RESEARCH ABSTRACT

PUBLIC HEALTH/WORKER SAFETY

Title: Occurrence and Movement of Antibiotic Resistant Bacteria and Resistance Genes in Tile-Drained Agricultural Fields Receiving Swine Manure Application - **NPB #12-089**

Investigators: Michelle Soupir, Tom Moorman, and Matt Helmers

Institution: Iowa State University and USDA-ARS

Date Submitted: September 20, 2013

Scientific Abstract:

The use of tylosin at subtherapeutic levels by the swine industry provides selective pressure for antibiotic resistance in the animal gut and manure. Land application of manure from tylosin-treated swine introduces tylosin-resistant enterococci, *erm* genes, which confer resistance to tylosin, and tylosin. This study documents the occurrence and transport of tylosin-resistant enterococci, *erm* genes and tylosin in tile-drained chisel plow and no-till agricultural fields treated with liquid swine manure in alternating years. Nearly 75% of the enterococci in manure were resistant to tylosin and *erm*B concentrations exceeded 10^8 copies g^{-1} manure while the mean *erm*F concentrations exceeded 10^7 copies g^{-1} manure. e*rm*T was not detected. The mean concentration of tylosin was 73 ng g^{-1} manure. Soil collected from the manure injection band closely following application contained $>10^9$ copies g^{-1} soil of both *erm*B and *erm*F in 2010 and $> 10^8$ copies g^{-1} soil after the 2011 application compared to 3×10^3 to 3×10^5 copies g^{-1} soil in the no-manure control plots. Gene abundances declined over the subsequent two-year period to levels similar to those in the no-manure controls. Concentrations of enterococci in tile water were low while tylosin-resistant enterococci was rarely detected. E*rm*B was detected in approximately 75% of tile water samples and *erm*F was detected in 30% of tile water samples but levels of these genes were not elevated due to manure-application and no difference was found between both tillage practices. These results show that tylosin usage increased the short-term occurrence of tylosin-resistant enterococci, *erm* genes, and tylosin in soils, but has had minimal effect on tile drainage water quality in years of below average precipitation.