

**Title:** Influence of the Method and Timing of the Land Application of Manure on the Fate and Transport of Manure Constituents in Soil, NPB # 15-045

**Investigator:** Xu Li

**Institution:** University of Nebraska-Lincoln (UNL)

**Date Submitted:** 12/11/2016      **Resubmitted:** 2/18/2017

### Scientific Abstract

Swine manure has been used as a soil amendment for crop production because it can provide nutrients, increase soil productivity, improve water infiltration, and reduce the potential for soil erosion. It is important to understand how different land application strategies may affect the fate and transport of various manure constituents in the environment. The objective of this project was to determine how the method and timing of swine manure application may impact the levels of multiple manure constituents in soil. The manure constituents included nutrients, antimicrobials, and antimicrobial resistance genes (AMR genes).

A series of plot-scale field experiments were performed. In these experiments, swine manure slurry from a commercial farm was either broadcast or injected into test plots by a commercial manure applicator. A set of three 30-min simulated rainfall events, 24 hour apart, were initiated on the manure amended plots 1 day (and referred as 0 week thereafter), 1 week, 2 weeks, or 3 weeks after the manure application. Soil cores were collected before and after the rainfall simulation tests and analyzed for nutrients using standard methods, for antimicrobials using liquid chromatography tandem mass spectroscopy, and for AMR genes using quantitative polymerase chain reactions (qPCR).

Broadcast resulted in higher nitrate concentrations in soil than did injection. In terms of application timing, three of the four nutrient compounds tested (i.e., nitrate, water soluble phosphorus, and Bray 1 phosphorus) did not show significant decrease in broadcast plots during the three weeks following manure application. Ammonium concentration dropped significantly in the third week. Simulated rainfall events lowered the concentrations of the nitrogen species in top soils significantly, and showed minor impacts on the phosphorus species in the top soils.

For top soils the antimicrobial concentrations in broadcast plots were higher than those in injection plots. For broadcast plots, chlortetracycline was detected in both the top and bottom of the soil cores before and after rainfall events. Lincomycin and tiamulin were only detected in the top of the soil cores. The antimicrobial concentrations in top soils decreased with time after manure application, although the trend is significant only for lincomycin.

---

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.

---

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • [pork.org](http://pork.org)

---