



Title: Determining Sources of Fecal Contamination of Surface Water Using Antibiotic Sensitivity Patterns

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Theme: Animal Waste Management

Situation: To make effective site-specific agricultural manure management recommendations, an analytical approach is needed that controls for the interaction between manure management and the geophysical characteristics of the location. Determining the nature and magnitude of the risk and interactions between risk factors will provide essential background data for the development of practical and efficient manure management programs that reduce both eutrophication and bacterial hazards from livestock waste, protecting both environmental concerns and human health.

Objectives: To develop techniques to apply discriminant analysis as a low-cost routine monitoring method for determining the source species for fecal contamination of surface water. To identify manure management practices on agricultural operations that are associated with an increased fecal contamination of surface water. To develop a manure management education program to reduce fecal contamination of surface water.

Methods: Surface water sampling and collection of fecal samples was conducted from Michigan's Red Cedar River and several rivers on Maryland's Eastern Shore. E. coli isolates from approximately 3000 water and fecal samples have been cultured and antibiotic sensitivity profiles developed using the Baur-Kirby disc diffusion technique. A sample of isolates has also been ribotyped, to source identification techniques. Multivariable linear regression modeling was used to evaluate the association between manure management and water contamination.

Partnerships: The University of Maryland, Michigan State University, West Virginia University and University of Washington. The Michigan and Maryland Departments of Natural Resources, Michigan Department of Health, Maryland Cooperative Extension Service and Delmarva Poultry Industry Inc.

Research: A database of 3000 E. coli isolates has been developed. Which will serve as a valuable source of data for future projects. Two graduate students have been supported by this grant. Findings from this project have been presented at several conferences, including the Southeastern Seafood Conference, the Conference of Research Workers in Animal Disease and the International Symposium on Veterinary Epidemiology and Economics. Outreach activities have included presentations to Delmarva Poultry Industry, Chesapeake Bay Foundation, Maryland Cooperative Extension, and the Regional EPA.

Resources: Faculty salary support provided by University of Maryland, Michigan State University, and West Virginia University. Maryland Agricultural Experiment Station funded preliminary data. The Michigan and Maryland Departments of Natural Resources and Health provided personnel.

Results: Using a database of antibiotic sensitivity profiles from approximately 2500 fecal samples, discriminant and quadratic function analyses failed to achieve an acceptable correct classification rate. Multiple Analysis of Variance indicates that there is a significant difference in the population distributions of the antibiotic sensitivity patterns by species. More than 50% of the E. coli isolates obtained from the surface water samples were most similar to wildlife isolates. Further study is needed to determine the proportion attributable to humans, wildlife, and agriculture.



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