

**Title:** Evaluate the dissemination of *Salmonella* in the environment following land application of swine manure – NPB #: 13-006

revised

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**Date Submitted:** 08/03/2015

### Scientific Abstract

Land application of animal manure is an important source of fertilizer. However, the presence of pathogens in soil and their occasional transmission to human and animal has become a topic of public health concern during the past few years. The objective of this study is to determine the transmission of *Salmonella* due to manure application in the environment. At the different time points of application: day 0, 7, 14, and 21, the soil and lagoon samples were collected representing swine farms in Iowa (n=7) and North Carolina (n=5). A total of 1,200 soil samples (IA=700; NC=500) and 50 lagoon and 70 manure pit samples from NC and IA, respectively. Antimicrobial susceptibility (AST) was characterized using Sensititre® with a panel of 15 antimicrobial drugs. Genotypic characterization was done using pulse field gel electrophoresis (PFGE). Overall *Salmonella* prevalence was 13.33% (176/1320). The prevalence in soil and lagoon were 10.92% and 37.5% respectively. *Salmonella* prevalence in North Carolina (28.18%) was significantly higher than in Iowa (2.73%) ( $p < 0.001$ ). Decrease in prevalence of *Salmonella* in the area from Day0 to Day21 was observed overtime and consistently across all the farms irrespective of geographic region. We identified 12 serotypes in the study. It is important to highlight that serotypes detected in one state were not reported from the other, thereby highlighting serotype association based on manure storage and soil application method in the two regions. For example, we detected serotypes Anatum (7.39%), Litchfield (3.98%), and Infantis (0.57%) in IA, while Altona (7.95%), Derby (3.98%), Johannesburg (3.98%), Mbandaka (1.70%), Muenster (9.09%), Rissen (0.57%), Typhimurium var5- (20.45%), Uganda (2.27%), and Worthington (5.68%) were detected in NC only. Multidrug resistant (MDR; Resistance to three or more antimicrobials) *Salmonella* isolates were 80.47% with the most frequent AMR against Streptomycin (82.81%), sulfisoxazole (73.44%), and kanamycin (61.72%). According to PFGE fingerprints, we detected clonal relatedness among *Salmonella* recovered from lagoon and soil at multiple time points with relatively close geographic proximity and serotypes. The outcome of this research study provides information on the occurrence and distribution of AMR *Salmonella*, its AMR phenotypes and genotypes in swine manure which is directly applied in the field. Our study highlights that the potential of *Salmonella* transmission in the environment on swine farms is dependent on the manure storage and application method durations.

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These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

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