

Research on Persistent Colonization of Pigs by *Salmonella typhimurium* and the Effects of Transportation Related Stress on the Shedding of *Salmonella typhimurium*

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Research in my laboratory has been on the mechanism(s) employed by *Salmonella typhimurium* to persistently colonize pigs and on the factors contributing to increased shedding of *S. typhimurium* by pigs at slaughter. A phenotype of *S. typhimurium* has been identified that attaches to epithelial cells isolated from the pig small intestine. Cells of the adhesive phenotype produce pili that may be the adhesin, while cells of the non-adhesive phenotype do not. Cells of the adhesive phenotype also produce 10-12 unique envelope proteins and several new surface antigens. Adhesive cells are more readily phagocytized by porcine neutrophils and macrophages and have a much greater degree of intracellular survival in the phagocytic cells. Cells can readily shift between the two phenotypes. In the laboratory the rate of change is between 10^{-2} and 10^{-4} . When pigs were challenged with cells in the non-adhesive phenotype, only cells in the adhesive phenotype were recovered from pigs. Both phenotypes were of equal virulence. This demonstrates that the adhesive phenotype is important in pigs. A non-adhesive mutant was isolated and shown to be less virulent in mice and was more rapidly cleared from the intestinal tract of pigs. The role of the adhesin and the other properties associated with the adhesive phenotype are being investigated with the intent of learning how pigs can be long term carriers of *S. typhimurium*.

The stress associated with shipping has been associated with increased shedding of *Salmonella* from pigs. The result of this is to increase the risk of spreading this food borne pathogen at the slaughter plant. However, since most of the evidence for this perceived association between stress and increased shedding of *Salmonella* is anecdotal, we have initiated a systematic approach of this problem. Pigs infected with *S. typhimurium* will be subjected to transportation related stress and quantitative measurements of *Salmonella* shedding from each pig measured to determine if shipping stress does increase shedding. To insure that all pigs in the study were carriers of *Salmonella*, 30 pigs at 4 weeks of age were challenged with a strain of *S. typhimurium* known to persistently colonize pigs and that can be easily cultured from fecal samples because it is resistant to nalidixic acid. These pigs will be reared in isolation until market weight. One-half of the pigs will be transported by truck for 3-4 hours, brought to the meat processing plant at the University of Illinois, and held in pens for 1-2 hours prior to slaughter. The other pigs will be slaughtered without the long transport and holding. Each pig will be sampled for fecal *Salmonella* prior to transport and again after slaughter. Immunologic variations among groups also will be measured including antigen-specific T-cell responses, measurement of IFN γ producing cells, and measurement of other cytokines. This study will allow us to confirm the relationship between transportation induced stress and shedding of *S. typhimurium* and to begin to define the mechanisms that increase shedding of *Salmonella*.