Swine Disease Reporting System
Report # 51 (May 3, 2022)

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 USA 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 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, and Kansas State University VDL.

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, Eric Burrough, Phillip Gauger, Pablo Pineyro, Christopher Siepker, Alyona Michael, Panchan Sitthicharoenchai, Rodger Main.

University of Minnesota: Mary Thurn, Paulo Lages, Cesar Corzo, Jerry Torrison.

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 Diagnostic Lab.: Melanie Prarat, William Hennessy, Yan Zhang, 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, USA state, specimen, and age group.

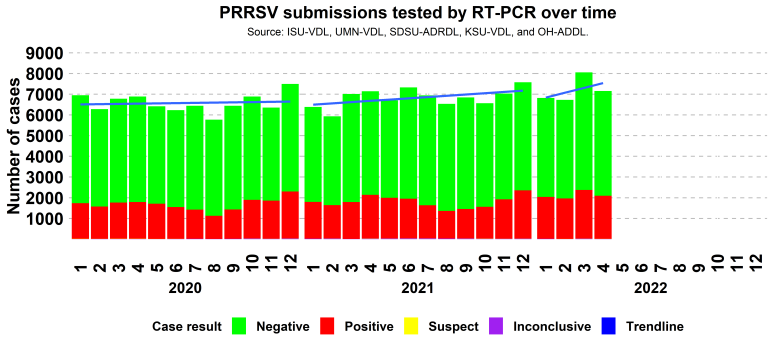
Audio and video reports: Key findings from SDRS projects are summarized monthly in a conversation between investigators, and available in the form of an "audio report", and "video report" through SwineCast, YouTube, LinkedIn, and the SDRS webpage.

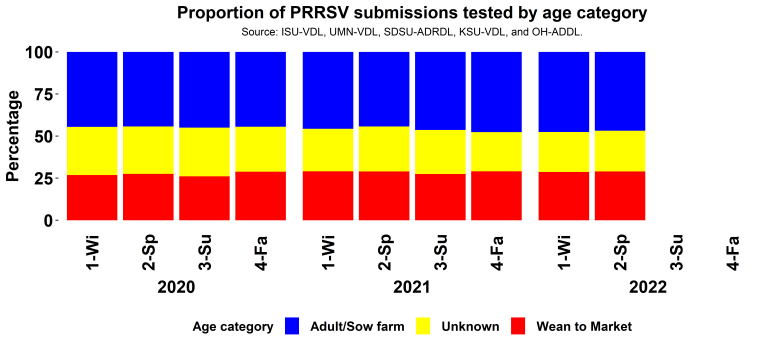
Advisory Group: Reviews and discusses the data, providing their comments and perspectives monthly: Mark Schwartz, Paul Sundberg, Paul Yeske, Tara Donovan, Deborah Murray, Scott Dee, Melissa Hensch, Brigitte Mason, Peter Schneider, Sam Copeland, Luc Dufresne, and Daniel Boykin.

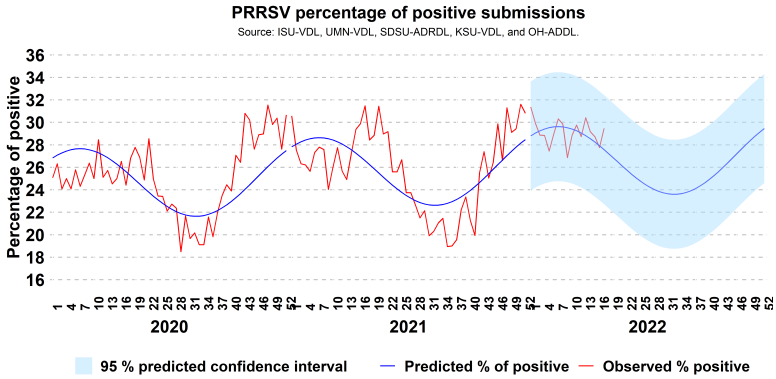
In addition to this report, interactive dashboards with aggregated test results are available at www.fieldepi.org/SDRS.

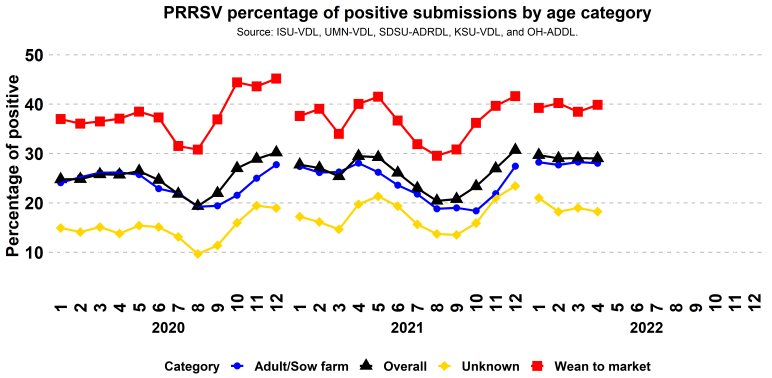
Note: This report contains data up to April 30, 2022.

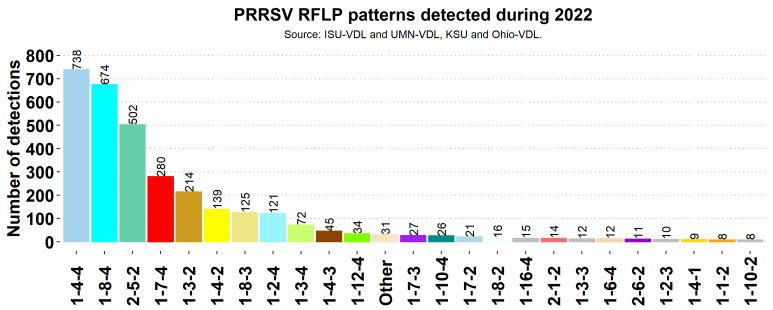
Topic 1 – Detection of PRRSV RNA over time by RT-qPCR.











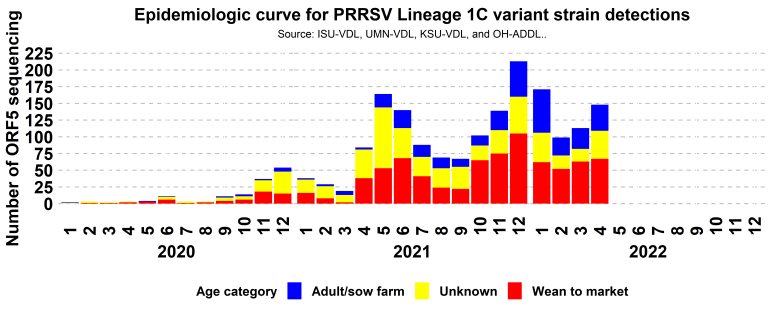


Figure 1. Top: *left*: Results of PRRSV RT-PCR cases over time. *Right*: Proportion of accession ID cases tested for PRRSV by age group per year and season. **Middle**: *Left* expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based 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* are 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, 29.03% of 7,159 cases tested PRRSV-positive in April, similar to 29.06% of 8,055 in March;
  - Positivity in the adult/sow category in April was 28.05% (923 of 3,291), similar to 28.29% (1,084 of 3,832) in March;
  - Positivity in the wean-to-market category in April was 39.87% (828 of 2,077), similar to 38.45% (899 of 2,338) in March;
  - Overall PRRSV-percentage of positive cases was 3 standard deviations from state-specific baselines in NE, IL, IN and MO;
- The overall levels of PRRSV detection during the first quarter of 2022 (January to March) were above those observed during previous years following the 2022 predicted levels of increase in PRRSV detection, potentially indicating more virus circulation in the field;
- The detection of PRRSV strains classified as L1C variant has started to form a new detection wave in April with 144 sequences. The majority of the detections of the PRRSV L1C variant occurred in IA (50%), followed by MN (20.8%) and MO (18.8%). There were also detections in IL, NE, and SD;
- The advisory group highlighted that during April, a transitional period from winter to spring, an increase in PRRSV activity normally occurs. Even though that is the case, there is an encouragement to close monitor PRRSV, reinforcing biosecurity and biocontainment practices due to the relatively high activity of PRRSV with regional outbreaks in sow farms that can contribute to weaning more PRRSV positive piglets and increasing the regional pressure of infection with potential opportunities for lateral transmission and continued virus circulation.

Topic 2 – Enteric coronavirus RNA detection by RT-qPCR

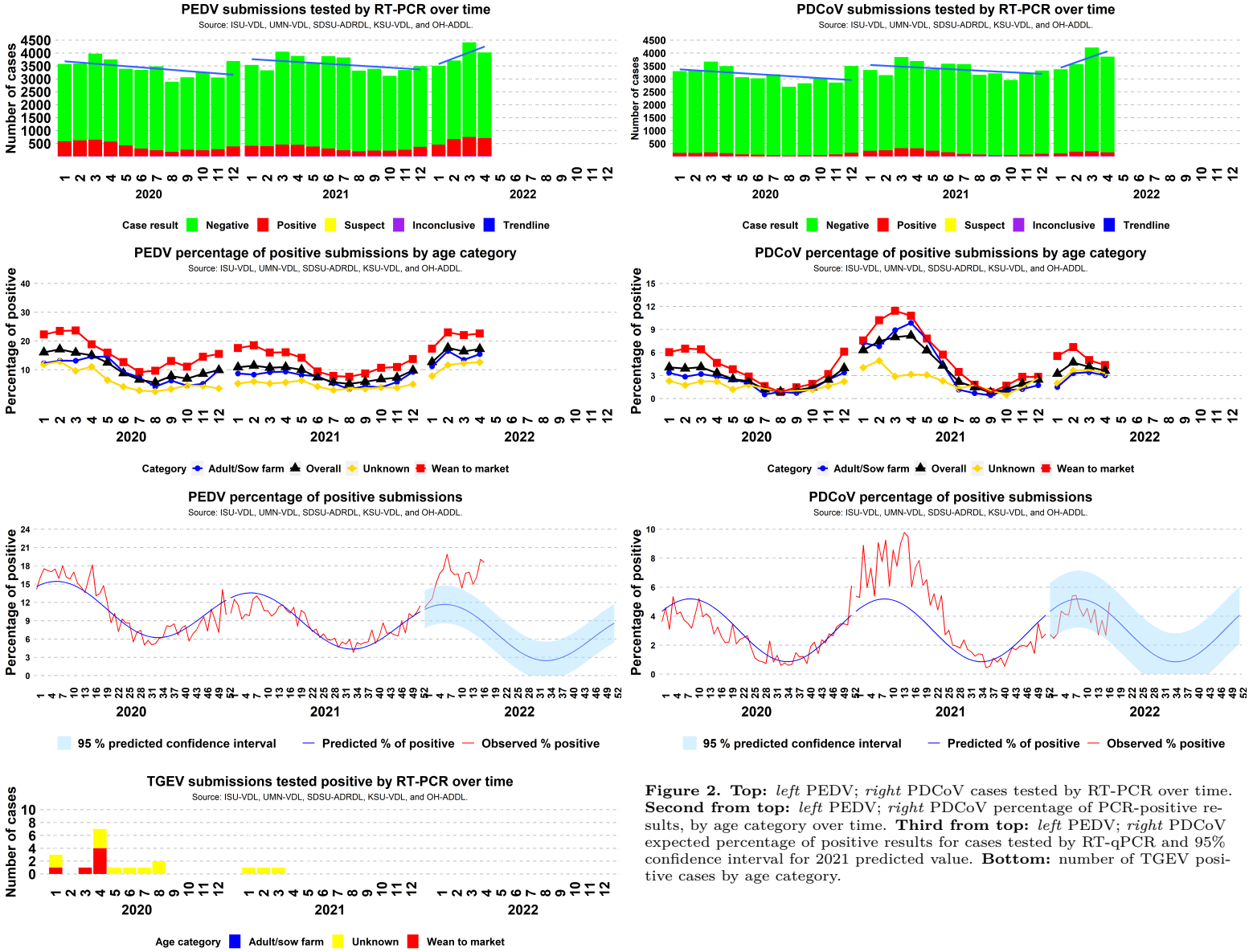


Figure 2. Top: *left* PEDV; *right* PDCoV cases tested by RT-PCR over time. **Second from top:** *left* PEDV; *right* PDCoV percentage of PCR-positive results, by age category over time. **Third from top:** *left* PEDV; *right* PDCoV expected percentage of positive results for cases tested by RT-qPCR and 95% confidence interval for 2021 predicted value. **Bottom:** number of TGEV positive cases by age category.

SDRS Advisory Group highlights:

- Overall, 17.26% of 4,026 cases tested PEDV-positive in April, similar to 16.4% of 4,414 in March;
  - Positivity in the adult/sow category in April was 15.46% (203 of 1,313), similar to 13.47% (195 of 1,448) in March;
  - Positivity in the wean-to-market category in April was 22.59% (338 of 1,496), similar to 22.06% (370 of 1,677) in March;
  - The overall PEDV-percentage of positive cases was 3 standard deviations from state-specific baselines in NC, KS, NE, OK, MN, and IA;
- Overall, 3.63% of 3,862 cases tested PDCoV-positive in April, similar to 4.13% of 4,212 in March;
  - Positivity in the adult/sow category in April was 3.03% (38 of 1,255), similar to 3.44% (47 of 1,366) in March;
  - Positivity in the wean-to-market category in April was 4.38% (63 of 1,440), similar to 5.01% (81 of 1,616) in March;
  - Overall PDCoV-percentage of positive cases was within state-specific baselines in all 10 monitored states;
- There was 0 positive case for TGEV RNA in April, 2022 over a total of 3,742 cases tested;
- The advisory group highlighted that sow farm outbreaks with PEDV have contributed to the current increased levels of PEDV detection and have also contributed to the weaning of positive pigs and downstream activity. Current issues like laboring shortage with sharing across multiple finishing sites, failure in biosecurity protocol execution, failures in cleaning/disinfection of sites and hauling trailers have been favored the additional spread of the agent contributing to farm re-breaks;
- A final reminder was that in 2021 the industry went through PDCoV outbreaks, and a learning experience was that continuous implementation of biosecurity and biocontainment measures are a very important tool to reduce and contain the spread of emerging or re-emerging animal health threats.

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

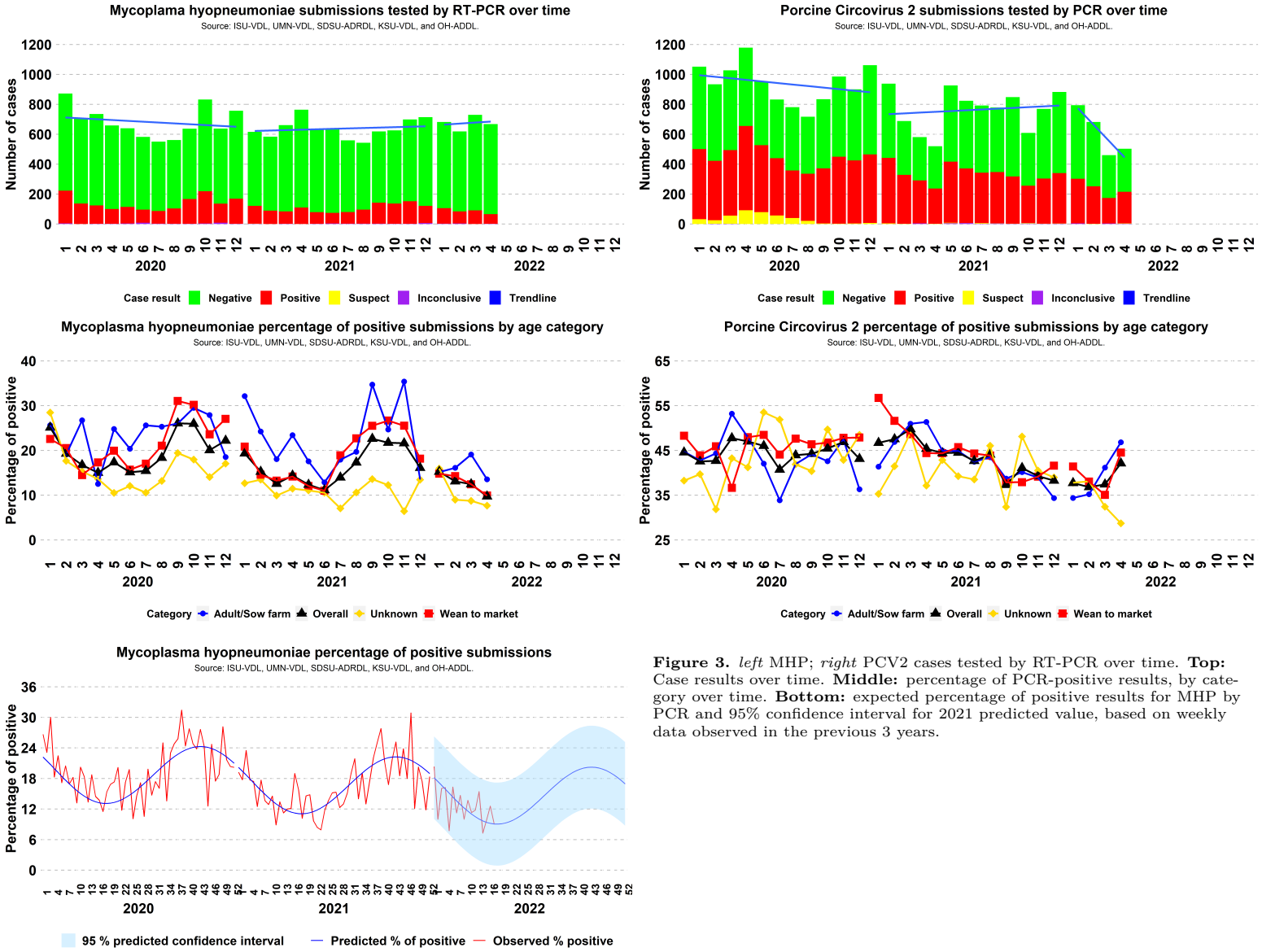


Figure 3. *left* MHP; *right* PCV2 cases tested by RT-PCR over time. **Top:** Case results over time. **Middle:** percentage of PCR-positive results, by category over time. **Bottom:** expected percentage of positive results for MHP by PCR and 95% confidence interval for 2021 predicted value, based on weekly data observed in the previous 3 years.

SDRS Advisory Group highlights:

- Overall, 9.73% of 668 cases tested *M. hyopneumoniae*-positive cases in April, a moderate decrease from 12.47% of 730 in March;
  - Positivity in the adult/sow category in April was 13.54% (13 of 96), a substantial decrease from 19.08% (25 of 131) in March;
  - Positivity in the wean-to-market category in April was 9.92% (36 of 363), a moderate decrease from 12.43% (46 of 370) in March;
  - Overall MHP-percentage of positive was within state-specific baselines in all 11 monitored states;
- Overall, 42.12% of 501 cases tested PCV2-positive in April, a moderate increase from 37.42% of 457 in March;
  - Positivity in the adult/sow category in April was 46.82% (103 of 220), a substantial increase from 41.15% (86 of 209) in March;
  - Positivity in the wean-to-market category in April was 44.51% (77 of 173), a substantial increase from 35.06% (61 of 174) in March;
- The advisory group highlighted that the increased positivity observed in March for adult/sow farms was related to sampling for herd closure and testing exposure/confirmation of gilt acclimation protocols. No major outbreaks or abnormal activity in the field were observed.
- The advisory group highlighted that detection of PCV2 by PCR must be interpreted with caution since a PCR positive does not necessarily indicate disease presence. PCR positive results associated with lower Ct values (around 20 or lower) may be a good indication of clinical disease occurring in the field;
- Currently, 1/3 of PCV2 testing is done using processing fluid samples. The advisory group highlighted that this trend aligns with field observations on the usage of processing fluid for PCV2 testing to monitor sow farm PCV2 activity to support informed decisions on disease management as vaccination protocols;
- SDRS report # 51 bonus page brings a historical perspective of PCV2 detection.

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

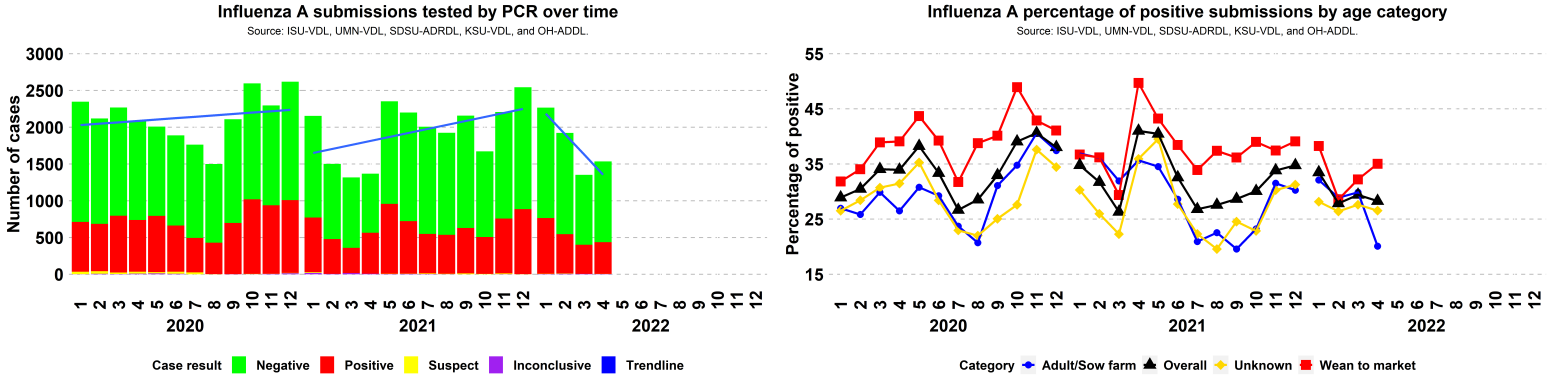
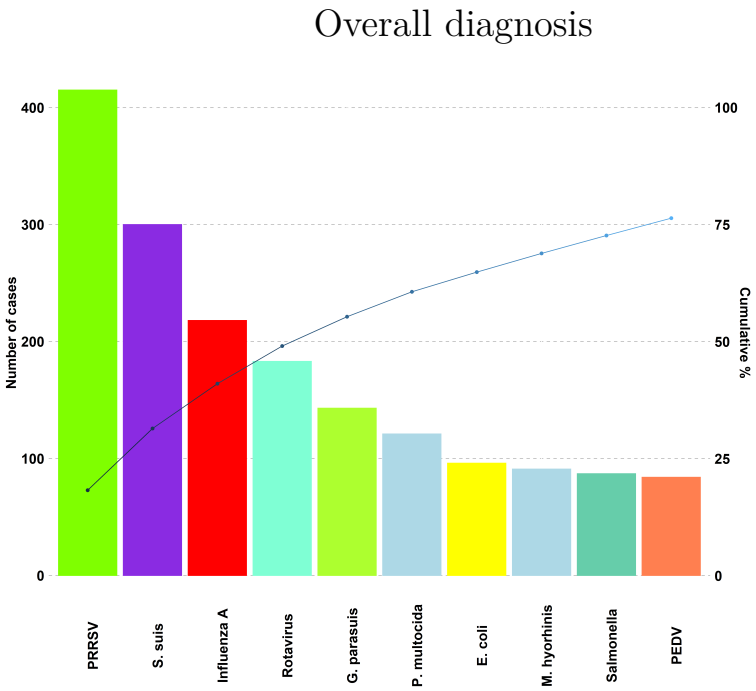


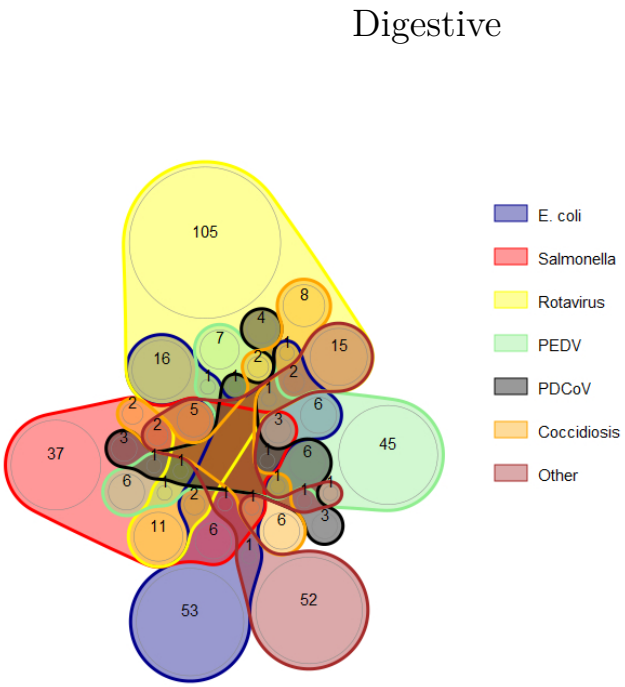
Figure 3. *Left*: results of IAV PCR cases over time. *Right*: percentage of IAV PCR-positive results, by category over time.

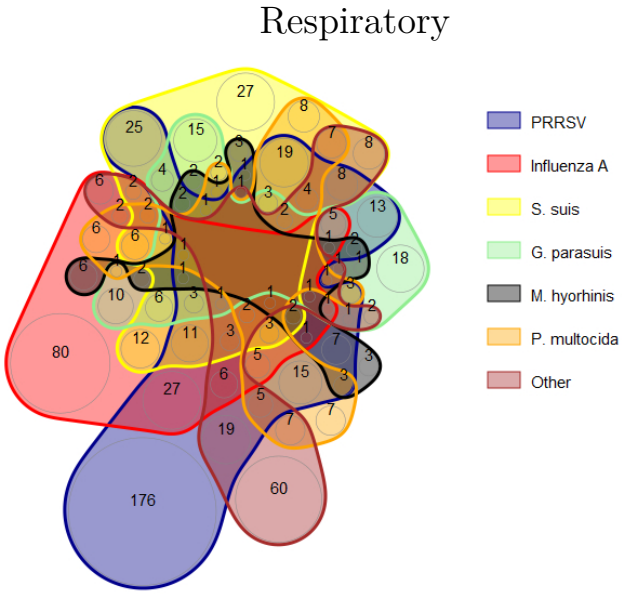
SDRS Advisory Group highlights:

- Overall, 28.28% of 1,531 cases tested IAV-positive cases in April, similar to 29.4% of 1,347 in March;
  - Positivity in the adult/sow category in April was 20.08% (49 of 244), a substantial decrease from 29.87% (46 of 154) in March;
  - Positivity in the wean-to-market category in April was 35.04% (171 of 488), a moderate increase from 32.21% (134 of 416) in March.

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







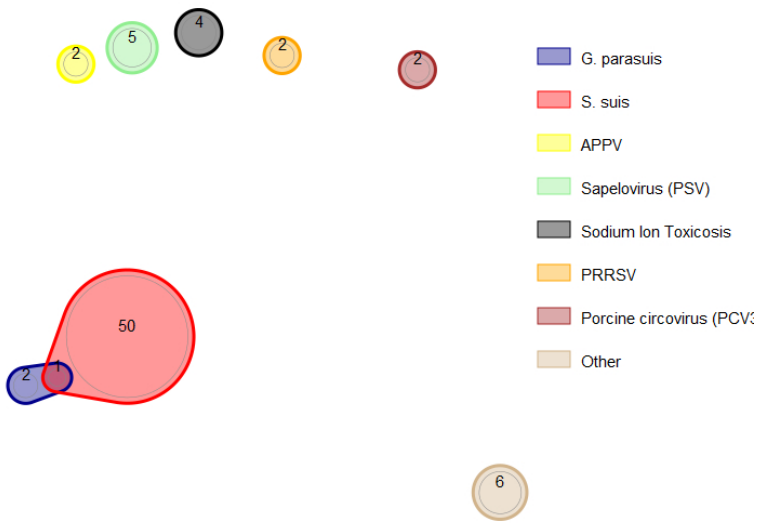


Figure 4. ISU-VDL most frequent overall confirmed tissue disease diagnosis. The presented system is described in the title of the chart. Colors represent one agent. Line intersections present diagnosis of 2 or more agents within a submission. Only the most frequent etiology/disease are presented. Less 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, Harm, Magstadt, Mainenti, Michael, Piñeyro, Rahe, Schumacher, Siepker, Sitthicharoenchai, 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 Mar. 1 to April. 17, 2022.

SDRS Advisory Group highlights:

- PRRSV (37) led cases with confirmed etiology, followed by *S. suis* (36), and Rotavirus (29). PRRSV (389 of 1236) led the number of confirmed respiratory diagnoses, Rotavirus (183 of 574) lead the number of confirmed digestive diagnoses, and *S. suis* (51 of 75) led the number of confirmed neurological diagnoses;
- From March 28 to April 10 there was an increased number of diagnosis for cases classified as cardiovascular-blood-endocrine-immune;
- During March 14 to April 3 there was signal for an increased number of porcine tissue cases diagnosed with Influenza A.

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.*

Information for Porcine Circovirus Type 2 (PCV2) PCR detection is now available on the monthly PDF reports and online SDRS dashboards

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The Swine Disease Reporting System (SDRS) has the goal of sharing 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 a request from our stakeholders, the SDRS brings onboard information for Porcine Circovirus type 2 (PCV2) DNA detection by PCR. Also, it is important to monitor a virus known for different clinical manifestations and which has a key role in the porcine respiratory disease complex. Historical data was fully incorporated, and a new page starting on SDRS report # 51 will bring monthly updates about PCV2 DNA detection. Dashboards are also available on the SDRS webpage under the *PCV2 detection dashboard*. The major highlights for IAV detection are:

Sample type submitted for PCV2 testing over time (Figure 1)

- PCV2 testing using processing fluids samples increased since 2018 and represented 1/3 of the samples used for PCV2 testing in 2020-2021;
- Lung tissue submissions have increased throughout the years. Since 2015 data standardization initiatives across VDLs have contributed to better capturing of sample type information been submitted for testing;
- Oral fluid was the sample type used for about 10% of submissions tested for PCV2 and had an overall percentage of positive submissions of above 60%.

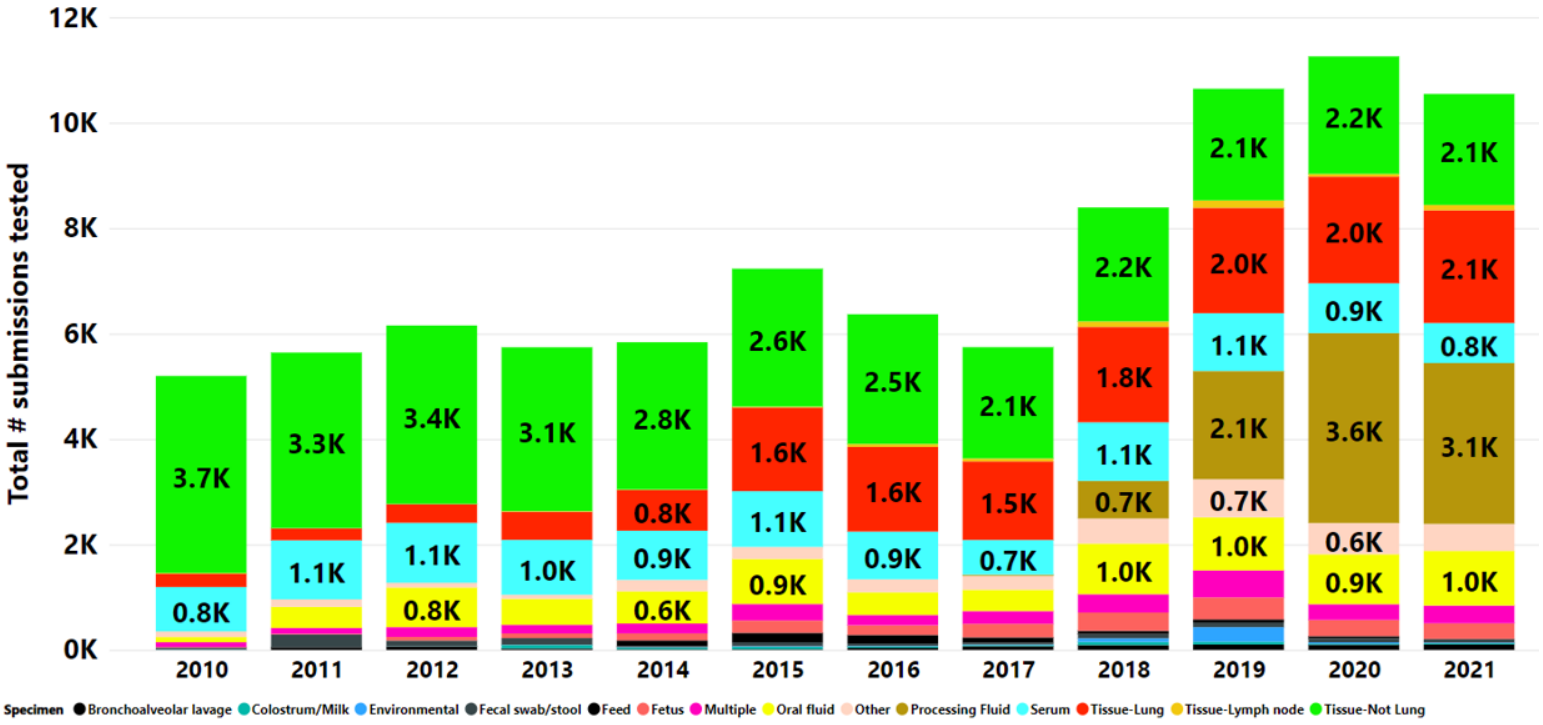

Figure 1: Number of submissions by sample type tested for Porcine Circovirus Type 2 by PCR over time.

Number of cases tested for PCV2 and percentage of positive submissions (Figure 2)

- The number of submissions tested for PCV2 has increased since 2018, as has the percentage of positive submissions;
- Most of the increase in the number of submissions tested for PCV2 has been attributed to testing of processing fluid samples;

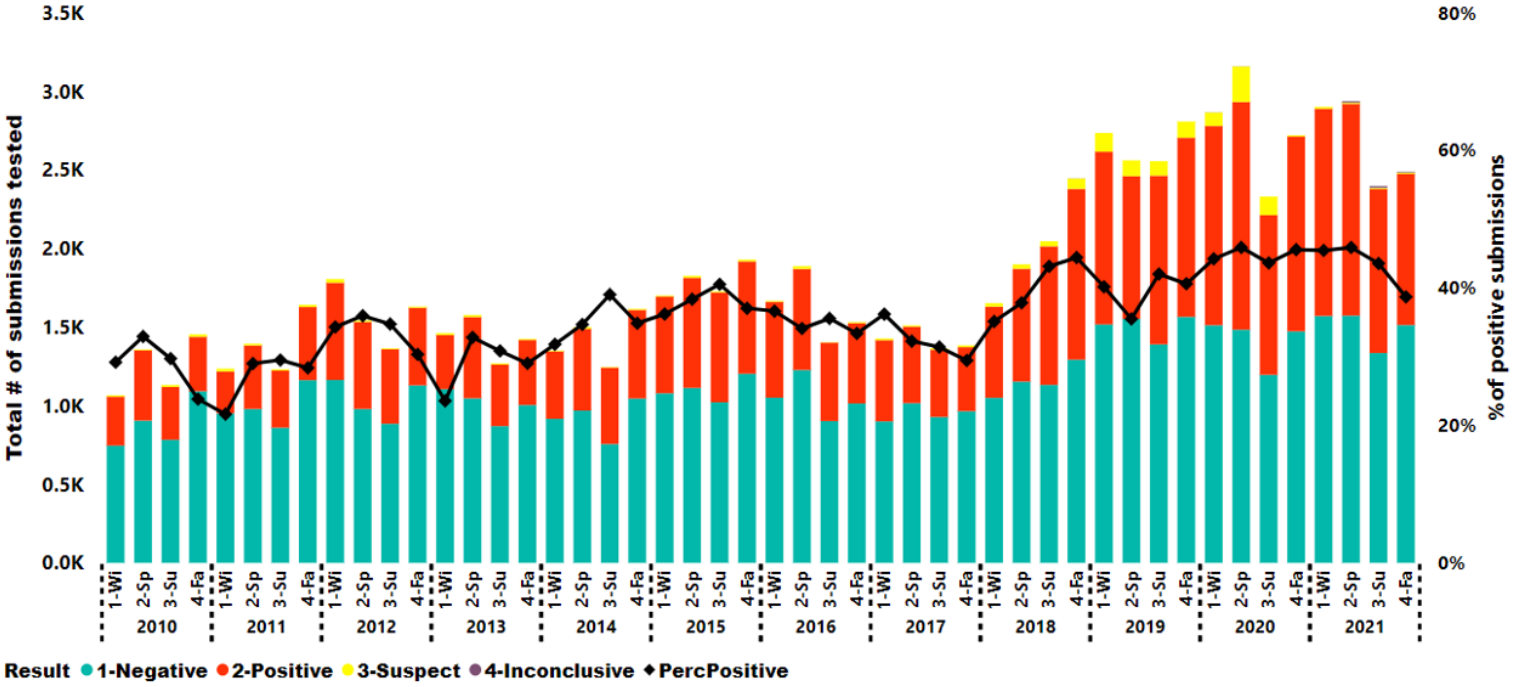

Figure 2: Number of submissions tested for PCV2 DNA by PCR and percentage of positive submissions.

Ct values by sample type (Figure 3)

- The average lowest PCV2 Ct-values for qPCR were from lymph node samples;
- In general, post-mortem samples, i.e., tissue cases, have lower average Ct-values than antemortem samples, e.g., oral fluid or serum.

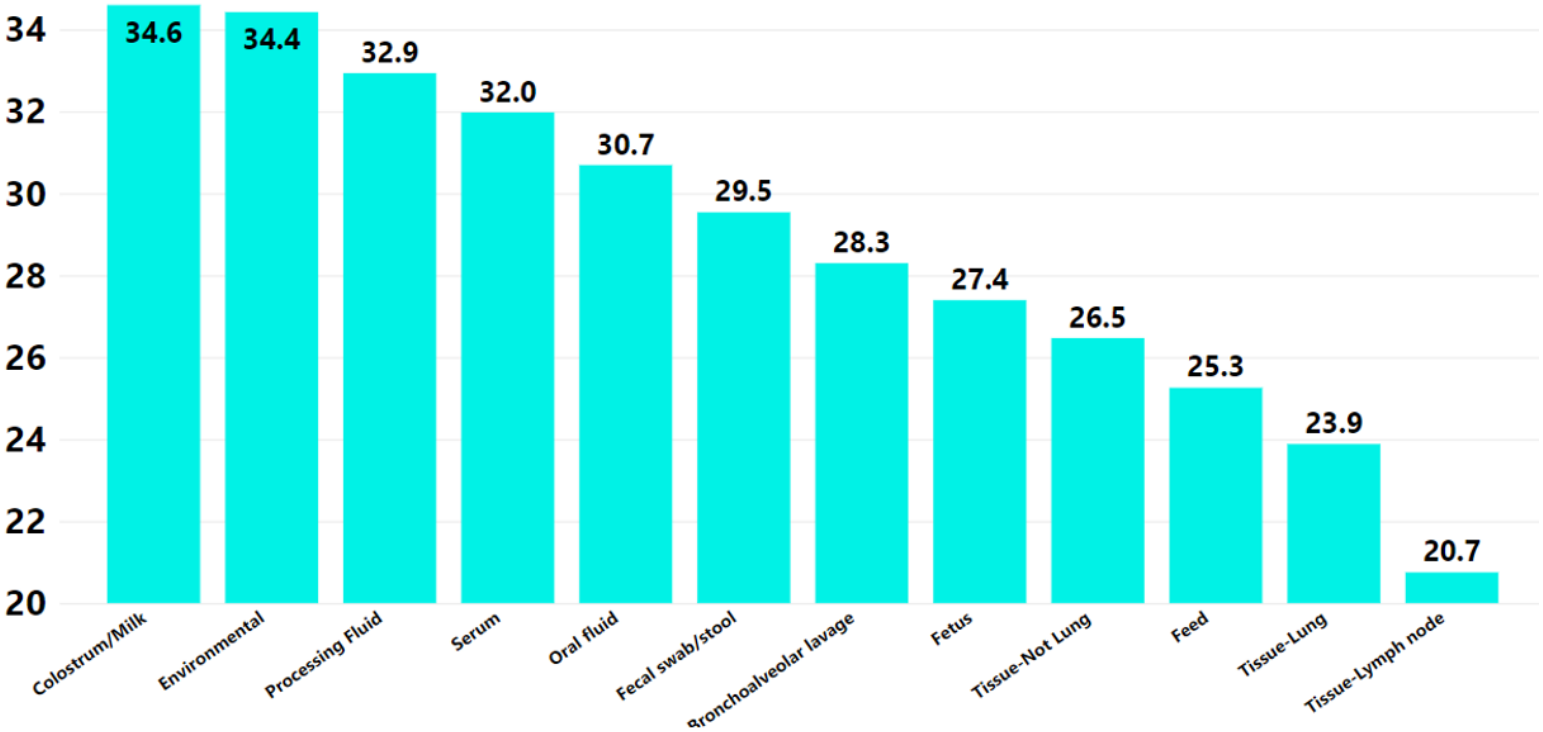

Figure 3: Average qPCR Ct values for PCV2 testing by sample type.