Swine Disease Reporting System

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report 7 (September 4th, 2018)

What is the SDRS?

SHIC-funded, veterinary diagnostic laboratories (VDLs) collaborative project, with goal to aggregate swine diagnostic data from participating reporting VDLs, and report in an intuitive format (web dashboards), describing dynamics of disease detection by pathogen or disease syndrome over time, specimen, age group, and geographical space.

For this report, data is from the Iowa State University VDL and South Dakota State University ADRDL. Specifically, for PRRSV PCR results, there was a contribution from the University of Minnesota VDL and Kansas State University VDL.

For all "2018 predictive graphs", the expected value was calculated using a statistical model that takes into account the results from 3 previous years. The intent of the model is not to compare the recent data (2018) to individual weeks of previous years. The intent is to estimate expected levels of percent positive cases based on patterns observed in the past data, and define if observed percentage positive values are above or below the expected based on historic trends.

Collaborators:

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

University of Minnesota: Mary Thurn, Paulo Lages, Kimberly VanderWaal, Andres Perez, Jerry Torrison.

Kansas State University: Jamie Henningson, Eric Herrman, Gregg Hanzlicek, Ram Raghavan, Douglas Marthaler.

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

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** Daniel Linhares: Principal investigator. E-mail: linhares@iastate.edu.

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, Hans Rotto, Jeremy Pittman, Mark Schwartz, Paul Sundberg, Paul Yeske, Pete Thomas, Rebecca Robbins, Tara Donovan.

This report is an abbreviated version of the dashboards that are available online.

To access the full data, use your computer, tablet, or phone to:

Power BI

1) Scan the code below, or go to: www.powerbi.com
2) Login: sdrs@iastate.edu
3) Password: Bacon 100
4) On the left bar, click on 'Apps'
5) Select your dashboard of interest (e.g. PRRS)

Swine Disease Reporting System

Page 1 – Detection of PRRSV RNA over time by rRT-PCR.

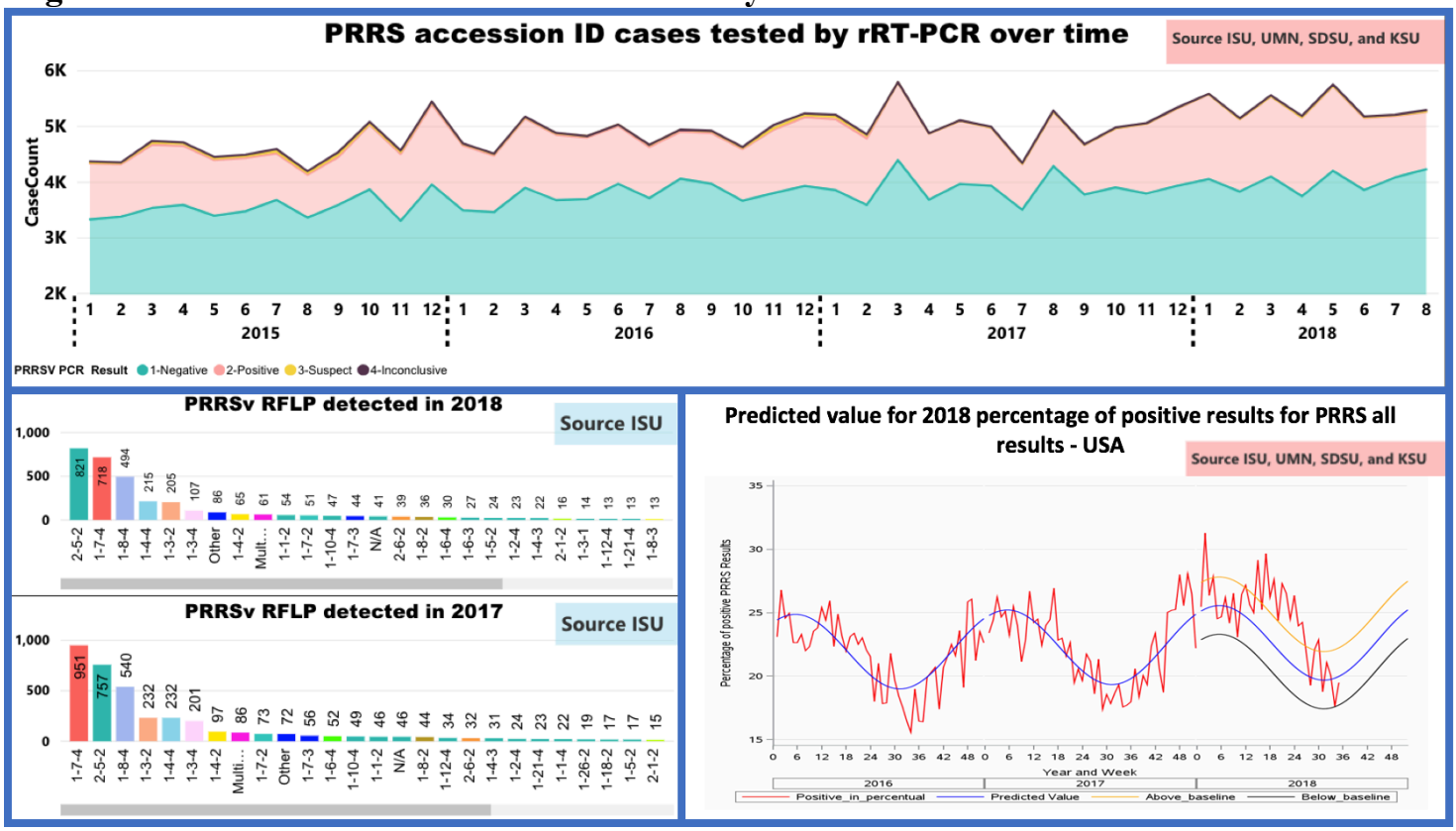

Figure 1 *Top chart*: Results of PRRS rRT-PCR cases over time. *Bottom right*: expected percentage of positive results for PRRSV RNA by rRT-PCR, with 1 standard deviation above and below the expected value. *Bottom left*: PRRS virus RFLPs detected on 2017, and 2018 for Winter, Spring, and Summer months.

PRRS rRT-PCR data were consolidated from Iowa State University Veterinary Diagnostic Laboratory (ISU-VDL), University of Minnesota Veterinary Diagnostic Laboratory (UMN-VDL), South Dakota State University Animal Disease Research & Diagnostic Laboratory (SDSU-ADRDL), and Kansas State University Veterinary Diagnostic Laboratory (KSU-VDL).

SDRS Advisory Council highlights:

1) PRRSV detection returned to the predicted level this summer of 2018, after being above the predicted band this past spring and winter.
2) So far in 2018 there was an increase on detection of the following RFLPs, compared to the same period of 2017: 2-5-2; 1-1-2; 2-6-2; 1-6-3; and 1-5-2.

Page 3 – Detection of enteric coronaviruses by rRT-PCR

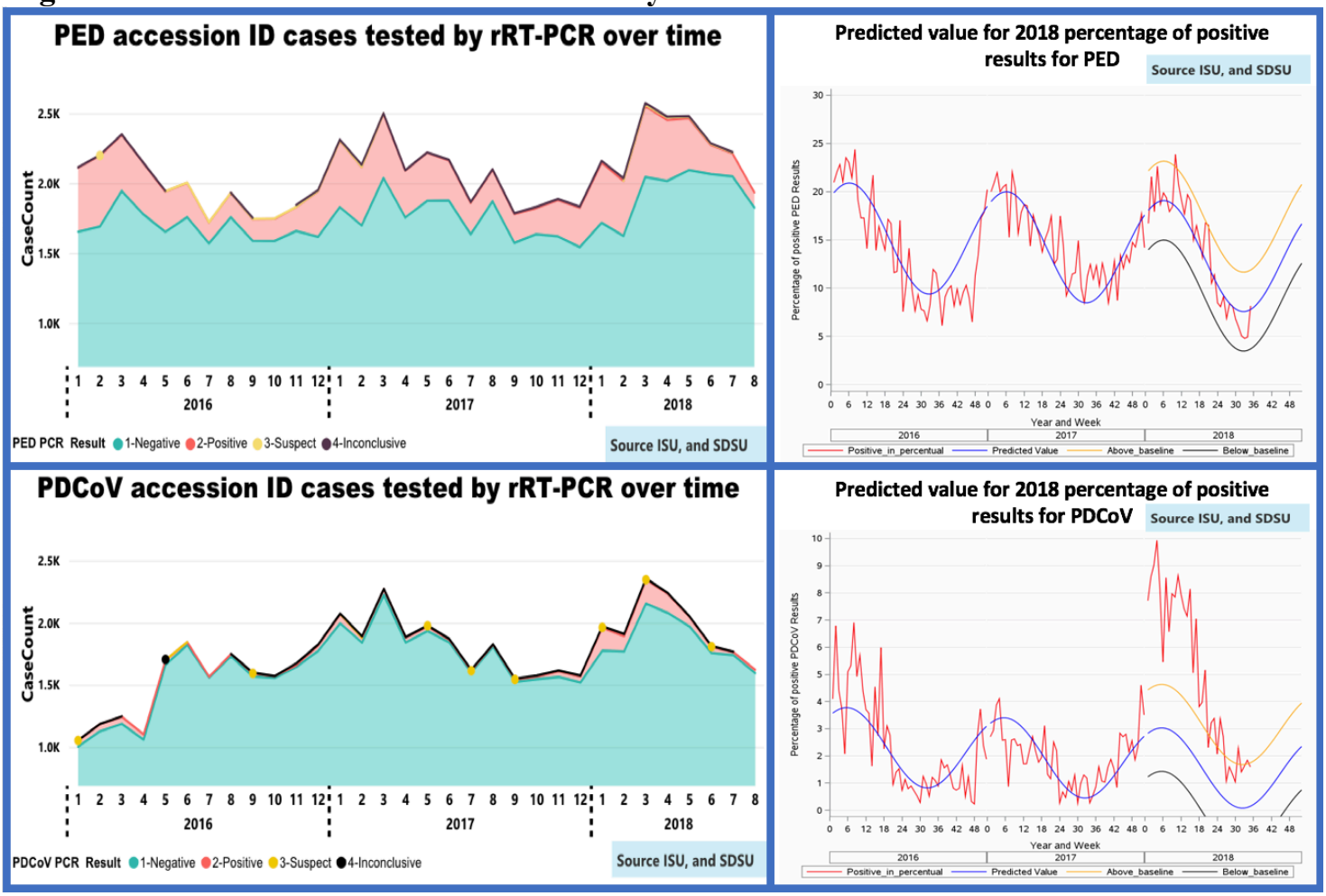

Figure 2 Left side: results of PEDV, and PDCoV rRT-PCR cases over time. Right side charts: expected percentage of positive results for PEDV and PDCoV by rRT-PCR, with 1 standard deviation above and below the expected value, respectively.

PEDV, PDCoV, and TGEV rRT-PCR test results include data from SDSU-ADRDL, and ISU-VDL.

SDRS Advisory Council highlights:

a) PEDV detection is following the predicted value for the Summer of 2018. PDCOV is moving towards the predicted values.

Page 4 – Detection of pathogens associated with CNS disease

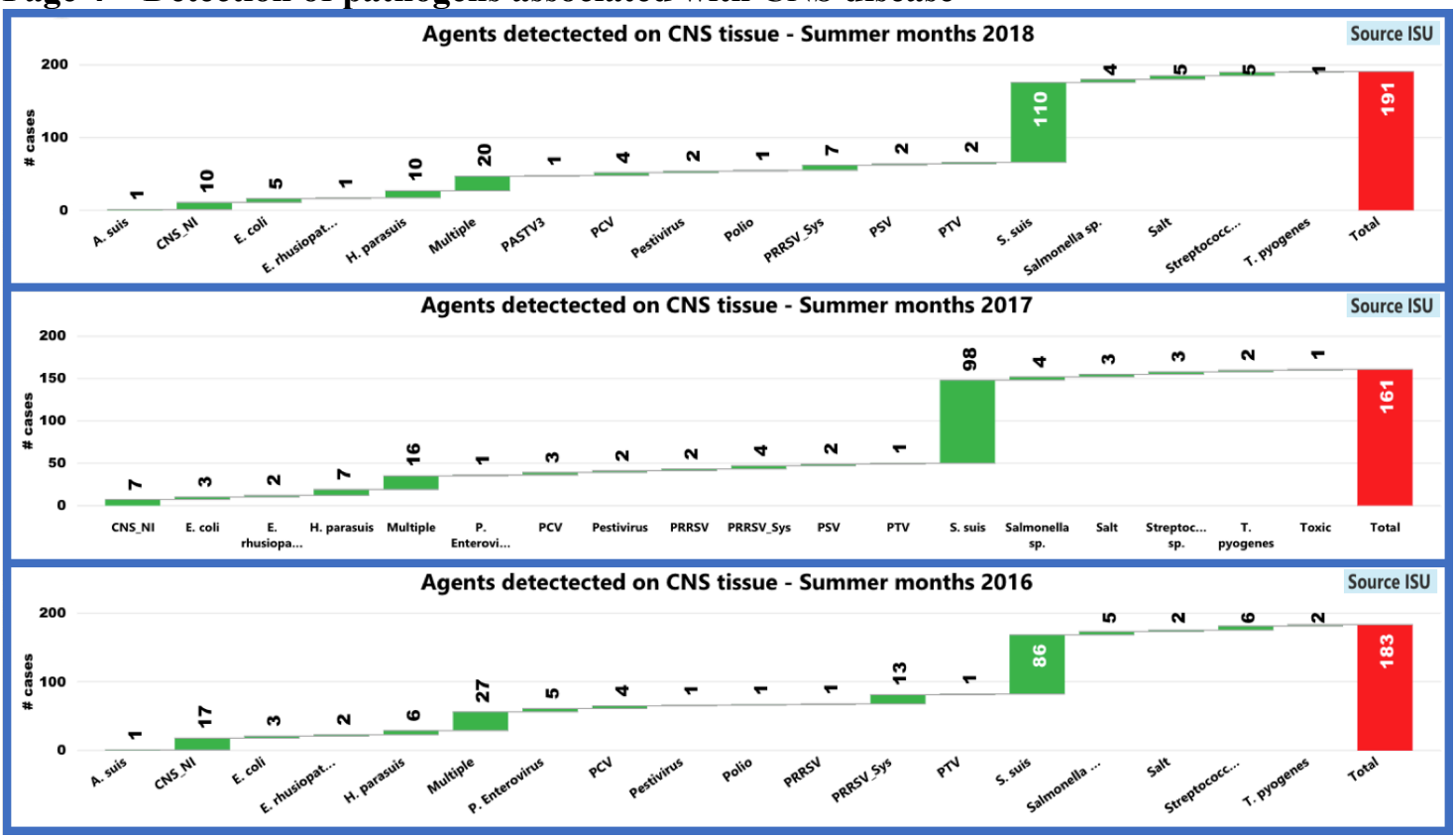

Figure 3 Pathogen detection on CNS tissue over time. Each green bar indicates a different agent or syndrome. The red bar accounts for the sum of the green bars. Bottom: summer months of 2016, middle summer months of 2017, top summer months of 2018. Summer months contains results of June, July, and August. 'Multiple agents' represent cases with more than one pathogen detected on CNS tissues.

SDRS Advisory Council highlights:

a) *Streptococcus suis* was the major agent detected on CNS tissue for summer months of 2018. *Haemophilus parasuis* slightly increased detection for summer of 2018 in CNS tissue when compared with previous years: 10 cases in 2018, 7 in 2017, and 6 in 2016.

Page 5 – Detection of pathogens in respiratory tissue over time (1 of 2)

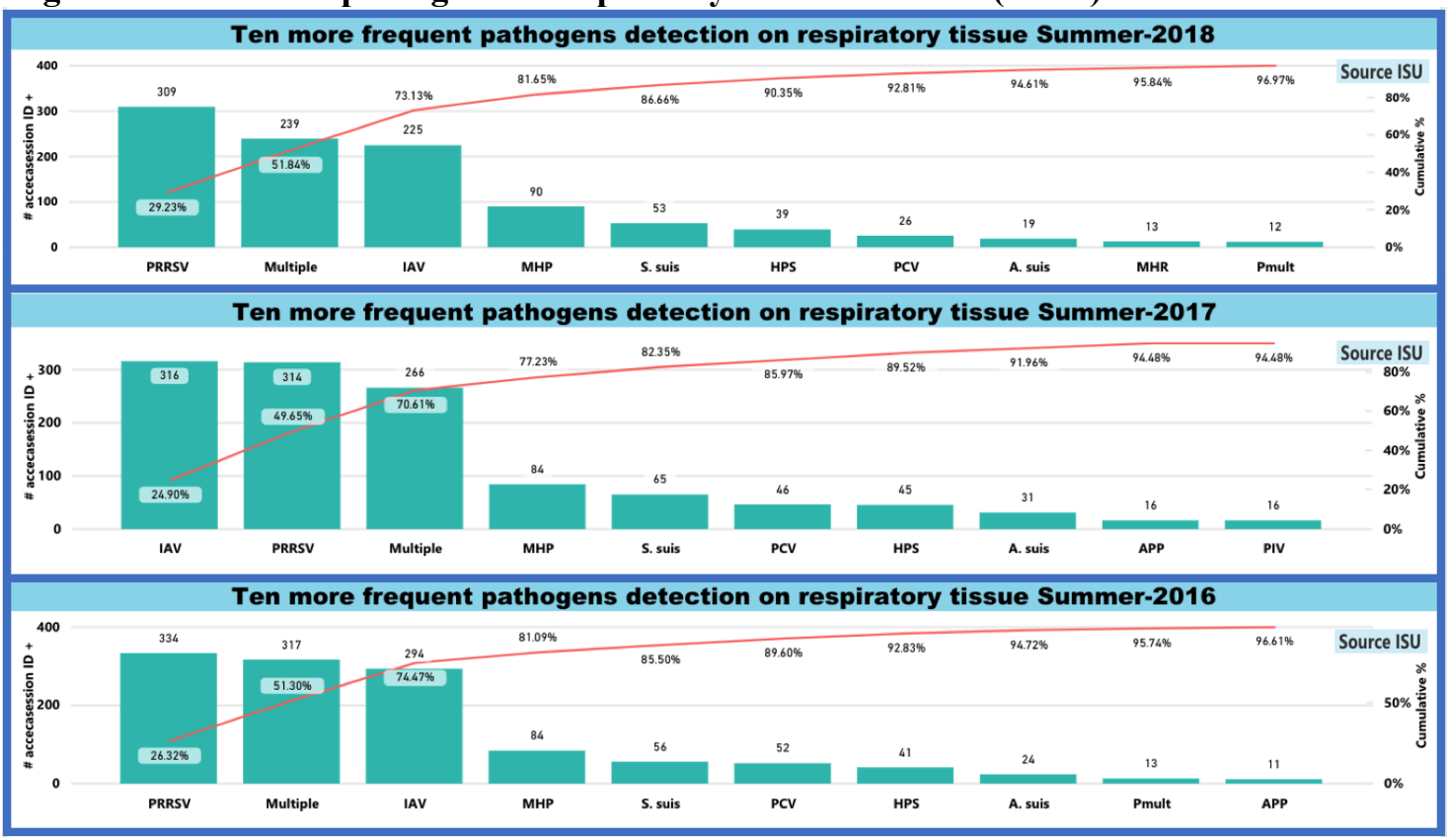

Figure 4 Pathogen detection on respiratory tissues over time. Each green bar indicates a different agent or syndrome. The red line accounts for the cumulative percentage of the green bars. Bottom: summer months of 2016, middle summer months of 2017, top summer months of 2018. Summer months include June, July, and August. 'Multiple agents' represent cases with more than one pathogen detected on respiratory tissues.

SDRS Advisory Council highlights:

a) PRRSV, Influeza A virus, and *Mycoplasma hyopneumoniae* were the 3 major agents detected on respiratory cases this year.

b) *Mycoplasma hyorhinis* appears in 2018 summer as one of the more frequent agents detected. This higher detection may be due to recent increase in request for testing, and also more accurate coding for the information by diagnosticians.

Page 5 – Detection of pathogens in respiratory tissue over time (2 of 2)

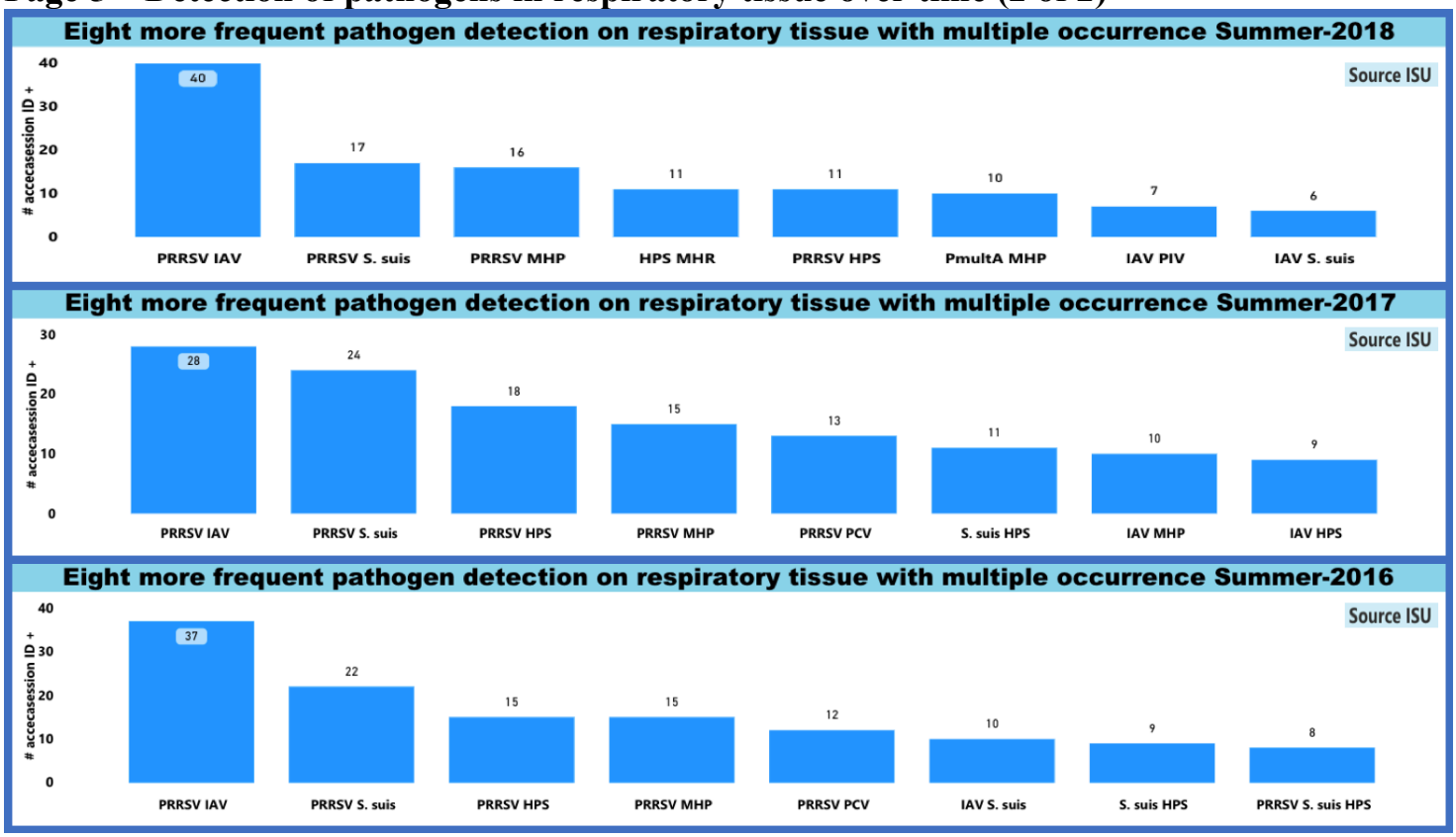

Figure 5 Multiple agents detected in respiratory tissue per accession ID case level. Each blue bar represents a combination of 2 or more agents.

SDRS Advisory Council highlights:

a) PRRSV has been the most frequent agent detected in respiratory cases with multiple pathogens since 2016.

b) The combination *Haemophilus parasuis* and *Mycoplasma hyorhinis* has increased in 2018 when compared to 2016 and 2017.

What is the Enteric Syndrome Page?

The enteric syndrome page is a compilation of lab results from porcine enteric tissue, feces, and fecal swab submitted to the ISU-VDL for pathogen investigation from 2010 to August of 2018. As a prerequisite to be included in this group of results, the case should have been from porcine and have specimen from enteric tract. Only results compatible with known enteric agents are reported in this dashboard page.

How it is organized?

Enteric data retrieved from ISU-VDL was organized at an accession ID case level. Information of animal category, specimen type, season, and geographic location was gathered similar to that of previous reports. Two new sets of information were added. First, cases where a final diagnostic, such as enteritis, colitis, hepatitis, parasitic infection, edema disease, and/or systemic agent affecting enteric tissue was reported by an ISU-VDL diagnostician, a diagnostic filter was compiled. The definition for multiple diagnostic was inserted when more than one of the following diagnostic codes was reported in the case: enteritis, colitis, hepatitis, parasitic infection, edema disease. When diagnostic code information was not available, and there was detection of a 'enteric' pathogen, the term "Lab results" was assigned for diagnostics. And second, the agent detected is always reported. When there was detection of more than one agent, the definition multiple is assigned in the agent field. When a diagnostician assigned a result as bacterial, viral or idiopathic infection but the agent was not able to be identified, a definition as bacterial miscellaneous, viral miscellaneous, and or idiopathic miscellaneous was assigned.

Where it is available?

The Enteric data is available as a dashboard (App) in the SDRS powerbi.com portal and can be accessed following instructions in the first page of this report. A list of abbreviations used in the enteric page is provided in the second tab of the Enteric App. Two dynamic graphs are available so far with information by season and over time. Relative number of cases and percentage of the agent over the total number of cases. Dynamic filters can be applied for animal category, specimen, diagnostic, and agent. Specific data drilling will be performed and reported at the press report.

How to interpret?

Enteric data contains cases where enteric tissue was submitted to ISU-VDL. The cases potentially represent a good picture of clinical cases happening in the field and submitted for diagnostic investigation. The number of cases and agents here reported only represents the agents detected at ISU-VDL.

Page 6 – Detection of pathogens associated with enteric tissue over time

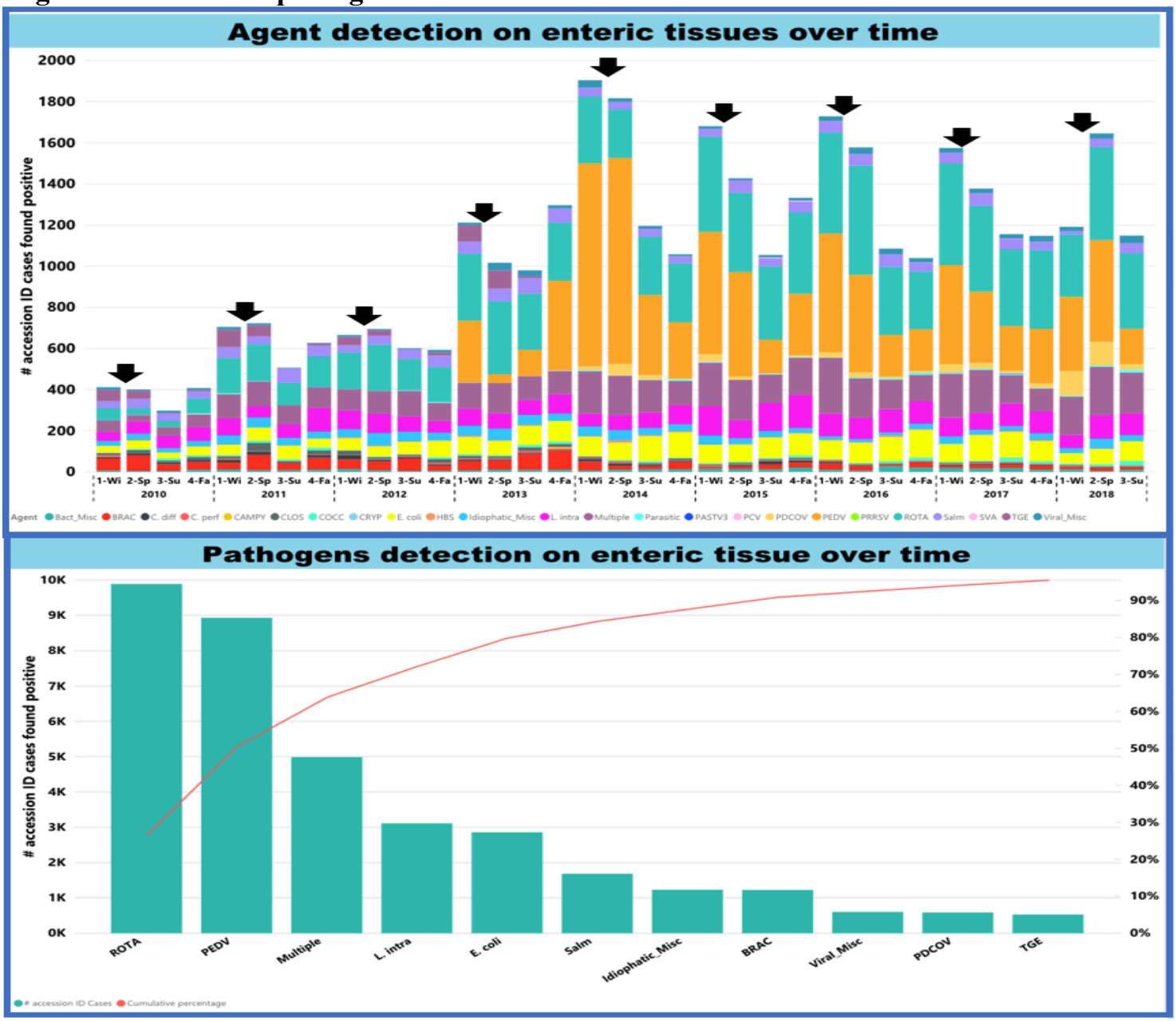

Figure 6 *Top:* Pathogen detection on enteric tissue over time. Each color represents one agent. Arrows point the winter, and spring season (note higher number of enteric cases over years). *Bottom*: Each green bar indicates an agent. The red line accounts for the cumulative percentage of the green bars over all cases.

SDRC Advisory Council highlights:

a) Rotavirus, PEDV, *Lawsonia intracellularis*, *E. coli*, and *Salmonella sp*. are the most frequent agents detected on enteric tissue. A combination of 2 or more agents described as multiple is the third more frequent detection.

b) There is a seasonal pattern of detection for enteric agents, with higher number of cases testing positive during Winter and Spring months compared to Summer months.

c) Since the introduction of PEDV to the USA swine industry, the overall number of enteric cases testing positive increased over time.

Page 7 – Detection of pathogens associated with enteric tissue over time

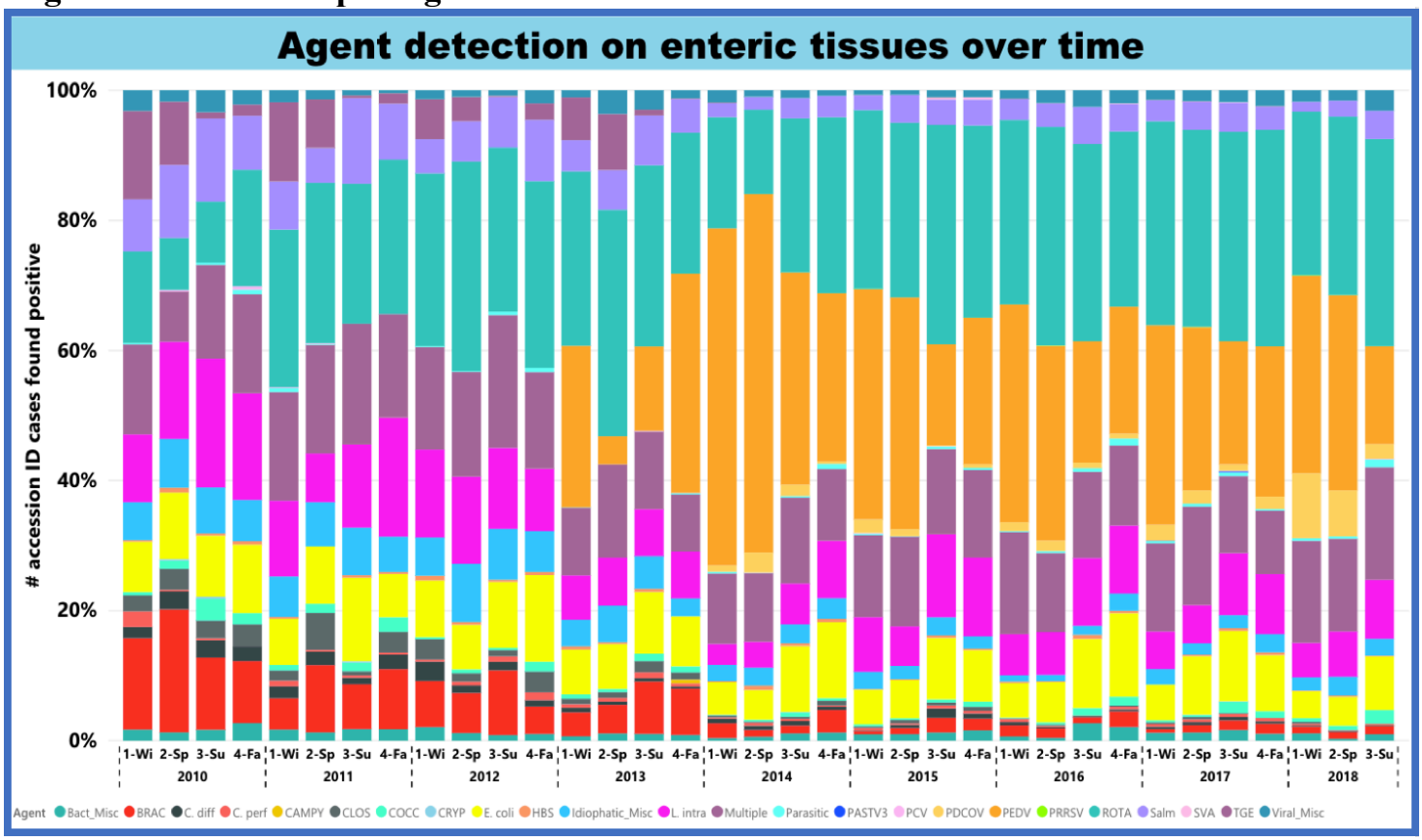

Figure 7 Pathogen detection on enteric tissue over time in percentage of occurrence by season. Each color represents one agent.

SDRC Advisory Council highlights:

a) With the introduction of PEDV in 2013 and PDCoV in 2014 to the US swine industry, the dynamic of detection of enteric agents changed significantly. TGEV has been practically undetected on enteric tissue since 2013. Also, the proportion of *Brachyspira spp* cases has decreased.

b) The reduction of *Bracyspira spp* cases may have been due to improvements on biosecurity, and implementation of programs to control and eliminate the pathogen in production systems.

Page 8 – Multiple agents combination detected in respiratory tissue

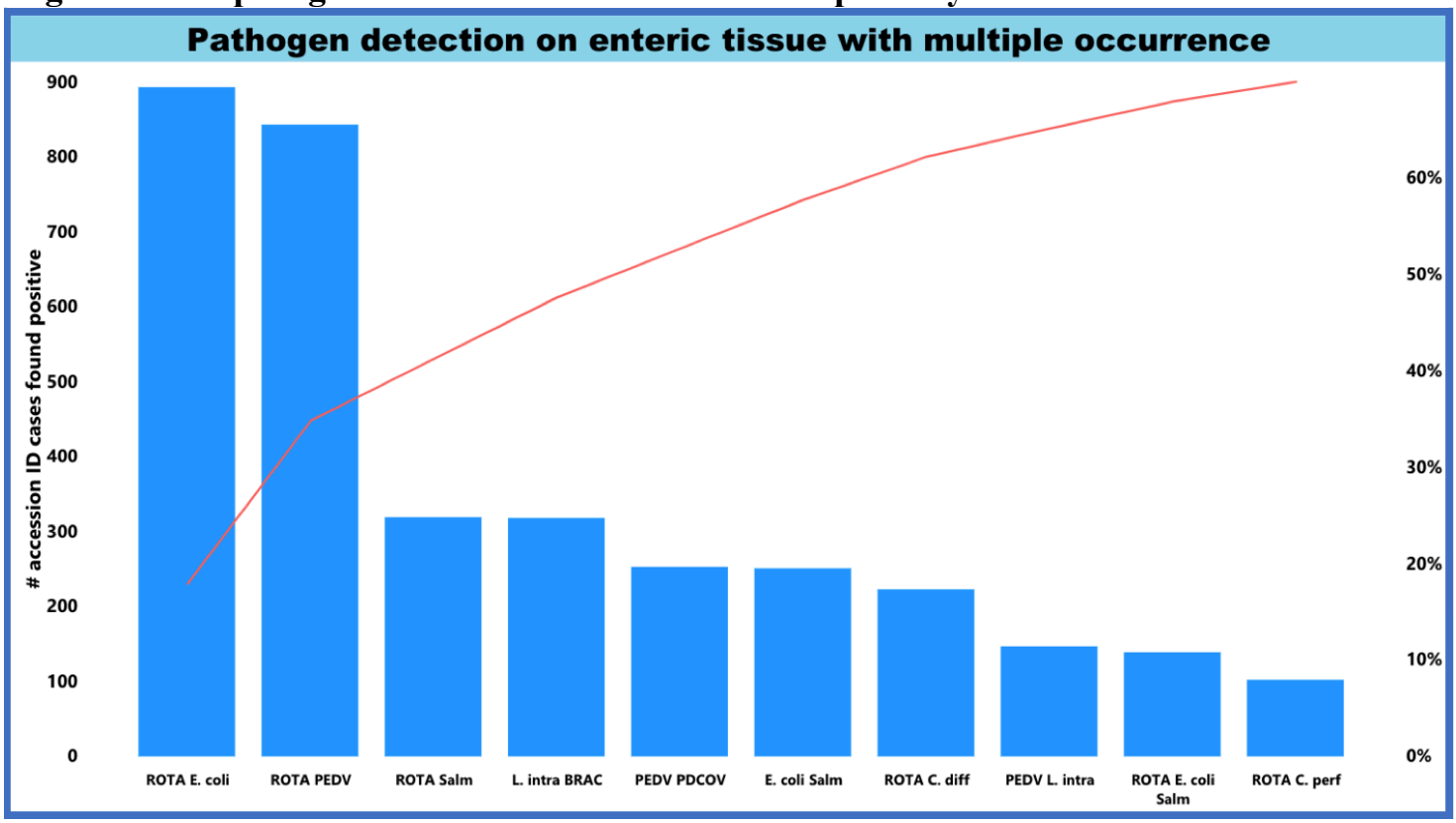

Figure 8 Multiple agents detected in enteric tissue per accession ID case level. Each blue bar represents a combination of 2 or more agents. The red line represents the cumulative percentage of multiple agents detected.

SDRS Advisory Council highlights:

a) Rotavirus and *E. coli*, followed by Rotavirus and PEDV, were the most frequent agent detected with multiple occurrence on enteric tissue.