Swine Disease Reporting System
Report # 68 (October 3, 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, Ohio Animal Disease and Diagnostic Laboratory (ADDL), and Purdue ADDL.

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, Jordan Gebhardt.

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

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

Purdue University: Craig Bowen, Kenitra Hendrix, Joseph Boyle.

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 over time by specimen, age group, and US State.

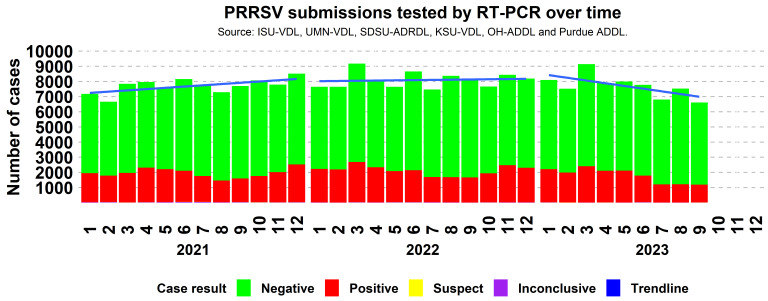
Audio and video reports: Key findings from SDRS projects are summarized monthly in a conversation between investigators and available in the form of an "audio report" and "video report" through Spotify, Apple Podcast, Google podcast, SwineCast, YouTube, LinkedIn, and the SDRS webpage.

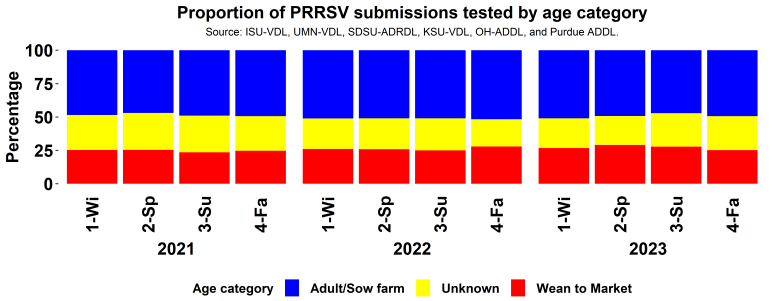
Advisory Group: Reviews and discusses the data, providing their comments and perspectives monthly: Mark Schwartz, Paul Sundberg, Paul Yeske, Deborah Murray, Brigitte Mason, Peter Schneider, Sam Copeland, Luc Dufresne, Daniel Boykin, Corrine Fruge, William Hollis, Rebecca Robbins, Thomas Petznick and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

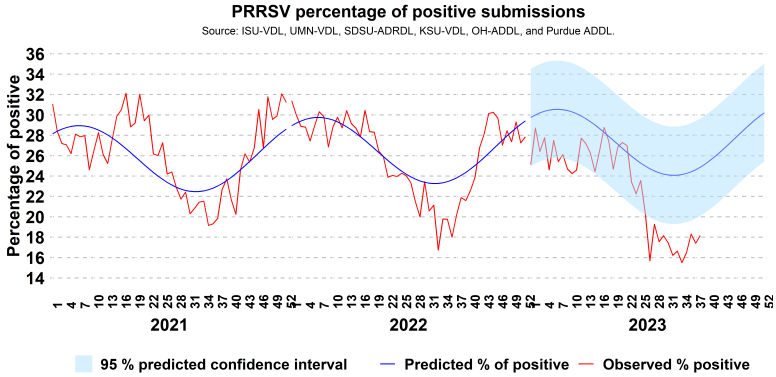
In addition to this report, interactive dashboards and educational material are available at www.fieldepi.org/SDRS.

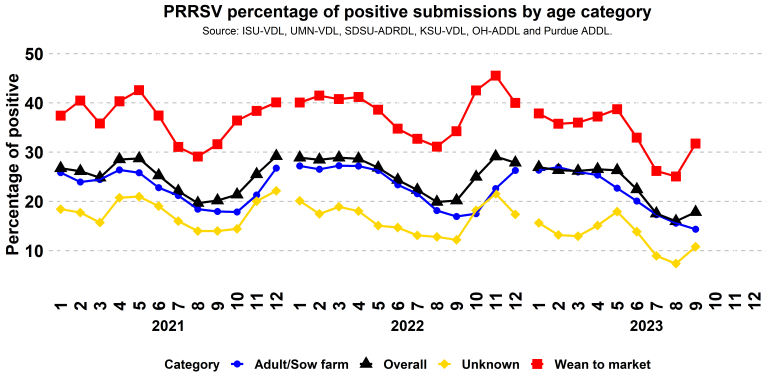
Note: This report contains data up to September 30, 2023.

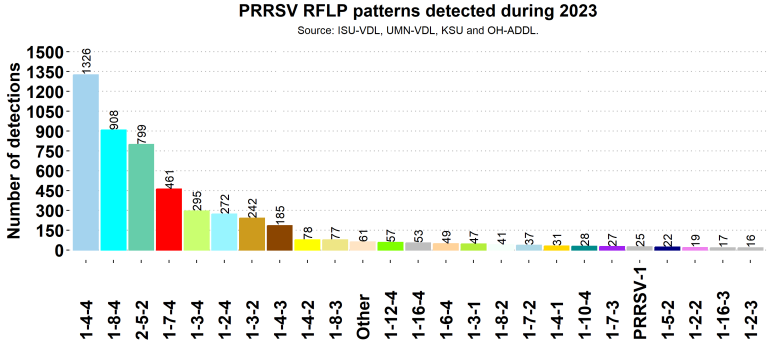
Topic 1 – Detection of PRRSV RNA over time by RT-qPCR.











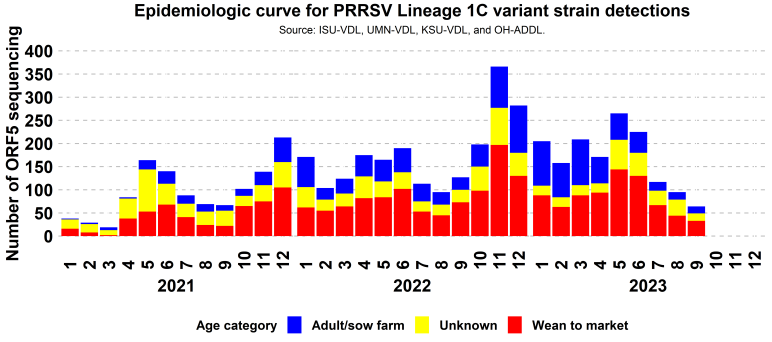
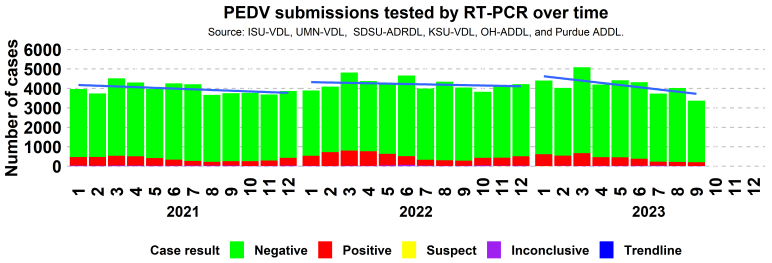


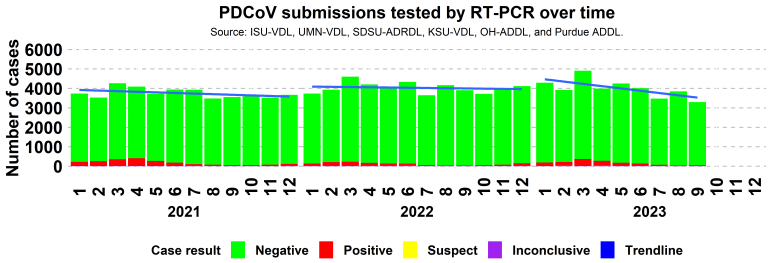
Figure 1. Top: *Left*: Results of PRRSV RT-PCR cases over time; *Right*: Proportion of accession ID cases tested for PRRSV by age group per year and season. **Middle**: *Left* Expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based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

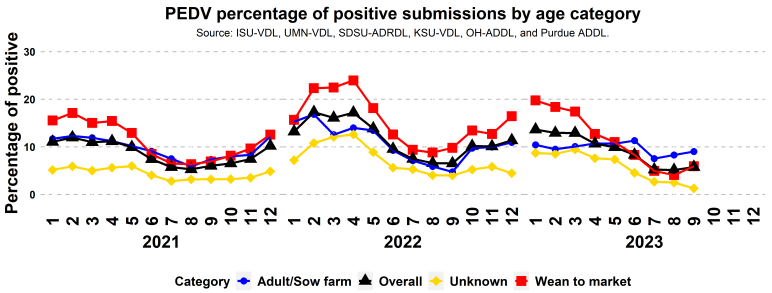
SDRS Advisory Group highlights:

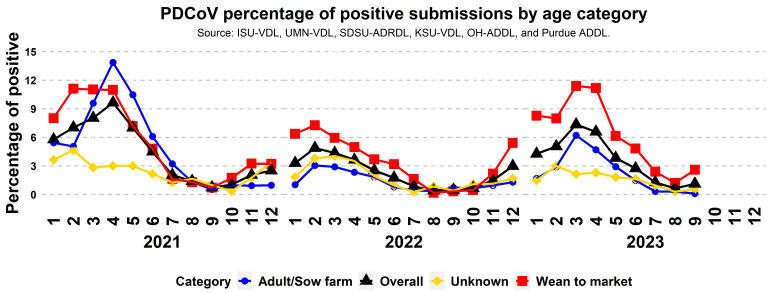
- Overall, 17.83% of 6,612 cases tested PRRSV-positive in September, similar to 15.96% of 7,529 in August;
  - Positivity in the adult/sow category in September was 14.34% (468 of 3,263), similar to 15.58% (559 of 3,589) in August;
  - Positivity in the wean-to-market category in September was 31.75% (529 of 1,666), a substantial increase from 25.06% (499 of 1,991) in August;
  - Overall PRRS-percentage of positive was 3 standard deviations from state-specific baselines in IL and OH;
- During September 2023, PRRSV L1C variant strains were detected in IA (36), MO (17), MN (7), and NE (4);
- Two of the seven pathogens monitored in the SDRS report had a substantial increase (PRRSV, IAV) in the percentage of positive submissions in the wean-to-market category. Two of the seven pathogens monitored in the SDRS report had a moderate increase (*M. hyopneumoniae*, PCV2) in the percentage of positive submissions in the adult/sow farm category. Even though this is expected for the month of September, it is important to raise an alert of the increased activity of endemic pathogens in the field

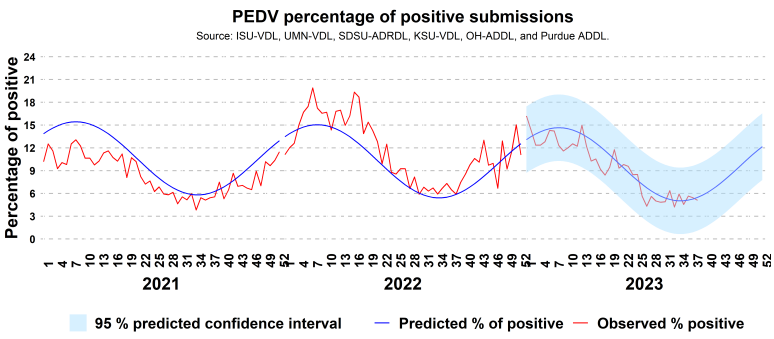
Topic 2 – Enteric coronavirus RNA detection by RT-qPCR

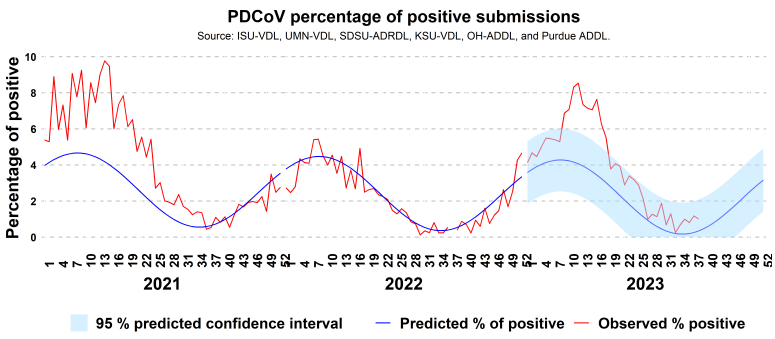












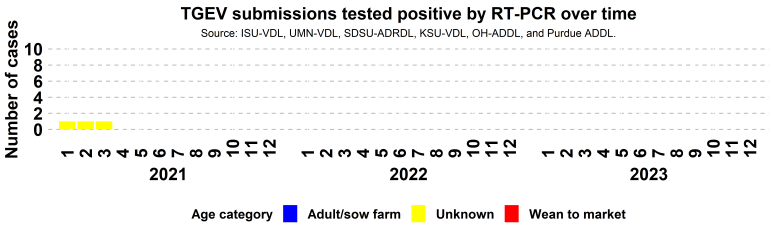


Figure 2. Top: *Left* PEDV; *right* PDCoV cases tested by RT-PCR over time. **Second from top:** *Left* PEDV; *Right* PDCoV percentage of PCR-positive results, by age category over time. **Third from top:** *Left* PEDV; *right* PDCoV expected percentage of positive results for cases tested by RT-qPCR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

SDRS Advisory Group highlights:

- Overall, 5.78% of 3,372 cases tested PEDV-positive in September, similar to 5.12% of 4,020 in August;
  - Positivity in the adult/sow category in September was 9.02% (111 of 1,231), similar to 8.3% (116 of 1,398) in August;
  - Positivity in the wean-to-market category in September was 5.94% (72 of 1,213), similar to 4.08% (63 of 1,543) in August;
  - Overall PEDV-percentage of positive cases was 3 standard deviations from state-specific baselines in MO and NC;
- Overall, 1.12% of 3,299 cases tested PDCoV-positive in September, similar to 0.65% of 3,847 in August;
  - Positivity in the adult/sow category in September was 0.08% (1 of 1,188), similar to 0.3% (4 of 1,337) in August;
  - Positivity in the wean-to-market category in September was 2.59% (31 of 1,196), similar to 1.21% (18 of 1,483) in August;
  - Overall PDCoV-percentage of positive cases was 3 standard deviations from state-specific baselines in KS;
- There was 0 positive case for TGEV RNA-PCR in September, 2023 over a total of 3,197 cases tested. It has been 30 months (with a total of 114,562 cases tested) since the last TGEV PCR-positive result;
- The advisory group highlighted that the slightly increased positivity of PEDV raises an alert since the manure season is starting, and the manure pumping of positive sites might contribute to an increase in PEDV outbreaks.

Topic 3 – Detection of *M. hyopneumoniae* DNA by PCR.

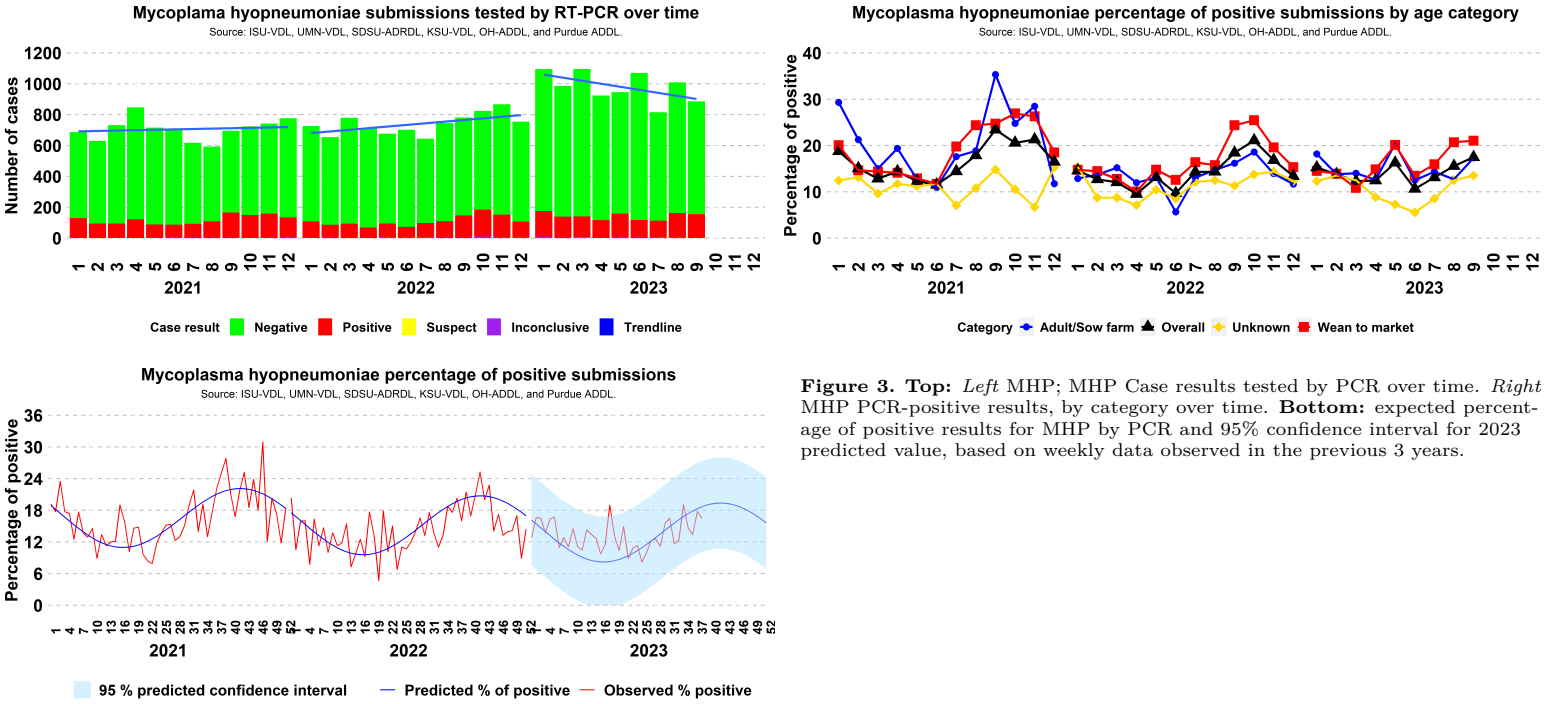


Figure 3. Top: *Left* MHP; MHP Case results tested by PCR over time. *Right* MHP PCR-positive results, by category over time. **Bottom:** expected percentage of positive results for MHP by PCR and 95% confidence interval for 2023 predicted value, based on weekly data observed in the previous 3 years.

SDRS Advisory Group highlights:

- Overall, 17.49% of 886 cases tested *M. hyopneumoniae*-positive cases in September, similar to 15.56% of 1,009 in August;
  - Positivity in the adult/sow category in September was 17.34% (56 of 323), a moderate increase from 12.71% (45 of 354) in August;
  - Positivity in the wean-to-market category in September was 21.05% (64 of 304), similar to 20.71% (76 of 367) in August;
  - Overall MHP-percentage of positive was within state-specific baselines in all 11 monitored states.
- *Mycoplasma hyopneumoniae*, throughout the year, had an increased number of submissions, with a stable number of positive submissions, indicated by our advisory group as a result of elimination programs being conducted in production systems. However, in September, this pathogen entered the top 10 confirmed tissue diagnoses from ISU-VDL (page 7) for the first time in the year, and had an increasing percentage of PCR-positive tissue submissions, which might indicate possible clinical disease in the field. The SDRS monitoring algorithms also indicate increased MHP detection as expected.

Topic 4 – Detection of Porcine Circovirus-2 DNA by PCR.

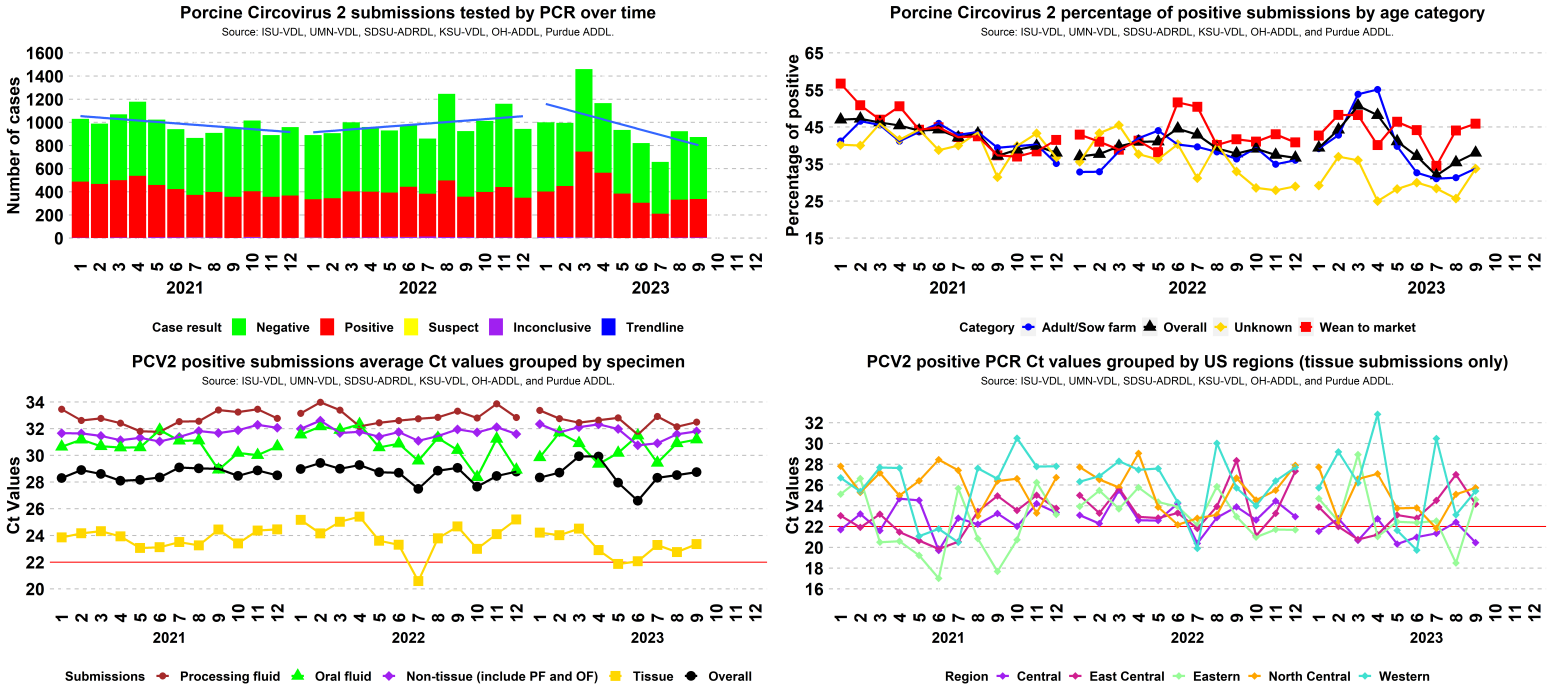


Figure 1. Top: *Left*: Results of PCV2 PCR cases over time; *Right*: PCV2 PCR-positive results, by category over time. **Bottom** *Left*: Average Ct values of PCV2 submissions by specimen; *Right*: Average Ct values of PCV2 tissue submissions by U.S. region; Central (IA), East Central (IL, IN, MO and WI), Eastern (AL, AR, CT, DE, FL, GA, KY, LA, MA, ME, MD, MI, MS, NC, NH, NJ, NY, OH, PA, RI, SC, TN VA, VT and WA), North Central (MN, ND and SD), Western (AK, AZ, CA, CO, HI, ID, KS, MT, NM, NV, OK, OR, TX, UT, WA and WY).

SDRS Advisory Group highlights:

- Overall, 38.03% of 873 cases tested PCV2-positive in September, a moderate increase from 35.43% of 923 in August;
- Positivity in the adult/sow category in September was 33.81% (166 of 491), a moderate increase from 31.34% (147 of 469) in August;
- Positivity in the wean-to-market category in September was 45.9% (140 of 305), similar to 44.06% (152 of 345) in August;
- In the month of September, the regions with the lowest PCV2 average Ct values was Central (33 submissions; average Ct 20.5), East Central (24 submissions; average Ct 24.2), Eastern (16 submissions; average Ct 24.6), Western (12 submissions; average Ct 25.4), and North Central (19 submissions; average Ct 25.7);

Topic 5 – Detection of Influenza A Virus (IAV) RNA by RT-PCR.

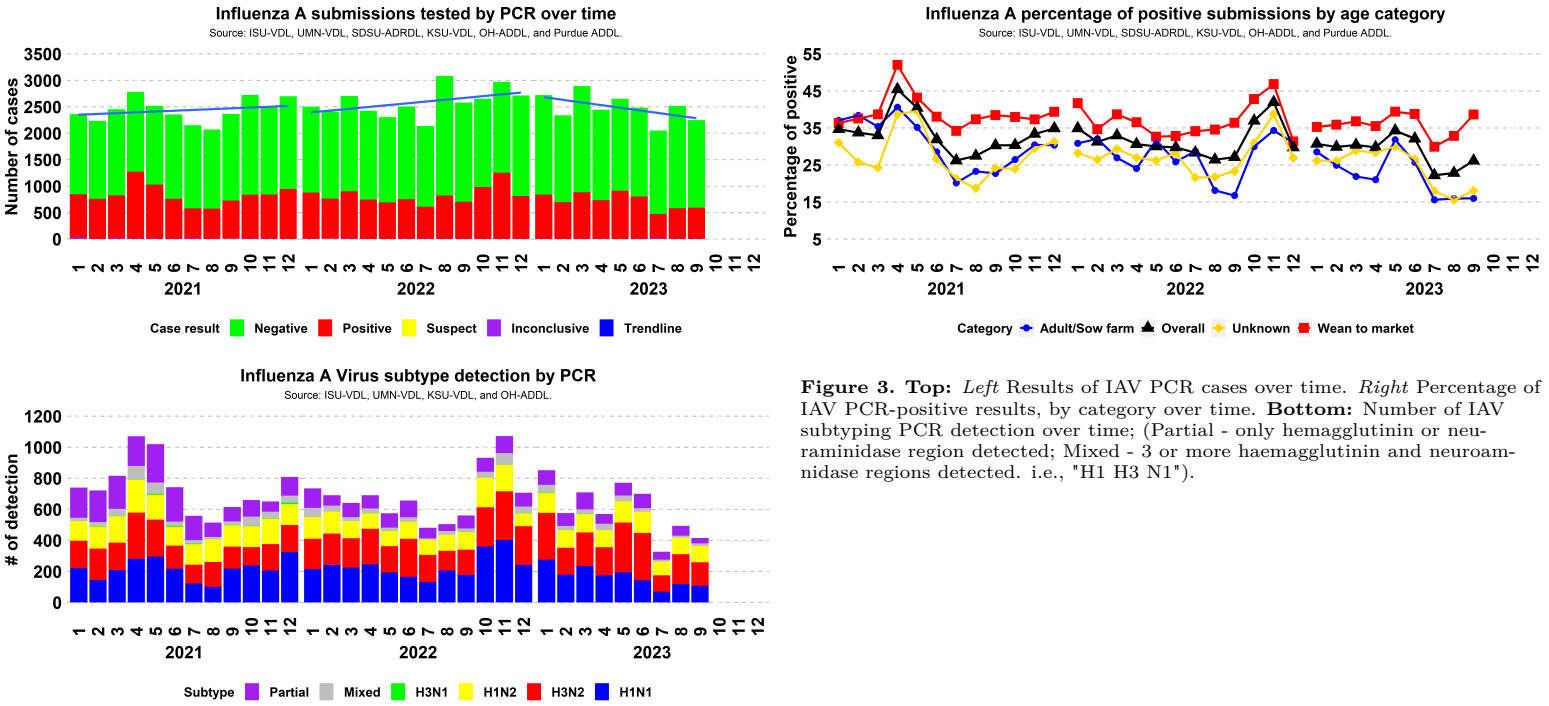


Figure 3. Top: *Left* Results of IAV PCR cases over time. *Right* Percentage of IAV PCR-positive results, by category over time. **Bottom:** Number of IAV subtyping PCR detection over time; (Partial - only hemagglutinin or neuraminidase region detected; Mixed - 3 or more haemagglutinin and neuroamnidase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

SDRS Advisory Group highlights:

- Overall, 26.18% of 2,250 cases tested IAV-positive cases in September, a moderate increase from 22.84% of 2,517 in August;
  - Positivity in the adult/sow category in September was 15.99% (79 of 494), similar to 15.97% (95 of 595) in August;
  - Positivity in the wean-to-market category in September was 38.63% (362 of 937), a substantial increase from 32.85% (343 of 1,044) in August.
- Overall, 4.1% of 415 samples had mixed subtype detection in September, similar to 2.43% of 494 in August;

Topic 6 – Confirmed tissue cases etiologic/disease diagnosis at the ISU-VDL.

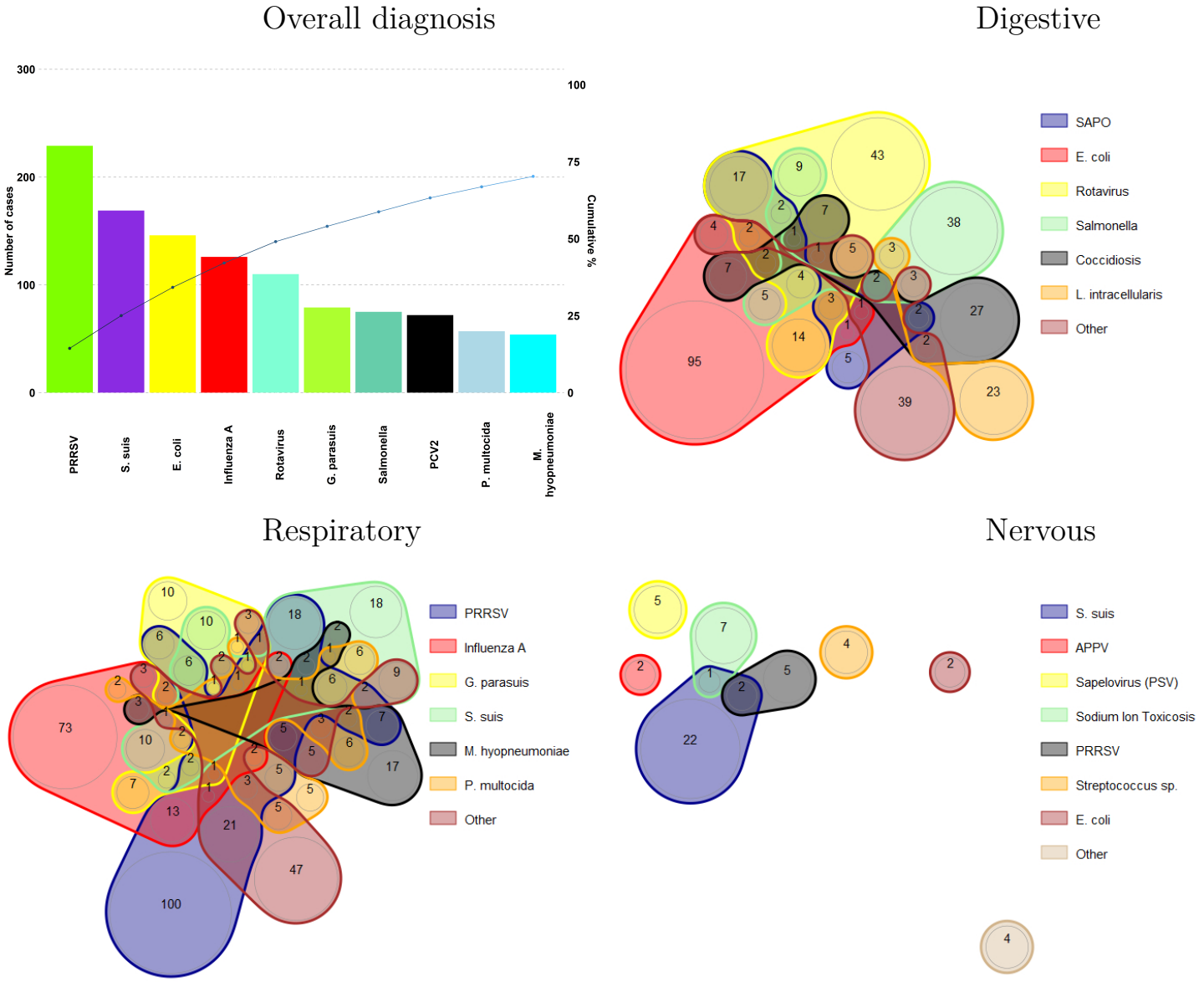


Figure 4. ISU-VDL most frequent overall confirmed tissue disease diagnosis. The presented system is described in the title of the chart. Colors represent one agent; line intersections present diagnosis of 2 or more agents within a submission. Only the most frequent etiology/disease are presented. Less 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, Magstadt, Mainenti, Michael, Piñeyro, Siepker, Madson, Thomas 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 August. 1 to September. 15, 2023.

SDRS Advisory Group highlights:

• PRRSV (229) led cases with confirmed etiology, followed by *S. suis* (169), and *E. coli* (146). PRRSV (208 of 732) led the number of confirmed respiratory diagnoses, *E. coli* (138 of 480) lead the number of confirmed digestive diagnoses, and *S. suis* (25 of 57) led the number of confirmed neurological diagnoses.

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.*

Monitoring Influenza A virus in a breeding herd: which sample type should we test?

Daniel Moraes[1], Phillip Gauger[1], Cesar Moura[1], Isadora Machado[1], Guilherme Cezar[1], Onyekachuco Osemeke[1], Rodrigo Paiva[1], Mafalda Mil-Homens[1], Alex Ramirez[2], Gustavo Silva[1], Daniel Linhares[1].

1 - Iowa State University, Ames, IA, USA. 2 - The University of Arizona, Tucson, AZ, USA.

Background

Defining the sampling plan to detect influenza A virus (IAV) depends on the diagnostic sensitivity of the sample type and the convenience of sample collection. This study compared different sample types on the probability of IAV RNA detection in swine breeding herds. Three breeding herds were screened with pigs in the farrowing room at weaning age (17-21 days) using udder wipes to ensure evidence of IAV circulation before sample collection of FOF within 48 hours of screening. Eligible herds had at least 15 percent (6/35) of udder wipes testing positive. Samples were collected from three rooms (A, B, C) at the selected breeding herd (n=3,500 sows) using 57 matched sets of FOF, udder wipes, nasal wipes from sows, individual nasal wipes of suckling piglets (as a reference sample type), and sow drinker wipes.

Major findings and implications

1. Using piglet nasal wipes as the reference, FOF and udder wipes showed higher IAV detection, and they can be used according to the veterinarian and producer's decision based on the expected within litter prevalence scenarios;

2. Family oral fluids (FOF) were an effective population specimen for IAV detection in the weaning-age litter, as compared to piglet nasal wipes. It had higher PCR positivity and lower Ct values than udder wipes and sow nasal wipes;

3. The proportion of positive piglets within litter differed significantly by room, ranging from 8 to 100 percent within farrowing stalls and 9 to 91 percent within rooms;

4. Sample collection for IAV monitoring should be conducted in different rooms (rooms A, B, C), as there may be significant differences in prevalence;

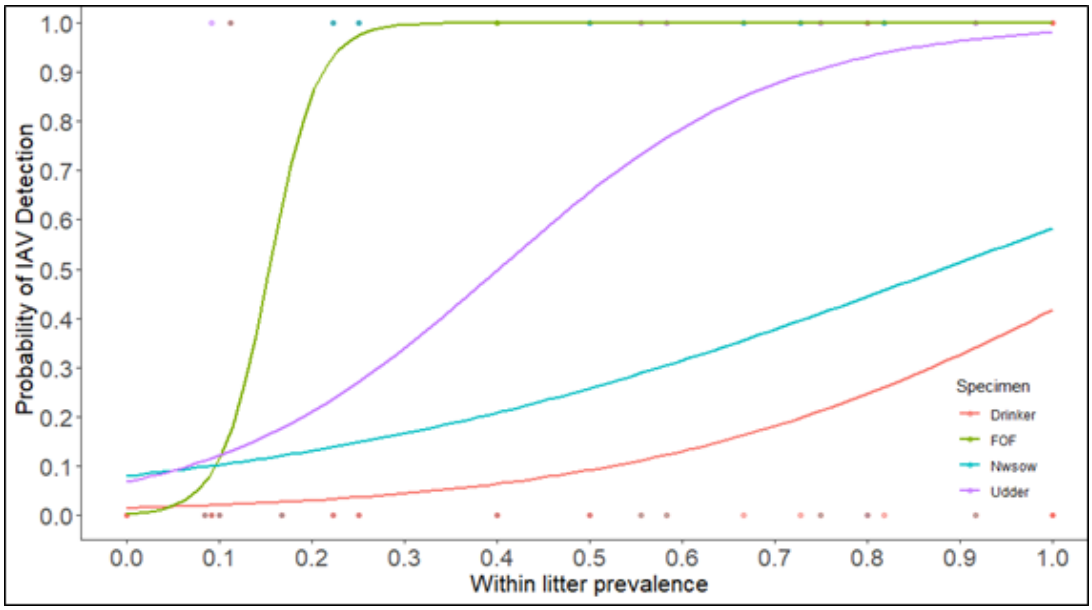


Figure 1. IAV Probability of detection by within litter prevalence by sample type.

5. Sample type should be considered in the breeding herd depending on the prevalence of IAV. FOF presented the highest probability of IAV detection, especially in scenarios of within litter prevalence lower than 25 percent;