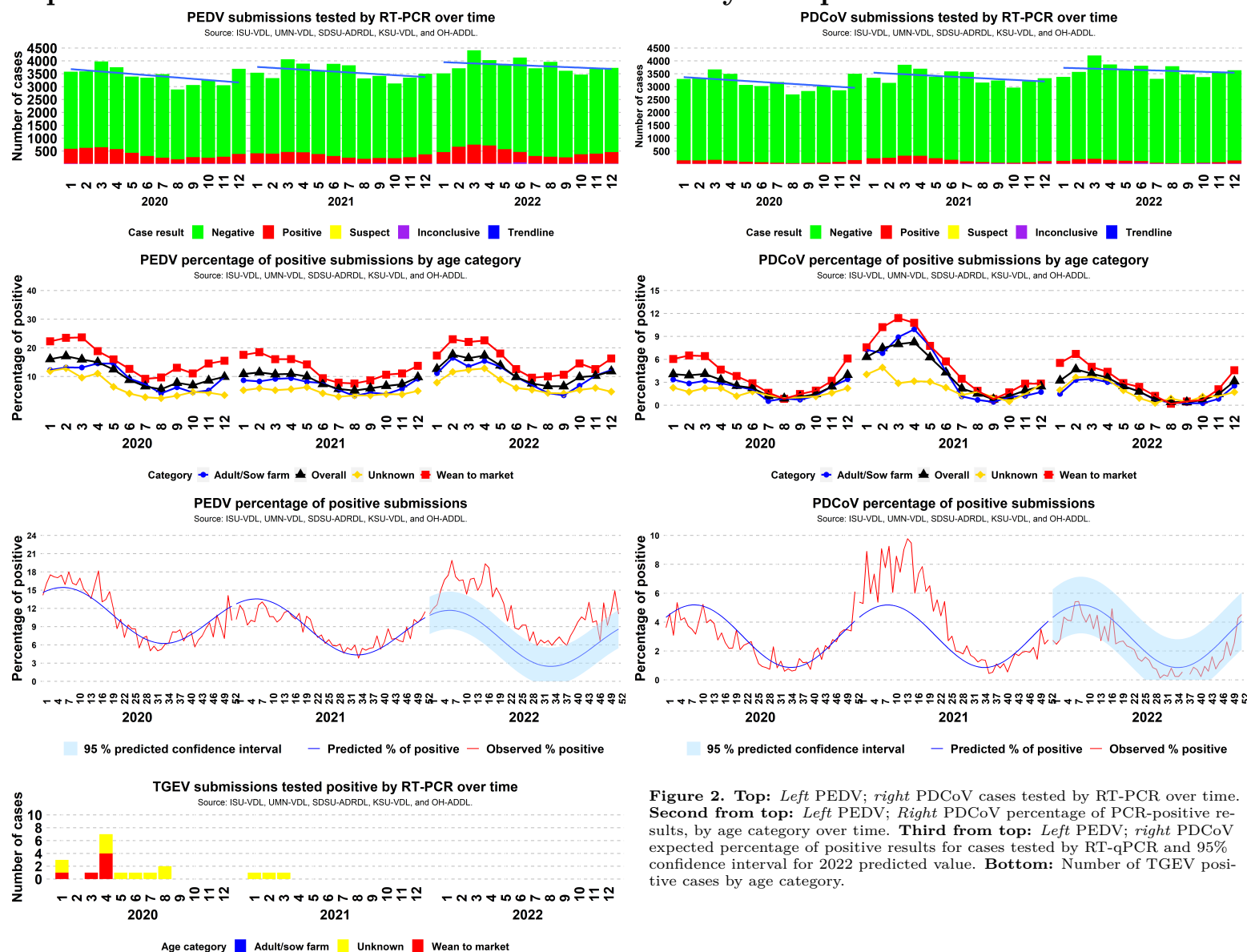


Figure 2. Top: Left PEDV; **right** PDCoV cases tested by RT-PCR over time. **Second from top: Left** PEDV; **Right** PDCoV percentage of PCR-positive results, by age category over time. **Third from top: Left** PEDV; **right** PDCoV expected percentage of positive results for cases tested by RT-qPCR and 95% confidence interval for 2022 predicted value. **Bottom:** Number of TGEV positive cases by age category.

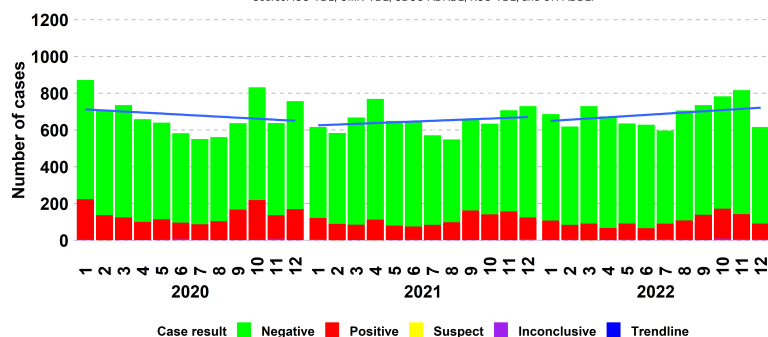
SDRS Advisory Group highlights:

- Overall, 11.84% of 3,725 cases tested PEDV-positive in December, similar to 10.25% of 3,677 in November;
 - Positivity in the adult/sow category in December was 12.29% (149 of 1,212), similar to 10.34% (128 of 1,238) in November;
 - Positivity in the wean-to-market category in December was 16.3% (244 of 1,497), a moderate increase from 12.58% (196 of 1,558) in November;
 - The overall PEDV-percentage of positive cases was 3 standard deviations from state-specific baselines in IA, KS, MO and NC;
- Overall, 3.14% of 3,635 cases tested PDCoV-positive in December, similar to 1.45% of 3,583 in November;
 - Positivity in the adult/sow category in December was 2.54% (30 of 1,181), similar to 0.83% (10 of 1,208) in November;
 - Positivity in the wean-to-market category in December was 4.58% (67 of 1,464), a moderate increase from 2.09% (32 of 1,534) in November;
 - Overall PDCoV-percentage of positive cases was within state-specific baselines in all 11 monitored states;
- There was 0 positive case for TGEV RNA in December, 2022 over a total of 3,583 cases tested;

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

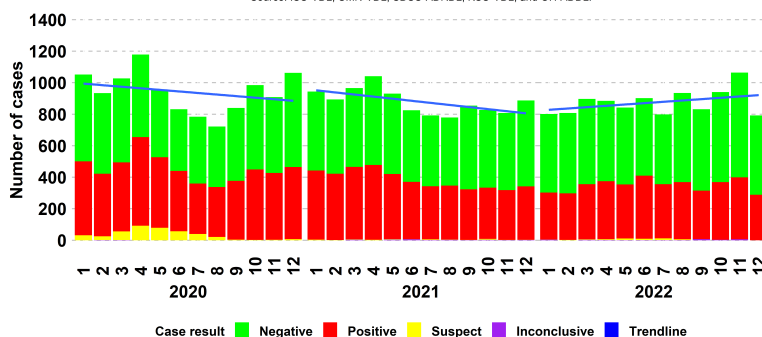
Mycoplasma hyopneumoniae submissions tested by RT-PCR over time

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



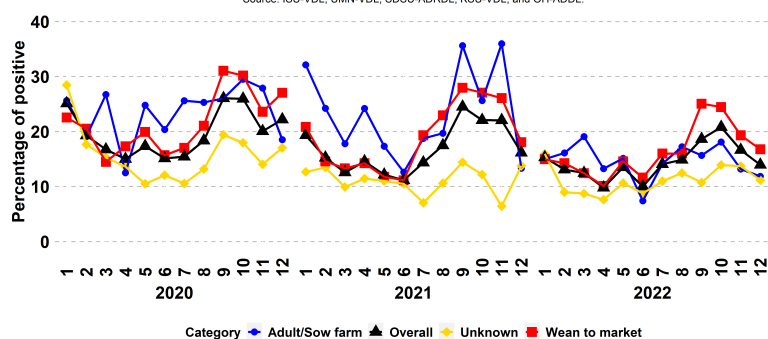
Porcine Circovirus 2 submissions tested by PCR over time

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



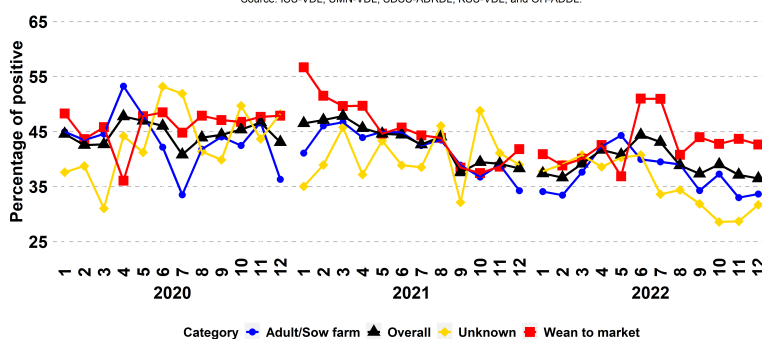
Mycoplasma hyopneumoniae percentage of positive submissions by age category

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



Porcine Circovirus 2 percentage of positive submissions by age category

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



Mycoplasma hyopneumoniae percentage of positive submissions

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

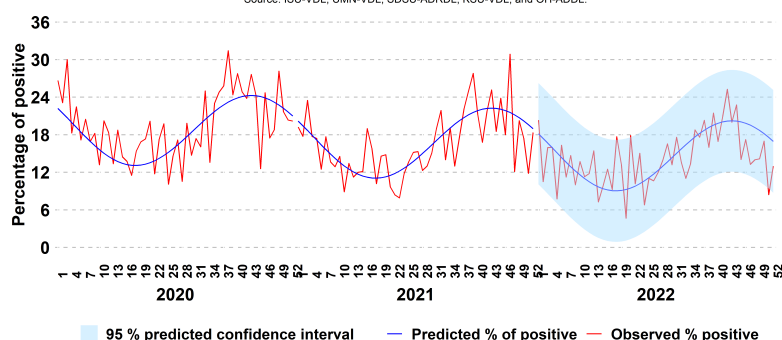


Figure 3. Top: Case results tested by PCR over time. *Left* MHP; *Right* PCV2. **Middle:** percentage of PCR-positive results, by category over time. **Bottom:** expected percentage of positive results for MHP by PCR and 95% confidence interval for 2022 predicted value, based on weekly data observed in the previous 3 years.

SDRS Advisory Group highlights:

- Overall, 13.96% of 616 cases tested *M. hyopneumoniae*-positive cases in December, a moderate decrease from 16.65% of 817 in November;
 - Positivity in the adult/sow category in December was 11.86% (14 of 118), similar to 13.19% (19 of 144) in November;
 - Positivity in the wean-to-market category in December was 16.78% (49 of 292), a moderate decrease from 19.32% (85 of 440) in November;
- Overall MHP-percentage of positive was within state-specific baselines in all 11 monitored states;
- Overall, 36.49% of 792 cases tested PCV2-positive in December, similar to 37.15% of 1,058 in November;
 - Positivity in the adult/sow category in December was 33.65% (141 of 419), similar to 32.99% (160 of 485) in November;
 - Positivity in the wean-to-market category in December was 42.65% (116 of 272), similar to 43.67% (200 of 458) in November;

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

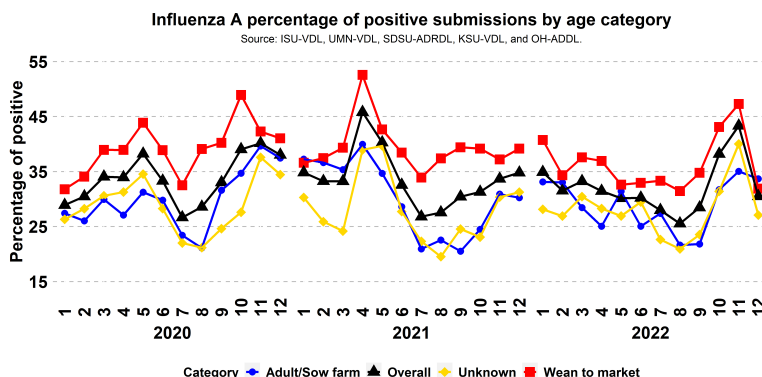
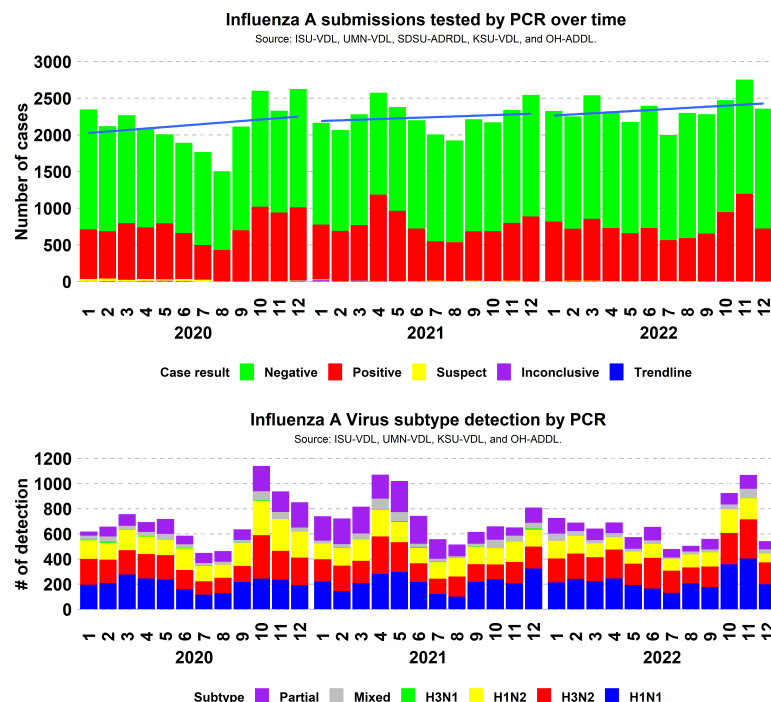


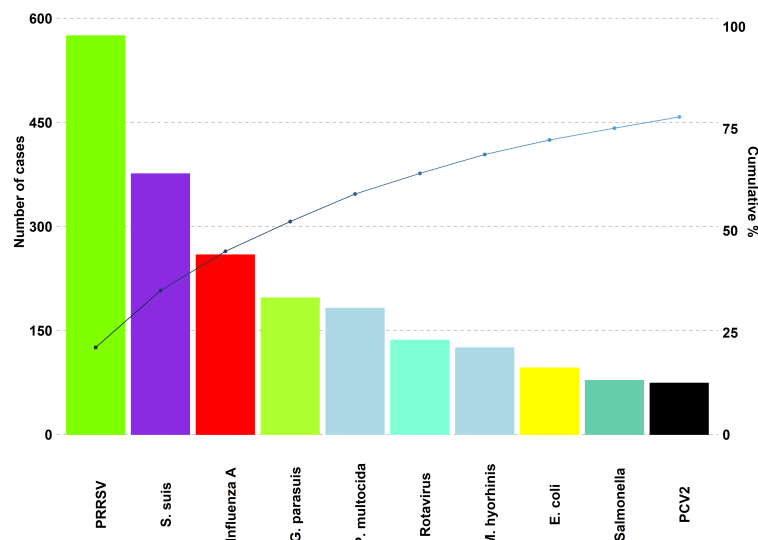
Figure 3. Top: *Left* Results of IAV PCR cases over time. *Right* Percentage of IAV PCR-positive results, by category over time. **Bottom:** Number of IAV subtyping PCR detection over time; (Partial - only hemagglutinin or neuraminidase region detected; Mixed - 3 or more haemagglutinin and neuraminidase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

SDRS Advisory Group highlights:

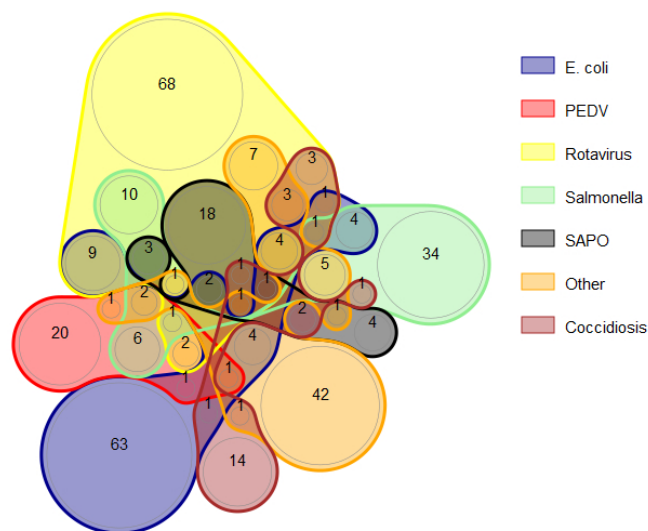
- Overall, 30.51% of 2,353 cases tested IAV-positive cases in December, a marked decrease from 43.32% of 2,749 in November;
 - Positivity in the adult/sow category in December was 33.68% (162 of 481), similar to 35.04% (171 of 488) in November;
 - Positivity in the wean-to-market category in December was 31.89% (316 of 991), a marked decrease from 47.29% (733 of 1,550) in November.
- Overall, 6.46% of 542 samples were mixed subtype detection in December, similar to 7.02% of 1,069 in November;
- The advisory group highlighted that the Influenza A virus was very active in November, and the decreasing detection in December is aligned with field observations of less activity, indicating that the IAV activity peak may be over.

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

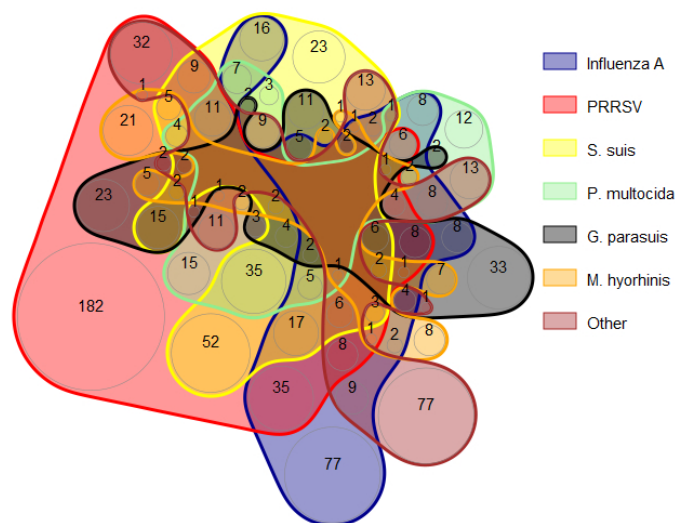
Overall diagnosis



Digestive



Respiratory



Nervous

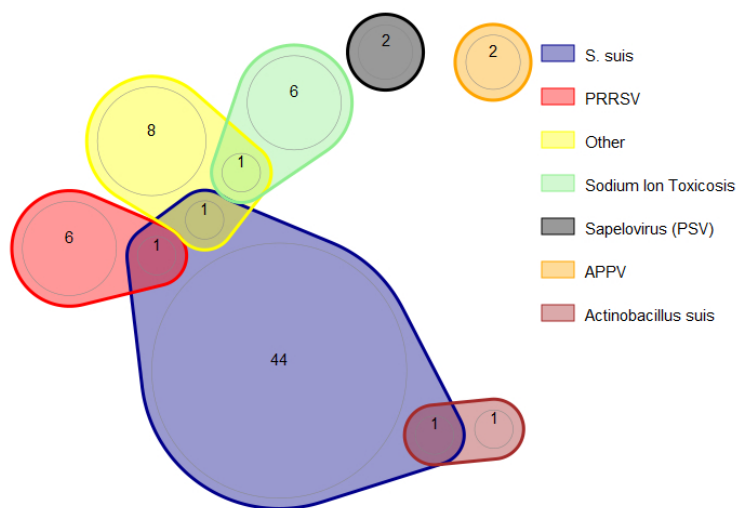


Figure 4. ISU-VDL most frequent overall confirmed tissue disease diagnosis. The presented system is described in the title of the chart. Colors represent one agent; line intersections present diagnosis of 2 or more agents within a submission. Only the most frequent etiology/disease are presented. Less 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, Sithicharoenchai, 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 November. 1 to December. 23, 2022.

SDRS Advisory Group highlights:

- PRRSV (575) led cases with confirmed etiology, followed by *S. suis* (376), and Influenza A (259). PRRSV (546 of 1746) led the number of confirmed respiratory diagnoses, *Rotavirus* (136 of 469) lead the number of confirmed digestive diagnoses, and *S. suis* (47 of 77) led the number of confirmed neurological diagnoses.
- During November 14th to December 23rd, there were spikes in the number of *M. hyorhinis*, Rotavirus, PDCoV, PEDV, and *A.suis* 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.

A 2022 *Swine Disease Reporting System-SDRS* retrospective

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¹ - Swine Disease Reporting System office, Ames, Iowa, USA.

The *SDRS* is a [Swine Health Information Center SHIC](#)-funded program. The SDRS's goal is to share information on the activity of endemic and emerging pathogens affecting the swine population in the U.S., assisting veterinarians and producers in making informed decisions on disease prevention, detection, and management. Currently, SDRS is the only publicly available source of swine health information from U.S. veterinary diagnostic laboratories (VDLs). With a database containing information for seven porcine endemic agents and more than 1 million cases, SDRS is also positioned as one of the largest U.S. and international databases for veterinary diagnostic information. The SDRS has been providing science-based spatiotemporal information on pathogen activity in all age categories, from boar studs to breeding herds to finishing with great representativeness of the U.S. swine industry.

Thank you to the five VDL partners and SDRS advisory board and collaborators for all of the accomplishments during 2022.

A 2022 SDRS retrospective includes but is not limited to:

- Creation of and implementation of a SDRS podcast channels on the main podcast streaming platforms, including [Spotify](#), [Apple Podcast](#), [Google Podcast](#), and [Amazon Music](#);
- Addition of [Porcine Circovirus type 2](#) DNA PCR detection;
- Addition of [Influenza A Virus RT-PCR detection](#) and [Influenza A subtyping detection \(PCR\)](#);

During 2022 SDRS generated and distributed information through:

- SDRS project website (www.fieldepi.org/SDRS) and online dashboards had more than 5,000 page visits;
- 12 editions of PDF, audio, and video reports have been shared through e-mail for 332 receivers from 51 organizations from 7 different countries and posted at the [SDRS webpage](#);
- SDRS hosted talks during the last 12 editions with 18 special guests;
- PDF reports shared at the [FieldEpi LinkedIn page](#) were visualized more than 15,000 times;
- SDRS reports have been shared through the monthly [Swine Health Information Center \(SHIC\)](#) newsletter and uploaded at the [SHIC website](#);
- 12 editions of audio reports have been shared through podcast platforms with over 550 downloads since June of 2022 from 28 different countries [RSS](#);
- SDRS video reports were watched 711 times on the [YouTube channel](#).
- SDRS highlights were presented in several national and international conferences (AASV, IPVS, Leman, AAVLD, James McKean, North America PRRS Symposium).
- SDRS information was published in [National Hog Farm](#), [Pig333](#), [Pork Business](#), and [Farm Progress](#).

Support U.S. swine-stakeholders with information on endemic agent activities:

- Contemporary PRRSV strains and specifically the L1C variant strain have kept PRRSV as the main subject in the report. The detection of PRRSV in 2022 was according to the expected forecasted levels of percentage of positive submissions. However, 2022 represented the highest level of detection of L1C variant with almost 2,000 sequences detected, with Iowa achieving almost the double of sequences detected (1,006) compared with 2021;
- Increased number of detections of PRRSV strains classified as Lineage 1C RFLP 1-2-4, with IA (90), CO (45), MO (23) and IL (19) having the higher number of sequences. However, it was also detected in other states.
- Overall, 11.64% of over 45,000 cases tested PEDV-positive during 2022. In 2022, PEDV overall detection levels was above expected since February, when several outbreaks started to occur, contributing to maintain the high activity of the virus throughout the year;
- PDCoV detection had the lowest percentage of positive submissions since 2018 and in September 2022, only 0.40% (12 of 3,478) submissions had a positive result;
- More than 40,000 submissions have been tested for TGEV, including 137,841 samples, and none of them had a positive result. No detection of TGEV has been registered since March 22 of 2021. From March 22 to December 2022 70,520 submissions and 229,967 samples have been tested for TGEV.

- The SDRS advisory group pointed out that intense *M. hyopneumoniae* control and elimination strategies have been applied by U.S. swine production systems in 2022. The levels of *M. hyopneumoniae* detection in sow farm decreased in 2022 (15.10% of 1,391 sow farms submissions were PCR-positive), being the lowest level since 201 (19.21% of 406 sow farms submissions were PCR-positive);
- Submissions using processing fluids samples represented 1/3 of PCV2 overall PCR testing in 2022. PCR testing for PCV2 has increased by 75% since 2018, mainly impacted by the processing fluids submissions;
- Similar to PRRSV, there is a preceding increase in detection of IAV in wean-to-market pigs of about a month as compared to increases in submissions from breeding herds. Also, a bi-seasonal pattern of IAV detection has been identified with spikes in detection during the spring and fall months;
- In 2022, H1N1 was the most detected IAV subtype (34,24%) followed by H3N2 (29,93%), and H1N2 (17,99%);

Highlights for disease diagnosis at *Iowa State University Veterinary Diagnostic Laboratory*:

- Contemporary and emerging PRRSV strains have contributed to keep PRRSV as the highest number of porcine diagnoses;
- An increase in the diagnosis of *Actinobacillus pleuropneumoniae*, was detected in the end of 2021 and beginning of 2022 in grow-finish that culminated in a series of [outbreak investigations](#) to better understand how the pathogen disseminate among production systems;
- Different agents including Influenza A virus, *E. coli*, Salmonella, *Lawsonia intracellularis*, *P. multocida*, *G. parasuis*, *Streptococcus suis* and *M. hyorhinis* have given signals for increased diagnosis during specific times of the year.

Requests from the SDRS advisory group:

- Add PCV3 DNA PCR detection in the report;
- Add *Escherichia coli* PCR genotyping detection targeting the main toxin genes;
- Add PCV2 and Influenza genotyping information;
- Provide video tutorials aiding the audience to interpret the charts in the SDRS report;

Happy 2023!!! and keep tuned for new SDRS development in 2023.