2002

The distribution of PRRS S:P Ratios in PRRS Negative Case Submissions

W.B. Epperson
South Dakota State University

The distribution of PRRS S:P Ratios in PRRS negative case submissions

W.B. Epperson
Department of Veterinary Science

SDSU

SWINE 2001 - 22

Porcine reproductive and respiratory syndrome (PRRS) is an important viral disease of swine. A popular way to diagnose PRRS infection is by detection of PRRS antibodies using a commercial system (HERDCHEK® PRRS ELISA - IDEXX Laboratory, Westbrook, ME). For each sample tested, the system measures PRRS antibodies and compares the concentration of antibody in the sample with the concentration of antibody in a known positive sample. The system outputs this result as an S:P ratio (sample: positive). Ratios ≥0.40 (the "cut-off" point) are interpreted to mean the sample is PRRS positive. We have observed that animals originating from PRRS negative herds have S:P ratios very near 0.00. The objective of this report was to characterize the typical PRRS S:P ratio distribution in negative case submissions at the South Dakota Animal Disease Research and Diagnostic Laboratory (SDADRDL).

Key Words: Reproductive, Respiratory, Epidemiology

Experimental Procedures

Data from the HERDCHEK® PRRS Database, containing PRRS ELISA results generated at SDADRDL, were used for this report. Data from a portion of 17 months of PRRS testing (July 97 - April 99) were available. Samples for PRRS testing originated from field veterinarians servicing commercial herds. There was usually little additional herd background information available with the submission, such as the origin of the samples, their representativeness of the herd, or if the herd was previously diagnosed with PRRS. Data including case number, date, and PRRS S:P result for each sample in the case were electronically transferred from the HERDCHECK® database, into a spreadsheet (Excel- Microsoft Crop, Redmond, WA), then into a statistical analysis package (Epi-Info 6 - CDC, Atlanta, GA).

This was a retrospective case series analysis, with the herd (not blood sample) as the unit of observation. All submissions were considered independent, and no effort to identify multiple submissions from the same herd was made.

To accomplish the stated goal, the database was restricted to consider only submissions that were negative (i.e. all samples PRRS negative, below the S:P ratio cutoff of 0.40 established by IDEXX), and consisted of a sample size (number of samples submitted in each case) that fell between 10 and 40. This subset of data was interpreted to represent negative submissions from medium sized swineherds where herd or group screening was being done for PRRS.

Results

The original database, with no restrictions, consisted of 27,789 samples from 1,516 case submissions. Following restriction to negative submissions where the samples/submission was between 10 and 40, the database was composed of 4,137 samples from 217 submissions. The average number of samples accompanying each submission was 19.1.

The overall case average S:P ratio was 0.0392, with a standard deviation of 0.0255. Case average was calculated as the average S:P ratio for all samples in a given case. The overall case average was calculated by averaging the 217 case averages. A cumulative distribution of the 217 case average S:P ratios is shown in Figure 1. The cumulative distribution portrays the percentage of case average S:P ratios that were above or below a given S:P value. Therefore, 90% of cases had average S:P values less than 0.066.

The distribution of cases that had samples in the S:P ratio ranges of 0.20 - 0.29 and 0.30 - 0.39 are given in Table 1. Of the 217 cases, 142 (65.4%) contained no samples ≥0.20, meaning all samples in these cases had S:P ratio readings below 0.20. In general, this table

indicates that cases are clustered in the upper left-hand corner. This indicates that there are few cases in the database that have multiple S:P values equal to or above 0.20. Cases that had no or only 1 S:P value ≥0.20 composed 195 of the 217 cases (89.9%), and cases with at most 2 S:P values ≥0.20 composed 208 of the 217 cases (95.9%).

Summary

Case submissions to SDADRDL were used in this study, and represent submissions from commercial pork producers. We do not know the "true" PRRS status of the herd from which samples came, or the representativeness of the samples. Since S:P ratios increase over a period of days following PRRS infection, it is possible that samples from some herds came from animals in very early stages of PRRS infection. This would tend to increase PRRS S:P values and bias our distributions toward higher S:P values.

A large percentage of case average S:P ratios fell in a rather narrow range. Ninety percent of submissions had case average S:P ratios below 0.066. While average S:P ratio is a useful way to summarize a submission, it is often easier to simply examine results for high S:P samples. It is likely that examination for high S:P values would be a more sensitive way to detect early PRRS infection in a herd.

Our findings suggest that PRRS negative herds would be expected to submit few samples with S:P ratios ≥0.20. Nearly 90% of herds had one or fewer samples ≥0.20, and nearly 96% of herds had 2 or fewer samples ≥0.20. These findings indicate that multiple high S:P ratio samples are unusual in negative submissions. These results suggest the need to re-evaluate the 0.40 S:P cutoff. This cutoff level might be reduced when examining herd level PRRS data. Reduction of the cutoff value would result in increased sensitivity in detecting early PRRS infection, but would reduce specificity, resulting in labeling some herds PRRS infected when indeed they are not. Additional work is needed in multiple PRRS negative herds to determine the magnitude of change in sensitivity and specificity following a change in the cutoff point.

Examination of data suggests that herds with multiple samples ≥0.20 may warrant special attention and follow-up. These submissions do not fit the "typical" S:P ratio distribution pattern for negative herds. In such cases, further testing for PRRS may be indicated. Increased reliance on interpretation of S:P ratios may also place more burden on quality control issues, such as sample collection, sample processing, and laboratory testing procedures.

TABLE 1 CROSS TABULATION OF NUMBER OF SUBMISSIONS WITH SAMPLE S:P RATIOS ≥0.20.

		Number of samples within a submission with S:P ratio 0.30 - 0.39			
		0	**1**	**2**	**3**
Number of samples within a submission with S:P ratio 0.20 - 0.29	**0**	142 (89.9%)	13	0	0
	1	40 (95.9%)	5	1	1
	2	8	3	1	0
	3	1		0	0
	4	0	1	0	0

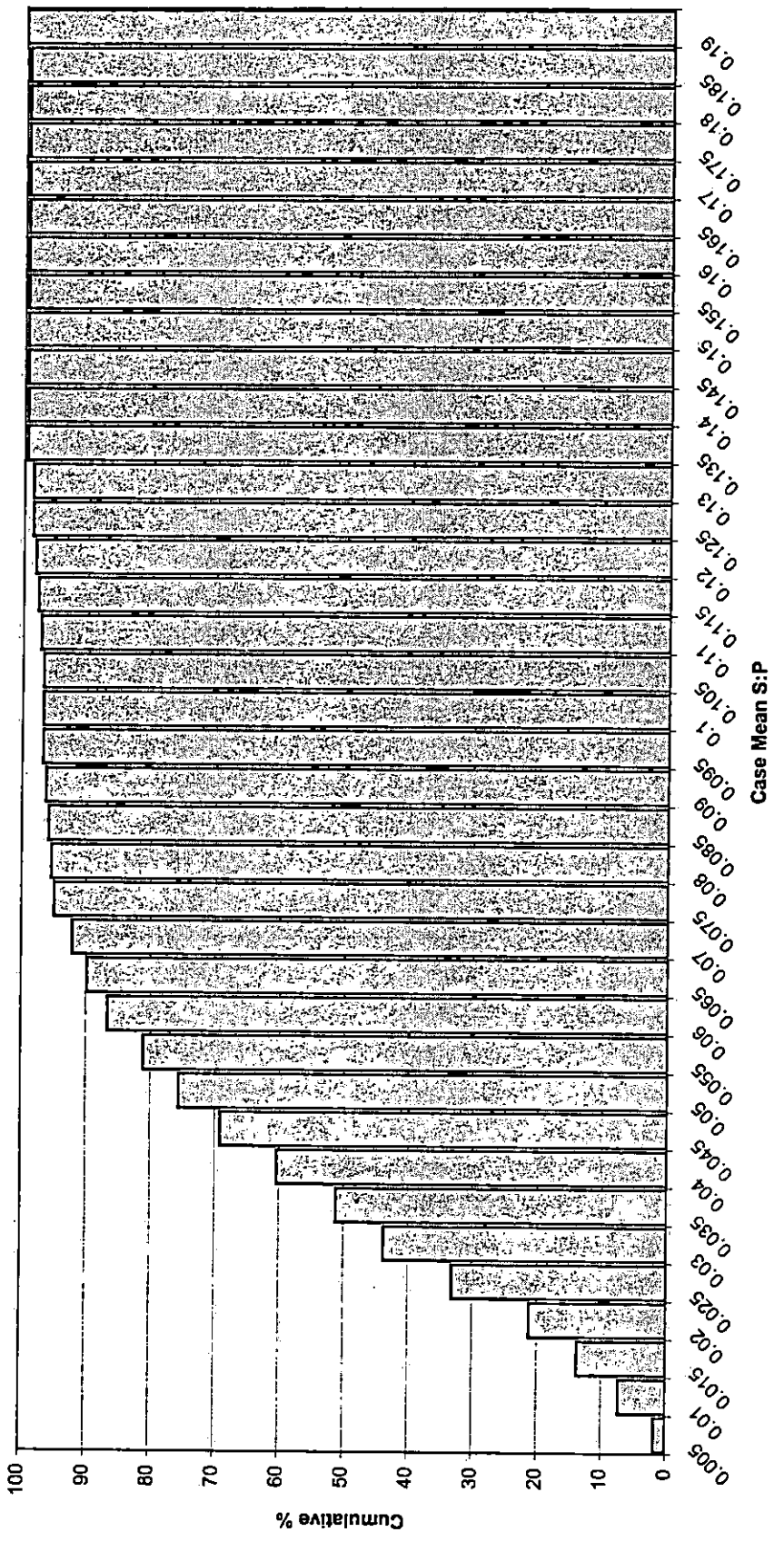

Figure 1 - Cumulative Distribution of Case Mean PRRS S:P Ratios