Swine Disease Reporting System:
Overview

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Report 18 (August 6, 2019)

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 endemic and emerging diseases affecting the swine population in the USA, assisting veterinarians and producers to make informed decisions on disease prevention, detection and management.

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

Swine Health Information Center (SHIC)-funded Domestic Disease Surveillance Program: collaborative project among multiple VDLs, with the goal to aggregate swine diagnostic data and report in an intuitive formats (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:

Iowa State University: Giovani Trevisan*, Edison Magalhães, Leticia Linhares, Bret Crim, Poonam Dubey, Kent Schwartz, Eric Burrough, Phillip Gauger, Rodger Main, Daniel Linhares**.

* Project coordinator (trevisan@iastate.edu). ** Principal investigator (linhares@iastate.edu).

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

Kansas State University: Rob McGaughey, Eric Herrman, Gregg Hanzlicek, Douglas Marthaler, Jamie Henningson.

South Dakota State University: Shivali Gupta, Jon Greseth, Travis Clement, Jane C. Hennings.

Disease Diagnosis System: This is a pilot program with the ISU VDL, which consists of reporting *disease detection* (not just pathogen detection by PCR), based on diagnostic codes assigned by veterinary diagnosticians.

FLUture: This is a project that aggregates *Influenza A virus (IAV) diagnostic data* from the ISU VDL, including test results, metadata, and sequences.

PRRS virus RFLP report: Benchmarks patterns of PRRSV RFLP type detected at the ISU VDL over time, USA state, specimen, and age group.

Audio and video reports: Key findings are summarized monthly in a conversation between investigators, and available in form of an audio report and video report though YouTube.

Advisory Council:

The advisory group reviews the data to discuss it and provide their comments to try to give the data some context and thoughts about its interpretation: Clayton Johnson, Emily Byers, Mark Schwartz, Paul Sundberg, Paul Yeske, Rebecca Robbins, Tara Donovan, Deborah Murray, Scott Dee, Melissa Hensch.

This report is an abbreviated version of the content available online at www.fieldepi.org/SDRS.

Swine Disease Reporting System:
Domestic Disease Monitoring Report

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

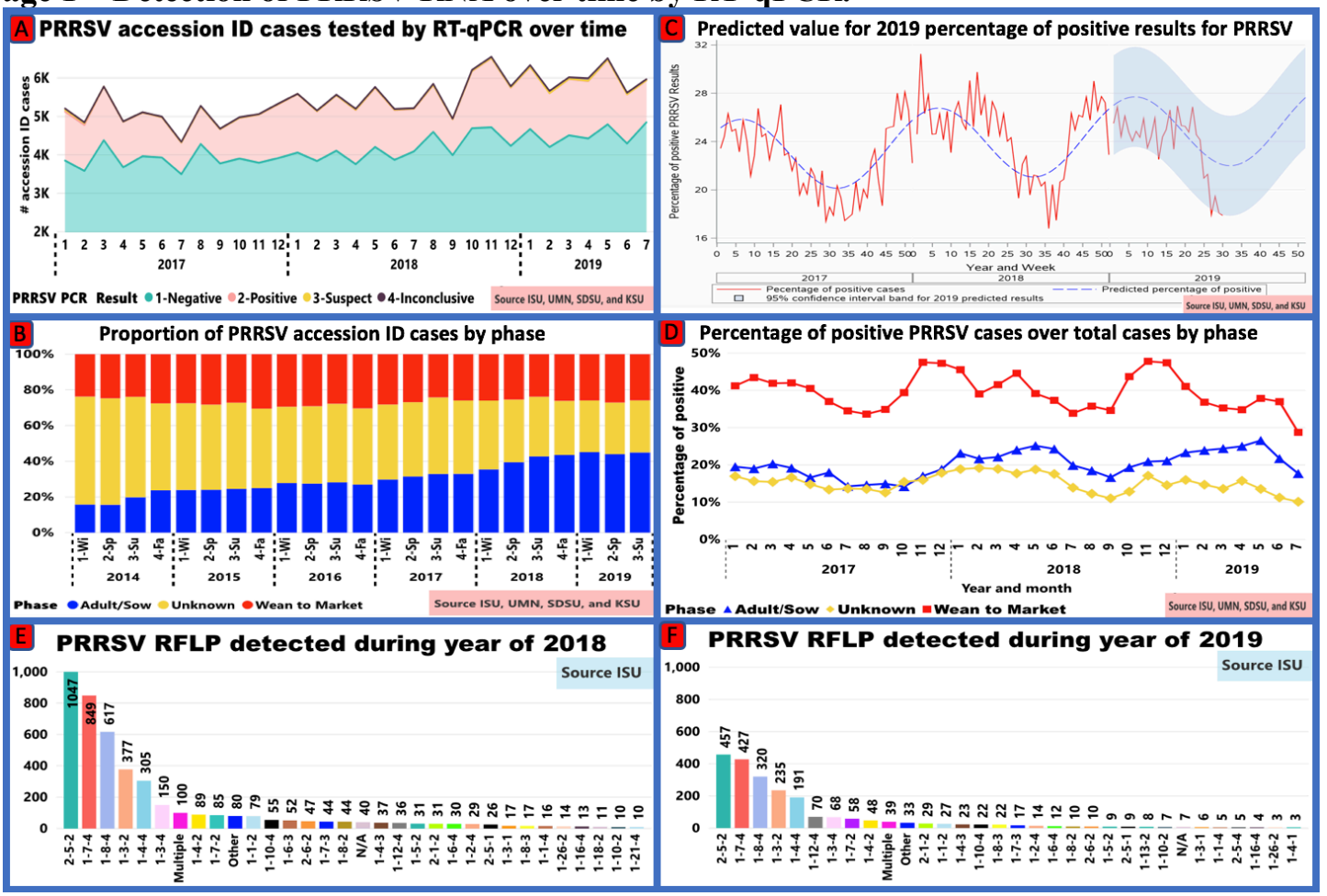

Figure 1. A: Results of PRRS RT-qPCR cases over time. **B**: Proportion of accession ID cases tested for PRRSV by age group per year and season. **C**: expected percentage of positive results for PRRSV RNA by RT-qPCR, with 95% confidence interval band for predicted results based on weekly data observed in the previous 3 years. **D**: percentage of PRRS 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. **E**: RFLP type detected during year of 2019. **F**: RFLP type detected during year of 2018. RFLPs indicated as N/A represents not detected, or European PRRSV type.

SDRS Advisory Council highlights:

- During July the PRRSV activity was at the lower boundaries for the predicted value for 2019;
- The percentage of positive cases coming from age category wean-to-market in July was at 28.75%. This results was the lowest since July of 2015 when it was at 28.19%;
- During July the percentage of positive cases coming from the age category adult/sow was at the lowest level of detection for the year of 2019 at 17.68%;
- Multiple factors were pointed by the Advisory Council as potential contributors for the lower detection of PRRSV in 2019: a) Better compliance on biosecurity protocols; b) Increased herd immunity and lower number of sow farms breaking with PRRSV generated a lower number of PRRSV-positive grower pigs; c) Increased adoption, during recent years, of the air filtration technology for the farms; d) Increasing use of feed additives as mitigant to reduce the spread of enteric coronaviruses may have contributed to reducing the risk of PRRSV spread via feed ingredients/delivery; e) Increased number of sows and piglets receiving modified-live virus vaccines, leading to a reduction of pressure of infection of wild-type PRRSv.

Page 2 – Detection of enteric coronaviruses by RT-qPCR

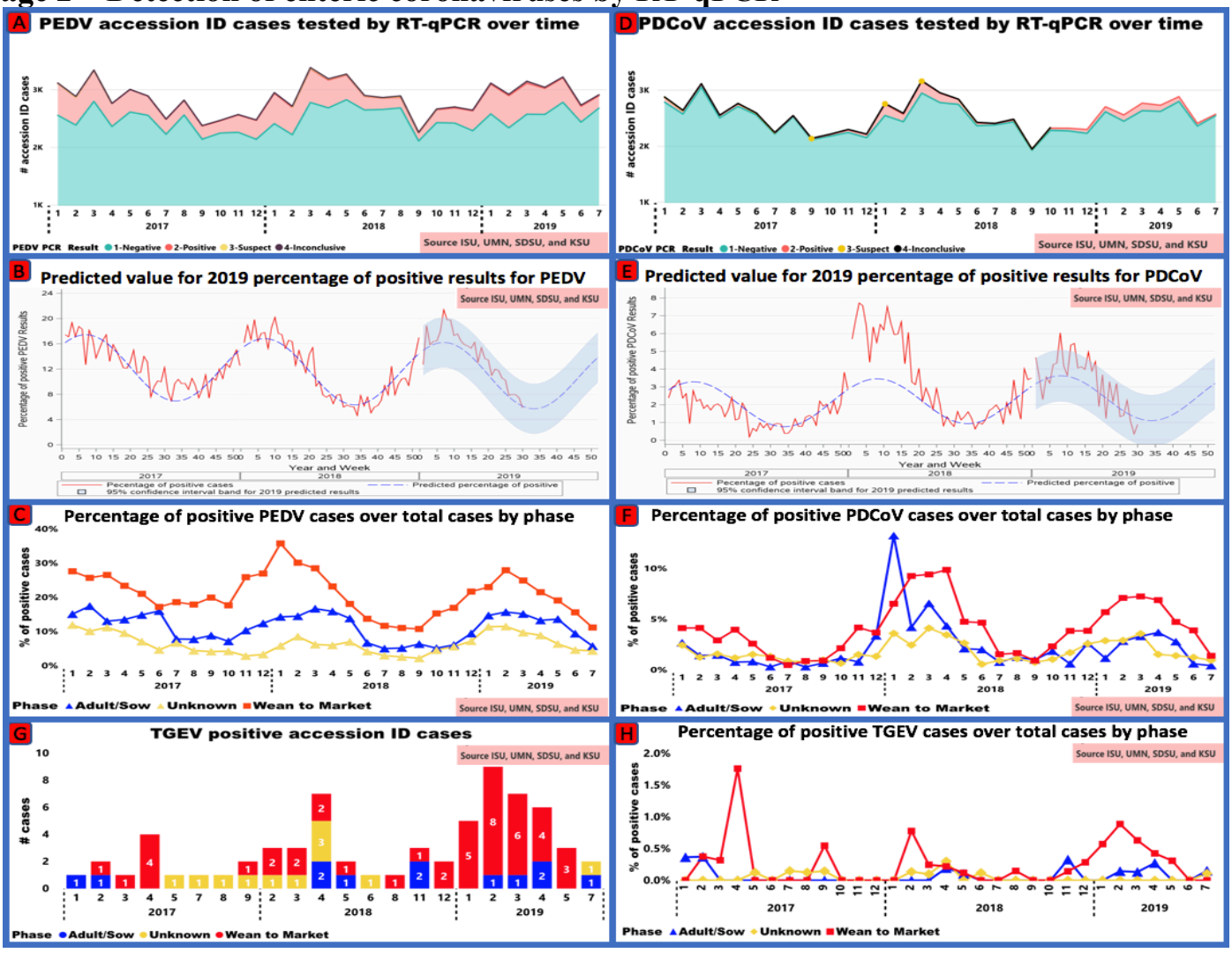

Figure 2. A: results of PEDV RT-qPCR cases over time. **B**: expected percentage of positive results for PEDV by RT-qPCR and 95% confidence interval for 2019 predicted value. **C:** percentage of PEDV PCR-positive results, by category over time. **D**: results of PDCoV RT-qPCR cases over time. **E**: expected percentage of positive results for PDCoV by RT-qPCR and 95% confidence interval for 2019 predicted value, based on weekly data observed in the previous 3 years. **F:** percentage of PDCoV PCR-positive results, by age category over time. **G**: number of PCR-positive accession ID results of TGEV by age category. **H**: percentage of PCR-positive results for TGEV by age category. Each color represents one distinct age category.

SDRS Advisory Council highlights:

- The level of detection of PEDV RNA, and of PDCoV RNA were both within the expected values for July, with decreased detection for all age categories;
- There were 2 positive cases for TGEV over a total of 2,473 cases tested in July.

Page 3 – Detection of MHP by PCR

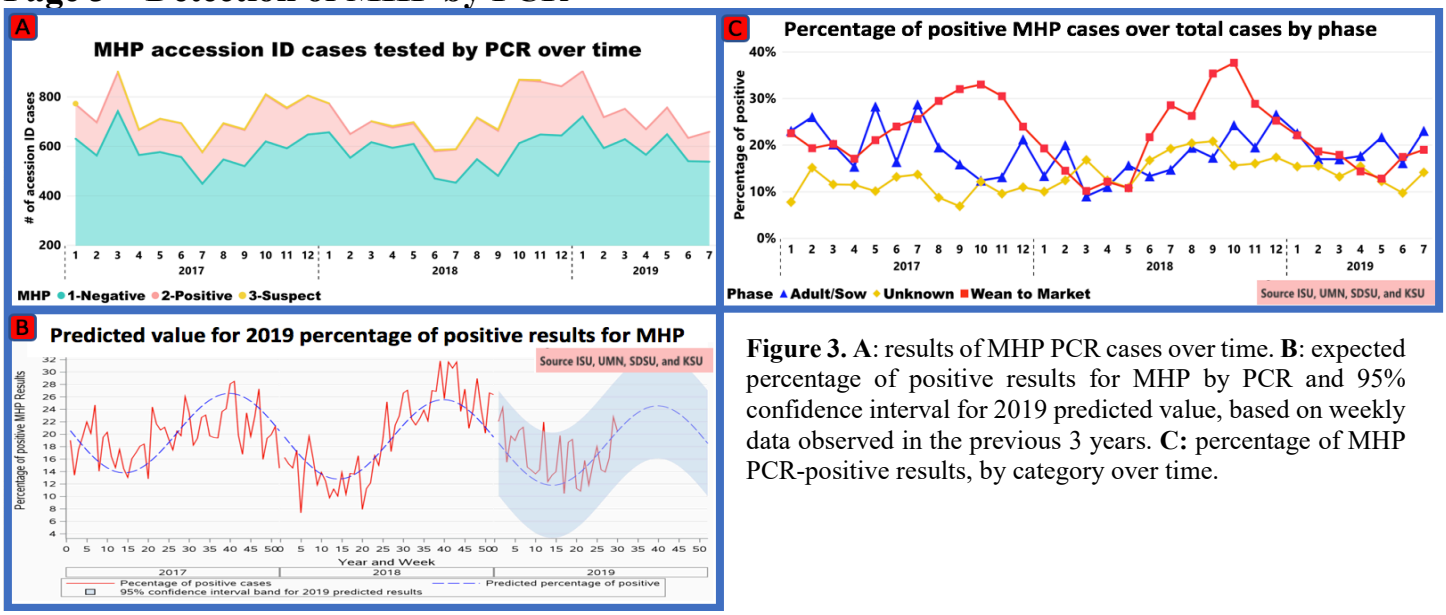

Figure 3. A: results of MHP PCR cases over time. **B**: expected percentage of positive results for MHP by PCR and 95% confidence interval for 2019 predicted value, based on weekly data observed in the previous 3 years. **C:** percentage of MHP PCR-positive results, by category over time.

SDRS Advisory Council highlights:

- Even though the number of cases tested and the level of detection of MHP DNA was within the expected value for July, there was an increased detection observed in the last 4 weeks from all age categories, as expected based on historical data for this time of the year.

Swine Disease Reporting System:
Disease Diagnosis Report

Monitoring swine disease detection at ISU VDL

Giovani Trevisan, Kent Schwartz, Edison Magalhães, Leticia Linhares, Bret Crim, Poonam Dubey, Eric Burrough, Rodger Main, Daniel Linhares

PCR-based tests inform pathogen detection, which may or may not be causing disease. To report disease detection (i.e. pathogen(s) *causing* clinical problems), veterinary diagnosticians gather multiple layers of information including data available in submission forms, test results including PCR, bacterial culture, virus isolation, parasitic flotation, macroscopic and microscopic findings. When a conclusion is reached at the ISU VDL, diagnosticians assign one or more standardized diagnostic codes (DXcodes) for cases, documenting etiology and associated lesions. The SDRS dashboards for disease detection at the ISU VDL were redesigned to present the information and summarize disease detection on swine cases over time based on DXcodes. Results are based on diagnostician interpretation of testing selected and solely informs disease detection for different systems. For the purpose of this project, a *case* corresponds to the information on all samples of a given accession identification number (accession ID).

Historical information dates back to 2007. A total of 115,051 tissue-based case submissions were summarized through July 31, 2019. Online dashboards were designed to report information on each of the 8 swine systems: respiratory, digestive, integument, nervous, systemic, urogenital, cardiovascular-blood-endocrine-immune, and musculoskeletal (Fig 1).

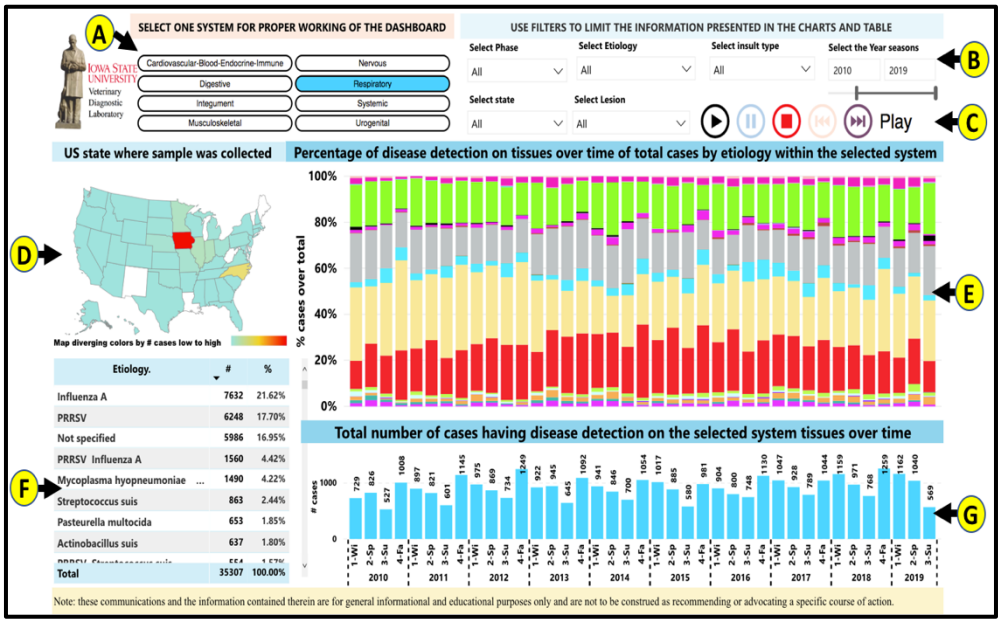

Figure 1. New SDRS dashboard format for disease detection at ISU VDL. **A)** Click buttons to select a physiologic system. **B)** Filters data over time, age category, lesion, etiology, state, insultant type, and lesion type. **C)** Play button to animate the charts over time. **D)** USA heat map for number of cases. **E)** Bar chart for etiology proportion over total cases for the system displayed in the page. **F)** Table for etiology name, number of cases, and percentage of cases. **G)** Total number of cases per year and season.

There are important differences in the way information is presented in the new dashboards compared with the old respiratory, enteric and CNS dashboards, which have been discontinued. As an example, in the old dashboards if a diagnosis of *systemic infection by PRRSV*, and not pneumonia, was assigned in a case having *lung tissue* it was presented in the respiratory page. On the new dashboards it is presented in the systemic page. Old CNS pages presented agent and disease detection on CNS tissues. The nervous page was standardized to present only *disease detection*. It is important to remember information based on disease detection does not represent incidence and/or prevalence since samples submitted for disease diagnosis are typically collected from a targeted subset of sick animals.

This new DX coding system will enhance the ability to monitor trends in disease detection over time and space and provides a platform that could be used to perform comparisons between the aggregated ISU VDL results and client specific datasets for benchmarking purposes. When facing an increased disease detection, reinforcement on disease prevention and control measures can be implemented for better preparedness to deal with the disease. The dashboards are available at www.fieldepi.org/SDRS.