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Antibiotics Losses in Runoff and Drainage from Swine Manure Application

Since their discovery, antibiotics have been instrumental in treating infectious diseases that were previously known to kill humans and animals. However, their widespread use as additives in animal feed has raised concerns about the development of antibiotic-resistant microorganisms. As much as 80% of the antibiotics added in animal feed may be excreted in urine or manure. Once excreted, these antibiotics can enter surface and/or ground waters through non-point source pollution from manure-applied fields. This study quantified antibiotics losses in runoff and drainage from swine manure application on a Webster clay loam. The experiment was a randomized split-plot design with four replications. The main plots were two primary tillage treatments (fall moldboard plowing versus chisel plowing) and the sub plots were two annually applied nutrient treatments (fall injected liquid swine manure versus spring-applied urea). At recommended N application rate, chlortetracycline and tylosin applications rates were 229 g/ha and 256 g/ha in 2001; and 199 g/ha and 165 g/ha in 2002. Field studies showed very little transport of chlortetracycline and tylosin through Webster soil into tile drains. There was almost no transport of dissolved chlortetracycline in surface runoff. Only about 0.07% of the applied tylosin was transported as dissolved tylosin in surface runoff. Soil analysis showed that most of the manure-applied antibiotics remained in place but there was some off-site transport of these antibiotics with sediment. Batch and flow through adsorption studies showed that these two antibiotics are tightly adsorbed by soils. Screening of soil samples showed that soil microbes had no resistance to tetracycline but higher resistance to tylosin after 5 years of swine manure application. However, there was more diversity in resistant bacteria from the manure-applied plots than the urea applied plots. The paper discusses the implication of these results for land application of antibiotic laden manure.

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