Evaluation of the Suitability of a Commercially Available ELISA Test as a Monitoring Tool for Estimating the *Salmonella* Prevalence of Commercial Swine Herds

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Summary: In this study we evaluate the suitability of the Salmotype® (Labordiagnostik Leipzig) Enzyme Linked Immunosorbent Assay (ELISA) in swine. The study demonstrated no association between either individual or pen fecal culture and serologic status when examined by linear regression. Culture positive pigs had a tendency to be seropositive based on the individual fecal culture and only at pen and individual levels based on the pen fecal culture. Lowering the suggested cutoff of 40% to 13% gave an equal number of culture and seropositive individuals. Therefore further adaptation of Salmotype® to the US swine industry and further additional field studies need to be done.

Key-words: pigs, serology, pre-harvest, food-safety

Introduction: The Danish mix-ELISA detects antibodies against *Salmonella* O-antigens 1, 4, 5, 6, 7 and 12 that are present in most serovars associated with human foodborne salmonellosis (Nielsen et al, 1995). The Salmotype® Pig ELISA (Salmotype® Labordiagnostik Leipzig) is a modification of the Danish mix-ELISA and is licensed for commercial use in Germany (Gabert et al., 1999). The goal of this study was to evaluate the suitability of Salmotype® ELISA in determining the prevalence of *Salmonella* in finishing pigs at individual, pen and farm levels and to compare it with bacterial culture of feces.

Materials and Methods: Five commercial swine farms from Minnesota were sampled: 496 individual feces, 496 matching individual sera and 224 pooled pen fecal samples from finishing pigs within 4 weeks of slaughter (Table 1). Pen and individual fecal samples were tested for the presence of *Salmonella* spp. Serum samples were tested using Salmotype® according to the manufacturer's instructions. Samples with OD% >40 were considered positive. A farm, barn or pen was considered positive by serology if there was at least one seropositive pig at that specific cutoff in the farm, barn or pen. Culture and serology data were compared
at individual, pen, and farm level. Statistical tests were considered significant if probability level (p) ≤ 0.05.

**Results:** Farm level: There were 3 culture positive farms: 2 positive by individual and pen cultures and one by pen culture only (Table 1). Seroprevalence was 1.4% (7/496). These 7 animals were from the same 3 farms that were found to be culture positive. No linear relationship was found between individual fecal culture and seroprevalence or between pen fecal culture and seroprevalence.

<table>
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<tr>
<th>FARM</th>
<th>NO. IND. FECES</th>
<th>(+) IND. FECES</th>
<th>IND. F. PREV.</th>
<th>NO. PEN FECES</th>
<th>(+) PEN FECES</th>
<th>PEN F. PREV.</th>
<th>NO. SERA</th>
<th>(+) SERA</th>
<th>SERO PREV.</th>
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<th>AVG OD%</th>
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Table 1: Prevalence of Salmonella at 5 swine farms as detected by bacterial culture and serology. No. Ind. feces = Number of individual feces. Ind. f. prev = Individual fecal prevalence. Avg = Average OD = Optical density

**Barn level** There were 12 barns in the 5 farms: 7 barns were positive by individual or pen fecal culture (7/12 = 58.3%) and 4 were positive by serology (4/12 = 33.3%). No linear relationship was found between individual fecal culture and seroprevalence or between pen fecal and seroprevalence. Seropositive pigs did not tend to be culture positive based on either the individual or the pen fecal culture results by Chi-square test. There was a statistically significant difference (p < 0.005) in the means of average seroprevalence of the individual culture positive and negative populations but not the pen fecal positive and negative populations. There was a statistically significant (p < 0.005) difference between the population distribution of the fecal culture positive and negative barns based on their mean OD%. The OD% of 5 culture negative barns was lower (3.7-5.62) compared with 7 culture positive barns (3.57-12.06).

**Pen level:** Of the 224 pens tested, 22 (9.8%) were culture positive, while 6 (2.67%) were seropositive. No linear relationship could be determined between either individual fecal culture prevalence and seroprevalence or between pen fecal culture prevalence and seroprevalence. Seropositive pigs did tend to be culture positive based on the individual fecal culture results by Chi-square analysis.

**Individual level:** The culture prevalence for individual fecal samples was 12.2% (61/496) and the individual seroprevalence was 1.4% (7/496). Linear regression could not be performed at this level. Seropositive pigs did not tend to be culture positive based on either the individual or the pen fecal culture results by Chi-square analysis.

**Serovars:** 83 serovars were
isolated: 76 from serogroups B, 4 from serogroup C1, 1 from serogroup G2, 1 from serogroup T1 and 1 isolate was untypeable.

**Discussion:** No linear relation was detected between either individual fecal culture or pen fecal culture and serologic status. Therefore the data were examined by Chi-square, Odds Ratio and ANOM analyses. Individual culture positive pigs tended to be seropositive and individual culture negative pigs tended to be seronegative at the pen level only when examined by Chi-square analysis. Within pens, seropositive pigs were likely to be culture positive by individual fecal culture by Odds Ratio. However, seropositive pigs were not likely to be from pens with culture positive pen feces. At the suggested 40 % cutoff, only 7 seropositive pigs detected. When the cutoff was lowered to 13 %, nearly equal numbers of animals were culture- and seropositive. However, even if the cutoff is lowered to 13 %, we still could not clearly distinguish between positive and negative populations based on their serologic status. However, at this 13 % cutoff the diagnostic sensitivity and specificity was not clear. Average OD % for individual culture positive farms was higher than for individual culture negative farms. Since the goal in the pig chain is to measure the farm level *Salmonella* status, the concept of a cutoff in US pig herds might have to be reconsidered and replaced by average OD % per farm. In future studies it is suggested to sample more farms with smaller sample size in order to better evaluate farm level results. Further adaptation of Salmotype® to the US swine industry and further seroprevalence studies need to be done.

**References**
