Summary: The objective of this study was to directly compare Salmonella isolation rates from pig slaughtered after ~4 hours holding on slatted or solid concrete floors. Seven truckloads (replicates) of market swine (~120 kg) from a fully integrated farrow-to-slaughter operation were studied. At unloading, groups of pigs (15-30) were sorted to 1) no-hold (20-45 minutes waiting), 2) pens with solid concrete floors (4 hours), 3) slatted concrete floors (4 hours). Postmortem samples were cultured for Salmonella. Those pigs held in pens with slatted floors (63.6%) had significantly (P < 0.05) less Salmonella in their ceca than those held on solid floors (72.7%).

Keywords: food safety, zoonosis, abattoir, lairage

Introduction: In the US, market swine spend two to six hours resting in holding pens before slaughter. This time is necessary for ante mortem inspection and improvement of meat quality. However, research is beginning to suggest that these holding pens may be a significant risk for Salmonella infection and a potential critical control point (Hurd et al., 2001; Hurd et al., 2002; Rostagno et al., 2003). The objective of this study was to directly compare Salmonella isolation rates from pigs slaughtered after ~4 hours holding on slatted or solid concrete floors.

Materials and Methods: Seven truckloads (replicates) of market swine (~120 kg) from a fully integrated farrow-to-slaughter operation were studied from June 2003 to February 2003. For each load, all pigs (n=170) originated from the same building. They were transported less than one hour in clean and disinfected trailers. All groups consisted of pigs marketed at close-out (emptying) of the building. At the time of unloading, small groups of pigs (15-30) were sorted to 1) no-hold (20-45 minutes waiting), 2) pens with solid concrete floors (solid), 3) slatted concrete floors (slatted). The latter two groups were held for approximately four hours. At harvest, samples were collected from 30 animals from each of the three groups. Following stunning and evisceration, cecal contents, feces, and ileocecal lymph nodes (ICLN) were collected from the viscera line.

For Salmonella isolation, samples (macerated ICLN, 10g feces, 10ml cecal contents) were added to both buffered peptone water and Tetrathionate (90 ml) which were incubated for 24 h at 37 °C. Each was then subcultured 1:100 in Rappaport-Vassiliadis broth + novobiocin (20mg/L), incubated for 24 h at 42 °C and then transferred 1:100 to Rappaport-Vassiliadis broth and incubated 24 h at 42 °C. Samples from the BPW pre-enrichment were screened using the Assurance gold EIA Salmonella ELISA kit (BIOCONTROL , Bellevue, WA). ELISA positive BPW samples and all samples from the Tet enrichment were then streaked onto XLT4 and modified brilliant green agar (MBG) and incubated for 24 h at 37 °C. Suspect colonies were then confirmed by isolation of typical colonies on Rambach agar (24 h at 37 °C) and serotyping by USDA National Veterinary Services Laboratory.

Results and Discussion: A total of 630 pigs were evaluated. Those pigs held in pens with slatted floors (63.6%) had significantly (P < 0.05) less Salmonella in their ceca than those held on solid floors (72.7%). There was no difference in the prevalence from ICLN or fecal samples between the solid and slatted groups (Figure 1). For all three groups, the overall proportion of positive ceca (62.8%) was higher than the ICLN (33.8%) or the feces (26.85). Based on previous studies we suspect that ICLN...
prevalence largely reflects the on-farm prevalence (Hurd, et al., 2003). For this reason, the ICLN prevalence is represented as an input on the left side of Figure 1. The cecal prevalence more likely represents the recent exposures occurring in the last four hours of life (holding pen) and is represented as an outcome of the holding process.

This study suggests that dry slatted floors may provide some benefit in reducing preslaughter Salmonella exposure. The slight dose-response observed with increasing cecal prevalence from no-hold to solid floors supports this hypothesis of causality. The observation of higher cecal prevalence in the no-hold pigs due to recent exposure is supported by our other work showing cecal contamination in as little as 15 minutes (Griffith, et al. 2003). The effect of the holding pen exposure is partially obscured by the relatively high on-farm prevalence, as measured in the ICLN. Further analysis, involving the comparison of serovars (and PFGE fingerprints) found between groups will better delineate the role of holding pens and possibilities for intervention.

Figure 1. Salmonella enterica recovery rates from market swine at slaughter after three types of lairage, 1) 20-45 minutes, 2) 4 hours on solid concrete floor, 3) 4 hours on slatted concrete floor.

References:


