Swine Disease Reporting System
Report # 58 (December 06, 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 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, Eric Burrough, Phillip Gauger, Christopher Siepker, Alyona Michael, Panchan Sitthicharoenchai, 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.

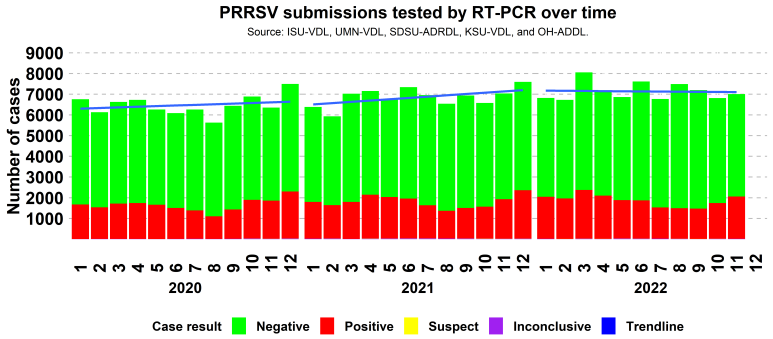
Audio and video reports: Key findings from SDRS projects are summarized monthly in a conversation between investigators and available in the form of an "audio report" and "video report" through Spotify, SwineCast, YouTube, LinkedIn, and the SDRS webpage.

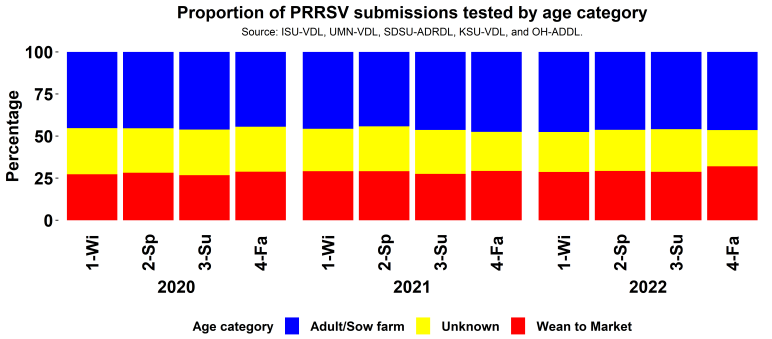
Advisory Group: Reviews and discusses the data, providing their comments and perspectives monthly: Mark Schwartz, Paul Sundberg, Paul Yeske, Tara Donovan, Deborah Murray, Scott Dee, Brigitte Mason, Peter Schneider, Sam Copeland, Luc Dufresne, Daniel Boykin, Corrine Fruge, and William Hollis.

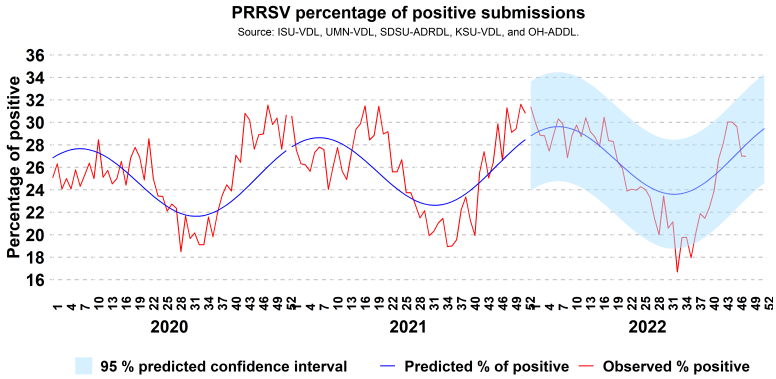
In addition to this report, interactive dashboards with aggregated test results are available at www.fieldepi.org/SDRS.

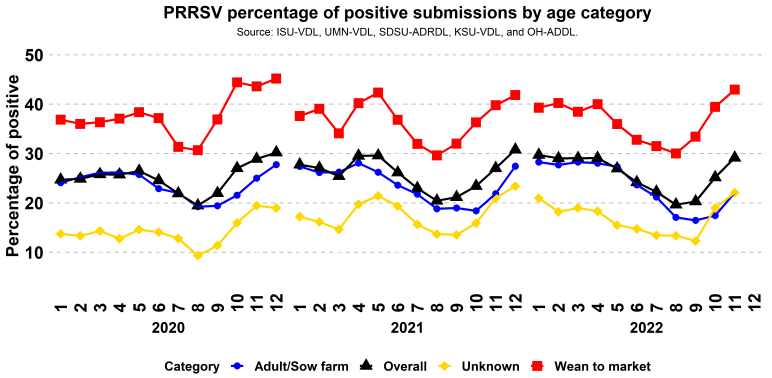
Note: This report contains data up to November 30, 2022.

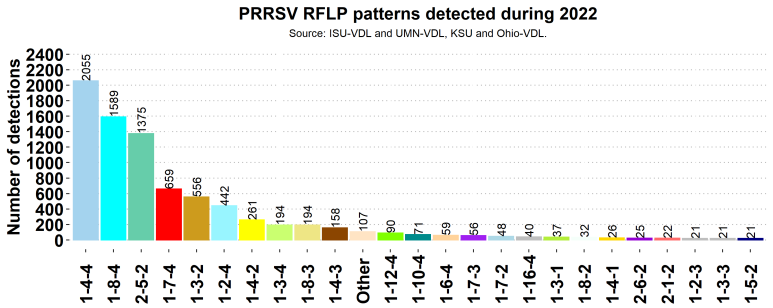
Topic 1 – Detection of PRRSV RNA over time by RT-qPCR.











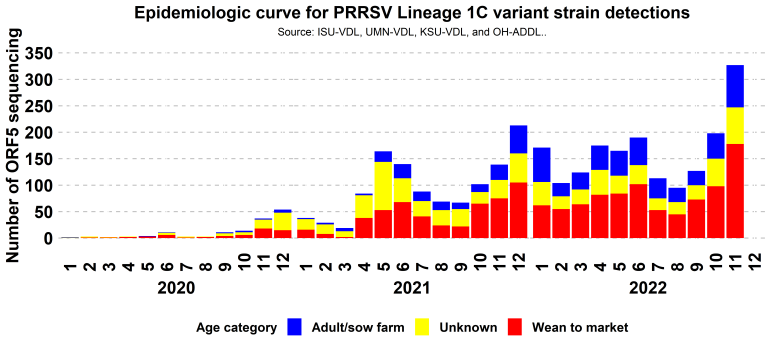


Figure 1. Top: *Left*: Results of PRRSV RT-PCR cases over time; *Right*: Proportion of accession ID cases tested for PRRSV by age group per year and season. **Middle**: *Left* Expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based 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*: 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, 29.15% of 7,006 cases tested PRRSV-positive in November, a moderate increase from 25.17% of 6,813 in October;
- Positivity in the adult/sow category in November was 22.08% (717 of 3,247), a moderate increase from 17.45% (549 of 3,147) in October;
- Positivity in the wean-to-market category in November was 42.94% (1,019 of 2,373), a moderate increase from 39.46% (906 of 2,296) in October;
- Overall PRRSV-percentage of positive cases was 3 standard deviations from state-specific baselines in NE and MO;
- In October and November, the 5 most frequent detected wild-type PRRSV ORF5 sequences were: L1C variant RFLP 1-4-4 (429), L1H RFLP 1-8-4 (174), L1A RFLP 1-7-4 (145), L1C RFLP 1-3-2 (110), and L5 RFLP 2-5-2 (48).
- Since its emergence in 2020, the highest number (333) of PRRSV Lineage 1C variant strains was detected in November 2022. The three states with higher number of detections were Iowa (199), Minnesota (68), Missouri (31).
- The advisory group highlighted that several PRRSV outbreaks occurred in November. Outbreaks have been concentrated in grow-finish sites and had increased lateral outbreaks. High activity of PRRSV in grow-finish sites is increasing the pressure of infection in sow farms. In addition, the advisory group reported breaks in sow farms due to these saturated regions with high PRRSV detection sites.
- The advisory group highlighted that the increased detection of L1C variant RFLP 1-4-4, mainly in Midwest states, put the states East of Mississippi River at high risk of exposure.

Topic 2 – Enteric coronavirus RNA detection by RT-qPCR

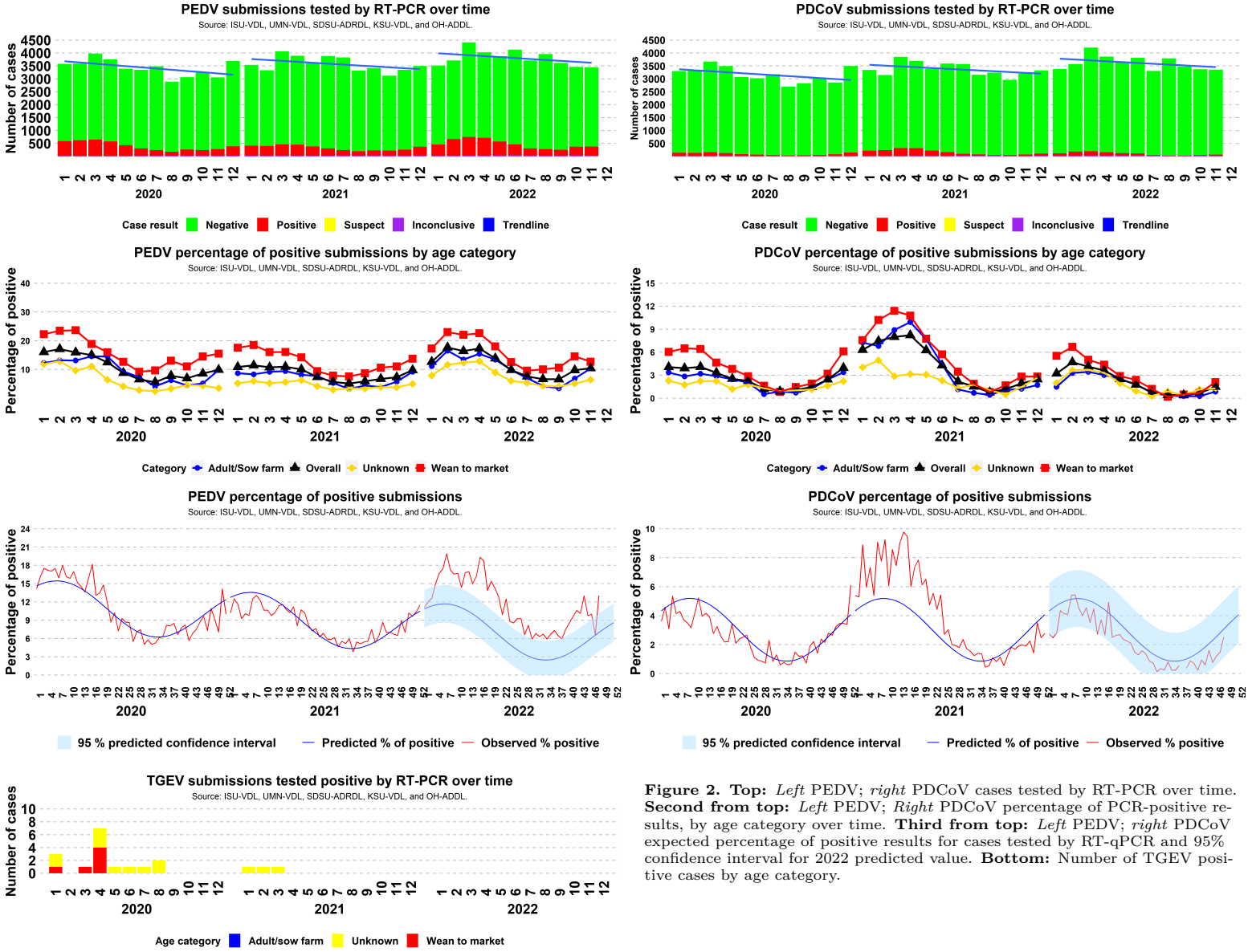


Figure 2. Top: *Left* PEDV; *right* PDCoV cases tested by RT-PCR over time. **Second from top:** *Left* PEDV; *Right* PDCoV percentage of PCR-positive results, by age category over time. **Third from top:** *Left* PEDV; *right* PDCoV expected percentage of positive results for cases tested by RT-qPCR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

SDRS Advisory Group highlights:

- Overall, 10.43% of 3,443 cases tested PEDV-positive in November, similar to 9.76% of 3,464 in October;
- Positivity in the adult/sow category in November was 10.39% (123 of 1,184), a moderate increase from 6.85% (79 of 1,153) in October;
- Positivity in the wean-to-market category in November was 12.7% (184 of 1,449), similar to 14.57% (217 of 1,489) in October;
- The overall PEDV-percentage of positive cases was 3 standard deviations from state-specific baselines in IA, KS, MO and NC;
- Overall, 1.49% of 3,356 cases tested PDCoV-positive in November, similar to 0.65% of 3,372 in October;
- Positivity in the adult/sow category in November was 0.87% (10 of 1,156), similar to 0.27% (3 of 1,116) in October;
- Positivity in the wean-to-market category in November was 2.1% (30 of 1,428), similar to 0.68% (10 of 1,465) in October;
- 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 November, 2022 over a total of 3,236 cases tested;
- PEDV percentage of positive submissions had a sharp increase in the week 49 (November 28th) with 14,24% of submissions being positive, raising a concern for the upcoming winter.

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

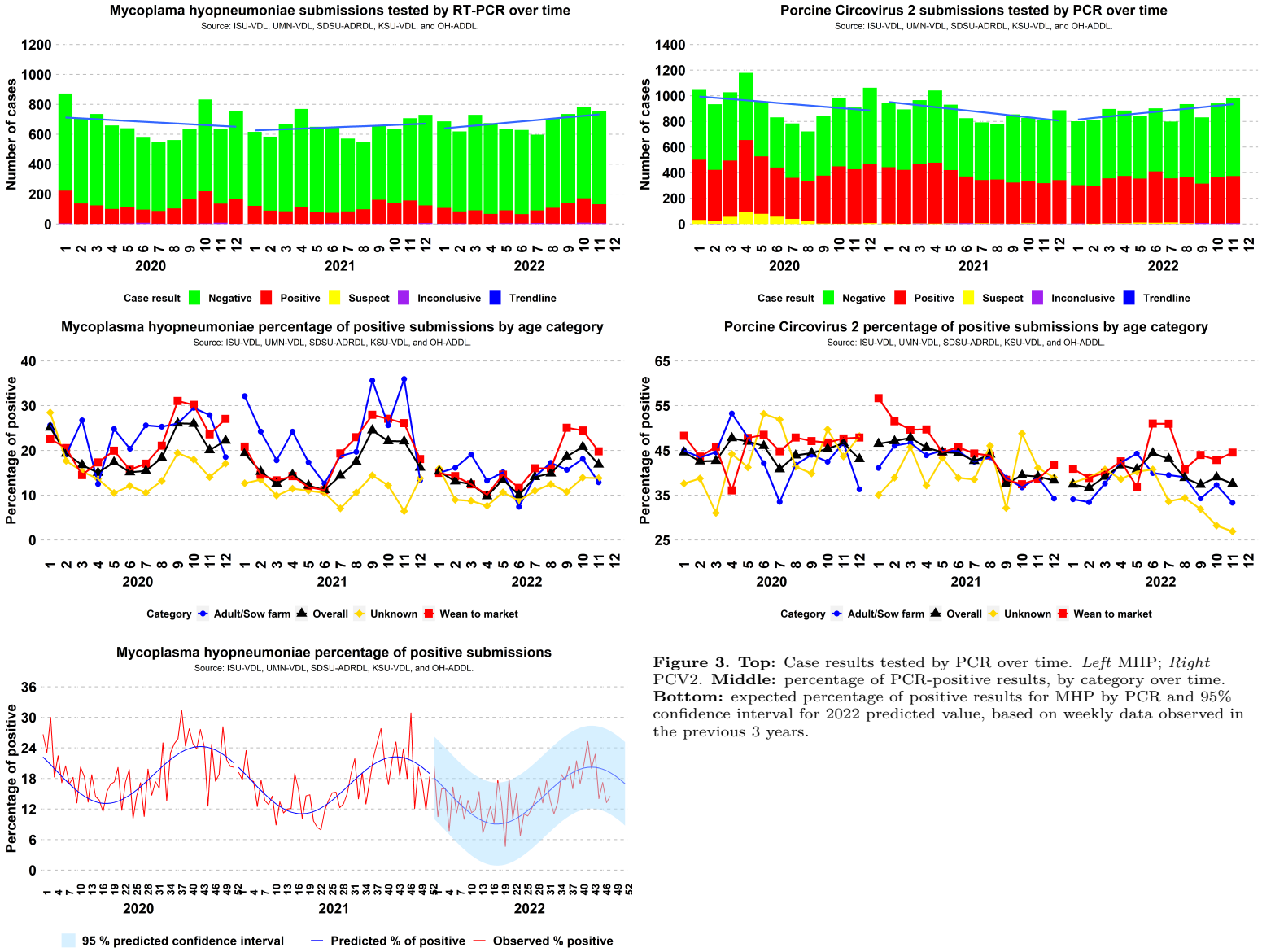
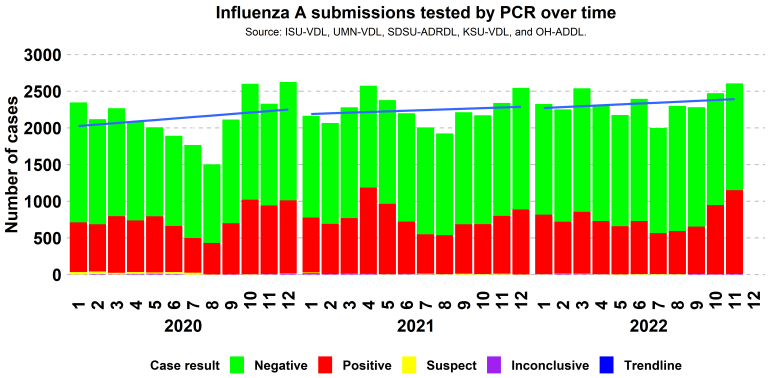


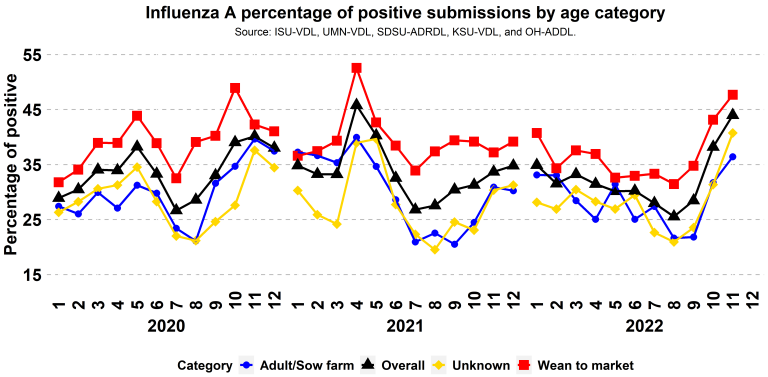
Figure 3. Top: Case results tested by PCR over time. *Left* MHP; *Right* PCV2. **Middle:** percentage of PCR-positive results, by category over time. **Bottom:** expected percentage of positive results for MHP by PCR and 95% confidence interval for 2022 predicted value, based on weekly data observed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

SDRS Advisory Group highlights:

- Overall, 16.87% of 753 cases tested *M. hyopneumoniae*-positive cases in November, a moderate decrease from 20.82% of 783 in October;
- Positivity in the adult/sow category in November was 12.88% (17 of 132), a substantial decrease from 18.11% (23 of 127) in October;
- Positivity in the wean-to-market category in November was 19.8% (80 of 404), a moderate decrease from 24.46% (113 of 462) in October;
- Overall MHP-percentage of positive was within state-specific baselines in all 11 monitored states;
- Overall, 37.55% of 980 cases tested PCV2-positive in November, similar to 39.02% of 938 in October;
- Positivity in the adult/sow category in November was 33.33% (149 of 447),a moderate decrease from 37.27% (164 of 440) in October;
- Positivity in the wean-to-market category in November was 44.52% (191 of 429), similar to 42.86% (180 of 420) in October;

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





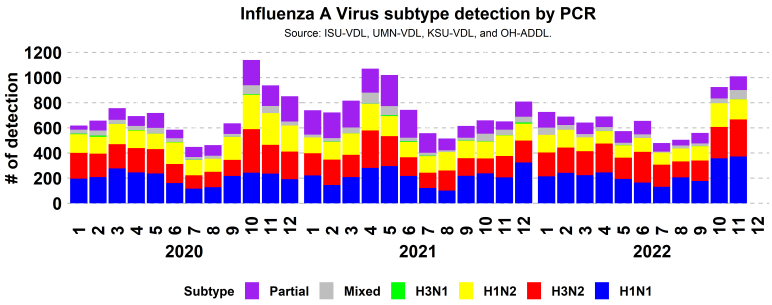


Figure 3. Top: *Left* Results of IAV PCR cases over time. *Right* Percentage of IAV PCR-positive results, by category over time. **Bottom:** Number of IAV subtyping PCR detection over time; (Partial - only hemagglutinin or neuraminidase region detected; Mixed - 3 or more haemagglutinin and neuroamnidase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

SDRS Advisory Group highlights:

- Overall, 43.98% of 2,601 cases tested IAV-positive cases in November, a substantial increase from 38.2% of 2,471 in October;
- Positivity in the adult/sow category in November was 36.42% (169 of 464), a moderate increase from 31.72% (144 of 454) in October;
- Positivity in the wean-to-market category in November was 47.68% (700 of 1,468), a moderate increase from 43.14% (610 of 1,414) in October.
- Overall, 7.23% of 1,010 samples were mixed subtype detection in November, a moderate increase from 4.11% of 924 in October;
- The advisory group highlighted that increased number of Influenza A virus outbreaks occurred in wean-to-finish sites and sow farms with reports of multiple strains circulating in the same site.
- In addition, the stress of manure pumping affects the ventilation dynamics of sites, and when shedding animals are present, the contamination of other animals is facilitated. The manure pumping season was also reported as a factor contributing to the increase the regional pressure of infection and increasing the likelihood of lateral breaks.
- The advisory group highlighted that the increased occurrence of Influenza A virus and PRRSV as primary pathogens in prodcution systems contribute to the increased number of confirmed tissue diagnosis of *Streptococcus suis*, *Pasteurella multocida*, and *Glaesserella parasuis* (Page 6).

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

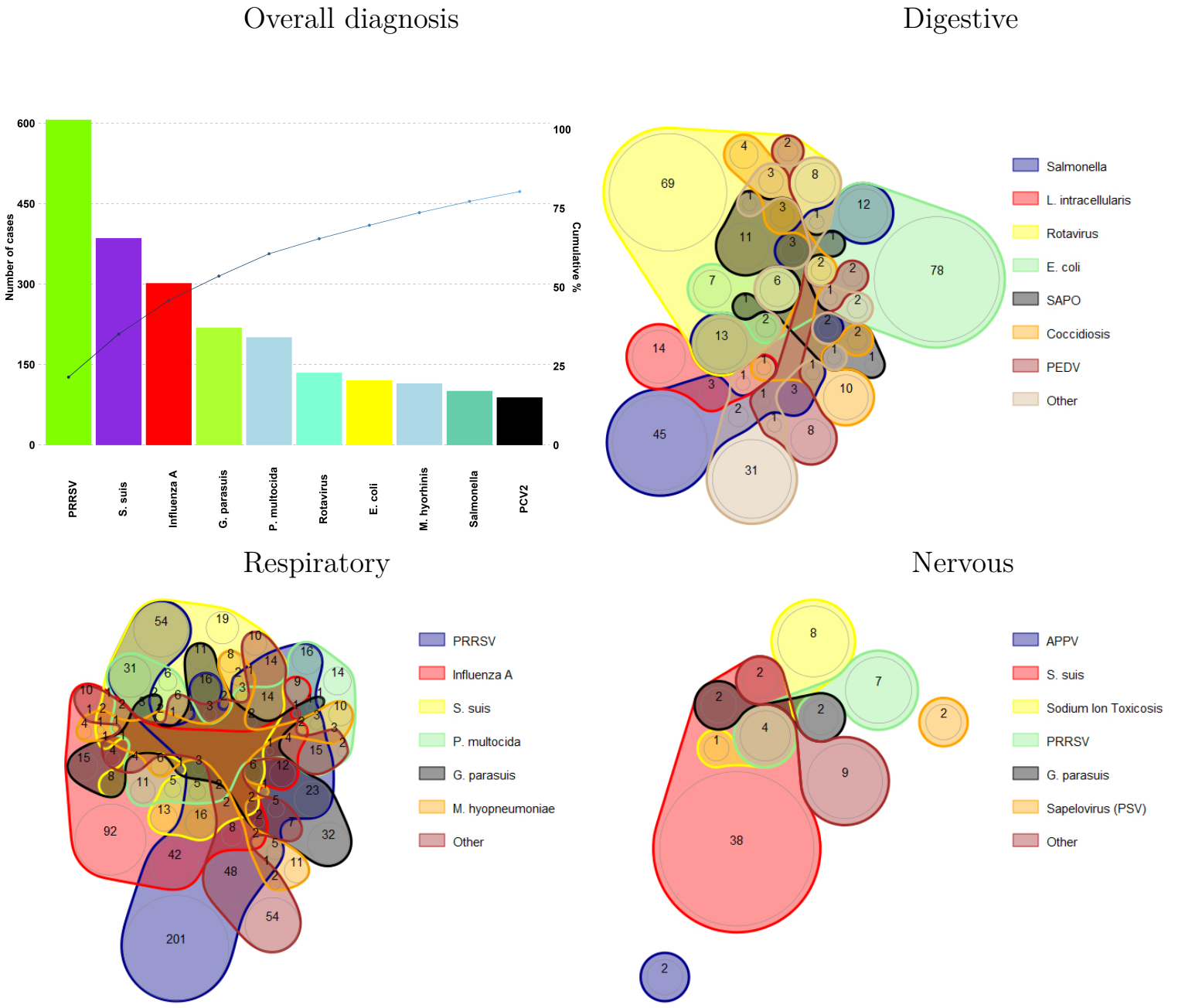


Figure 4. ISU-VDL most frequent overall confirmed tissue disease diagnosis. The presented system is described in the title of the chart. Colors represent one agent; line intersections present diagnosis of 2 or more agents within a submission. Only the most frequent etiology/disease are presented. Less 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 October. 1 to November. 21, 2022.

SDRS Advisory Group highlights:

• PRRSV (606) led cases with confirmed etiology, followed by *S. suis* (385), and Influenza A (301). PRRSV (581 of 1852) led the number of confirmed respiratory diagnoses, *Rotavirus* (134 of 488) lead the number of confirmed digestive diagnoses, and *S. suis* (47 of 86) led the number of confirmed neurological diagnoses.

• During October 3rd to November 18th, there were spikes in the number of respiratory, systemic, nervous, urogenital and musculoskeletal confirmed diagnoses; In the same period, occurred spikes of *S.suis*, *M. hyorhinis*, Influenza A, *A. suis*, and *P. multocida*.

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.*

Assessment of temperature and holding times to inactivate PRRSV and PEDV on contaminated surfaces commonly found in supply entry rooms in swine farms

Mafalda Mil-homens[1], Ethan Aljets[1], Rodrigo Paiva[1], Isadora Machado[1], Guilherme Cezar[1], Onyekachukwu Osemeke[1], Daniel Moraes[1], Swaminathan Jayraman[1], Mckenna Brinning[1], Lauren Tidgren[1], Madison Brinning[1], Mallory Wilhelm[1], Jolie Frenier[1], Vivian Flores[1], Daniel Linhares[1], Jianqiang Zhang[1], Derald Holtkamp[1], Gustavo Silva[1]
1 - Iowa State University, Ames, Iowa, USA.

Introduction

Swine production systems have a lot of materials and tools entering farms, being transferred from one farm to another, and that increases the possibility of disease introduction in swine farms through fomites. The use of disinfectants has been established in supply entry rooms in swine farms, mainly through fogging. Although this method is commonly used, it was shown that its efficacy decreases with the presence of organic matter or with blind spots. An alternative to the use of disinfectants is using time and temperature combinations, therefore, the main goal of this study is to assess the efficacy of time and temperature combinations in Porcine Reproductive and Respiratory syndrome virus (PRRSV) and Porcine Epidemic Diarrhea virus (PEDV) on different surfaces that are commonly found in supply entry rooms in swine farms.

Materials and Methods

Two different surfaces (aluminum and cardboard), four temperatures (68oF, 86oF, 104oF, and 122ºF), and six time-settings (15 minutes, 60 minutes, 6 hours, 12 hours, 24 hours, and 36 hours), PRRSV MN184 and 1-4-4 L1C variant, and the NC46469/2013 PEDV isolates were used in the trial. Each treatment and negative controls had three replicates. The surfaces were held for the designated contact times after the surface reached the desired temperature. Thermometers with thermocouples were used to control the temperatures during the trial. After virus recovery a virus titration followed by immunofluorescent staining were done and the cytopathic effect was observed. Linear models were built for each combination of virus, surface and temperature and half-lives were also calculated.

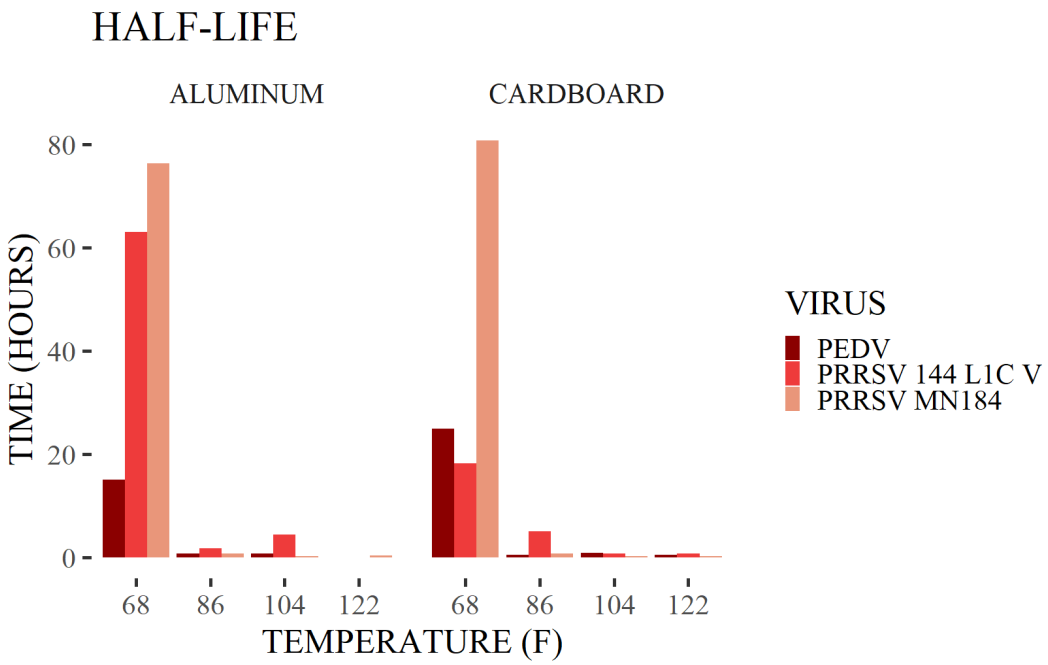


Figure 1. Half-life, or the time required for the virus quantity to reduce to half of its initial value of log10TCID50/ml. for PRRSV MN184, PRRSV 144 L1C Variant and PEDV for aluminum and cardboard at different temperatures (68ºF, 86ºF, 104ºF and 122ºF).

Major findings and implications

1. Aluminum surfaces took longer to reach the desired temperature;
2. Half-lives results suggests that there is a difference between PRRSV isolates because PRRSV 144 L1C variant had higher half-lives at higher temperatures than PRRSV MN184;
3. Virus was detected after 36 hours at 68ºF;
4. Although this was a controlled trial it provides practical information that can be applied in field conditions. Therefore, the minimum time that surfaces should be held at 86ºF is 24 hours, at 104ºF is 12 hours and at 122ºF is 6 hours;
5. To apply combinations of time and temperature to decrease virus concentration on surfaces, the type of material, size of the surface, the supply entry room insolation and size of the room should be considered.