



## WATER RESOURCES RESEARCH GRANT PROPOSAL

**Project ID:** 2003AR47B

**Title:** Antibiotic resistance and the relationship between enzyme activity and P in runoff from poultry litter amended soil

**Project Type:** Research

**Focus Categories:** Surface Water, Ecology, Non Point Pollution

**Keywords:** antibiotic resistance, phosphorus, runoff, microorganisms, enzymes, phosphatase, poultry litter

**Start Date:** 03/01/2003

**End Date:** 02/28/2004

**Federal Funds:** \$14749.00

**Matching Funds:** \$29451.00

**Congressional District:** Third

**Principal Investigators:** Savin, Mary Cathleen (University of Arkansas)

**Abstract:** While poultry litter amendments have provided a means to improve pasture lands, concern about runoff water quality is escalating. Debate continues over what controls the release of nutrients from organic compounds in the environment. Little research has been published on the contribution of biologically produced phosphatase enzymes on the release of P from organic sources and subsequent contamination of runoff from soils with long-term applications of poultry litter. While some studies suggest that organic P in animal wastes is much more mobile than inorganic P, there is some question as to whether elevated phosphatase enzymes will be sustained after multiple years of poultry litter inputs. If phosphatase enzyme activity remains after years of litter amendments, then this could provide valuable insight into soluble P concentrations found in runoff. Nationally, while research is being conducted on microbial source tracking to determine the origins of indicator organisms, little research has been conducted investigating the influence of poultry litter on the development and transport of antibiotic resistant bacteria from soil into runoff waters. Research has indicated that antibiotic resistant microbes are present in litter. It appears that antibiotic resistance in general is increasing due to large scale, indiscriminate use of antibiotics. However, it is not clear to what extent antibiotics in poultry litter

amended soil influence the development of antibiotic resistance among environmental bacteria. The proposed research will investigate the impact of microbial activity on the quality of runoff water.

Specific objectives include:

1. Determine the contribution of poultry litter land applications to antibiotic resistance development in microbial communities transported in surface runoff ;
2. Determine if there is a relationship between acid and alkaline phosphatase enzyme activities in surface soil amended with poultry litter and dissolved P concentrations in runoff water.

A multifaceted approach combining innovative molecular techniques with traditional cultivation techniques will be used to assess the development and persistence of antibiotic resistant microorganisms in runoff water. DNA fingerprints of bacterial communities will be generated and compared to DNA fingerprints of antibiotic resistant bacteria cultivated from runoff water. Additionally, measurements of microbial biomass and phosphatase enzyme activities will contribute to our understanding of how biological activity in soil influences soluble P availability in runoff. The information collected in this research project will enhance the current state of knowledge concerning biological processes controlling the environmental impact of poultry litter amendments.

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