



Lincoln University

College of Agriculture, Environmental and Human Sciences

Escherichia coli Genetic Markers for Water Safety

Escherichia coli (E. coli) is a fecal bacteria indicator. It is used in testing worldwide to determine water quality and manage water safety.

E. coli is used because it is a part of the bacteria living in the intestines of warm-blooded animals. However, a significant part of the global *E. coli* population might come from outside the body. These “environmental” *E. coli* can be a factor in the high number of *E. coli* in water. This causes false alarms of fecal pollution. Thus, methods must be developed to tell the difference between enteric (in the intestine) *E. coli* and environmental *E. coli*.

Research Methodology, Results and Impacts

This project studied the genetic differences between enteric and environmental *E. coli*. The gene *ycjM* (thought to relate to glucosyltransferase, a function-unknown enzyme) is often found with the enteric *E. coli* that are found in feces. A new polymerase-chain-reaction (PCR) method was developed using this gene as an indicator for the presence of enteric *E. coli*. In other words, presence of *ycjM* gene (determined by the PCR method) in water is indicative of fecal pollution. This new approach is better than the current practice. Also, another new PCR method was created to find the source of the *E. coli*—whether from humans or



Collecting water samples.

other sources. This has been achieved, because human-associated *E. coli* has the unique fragment in its *ycjM* gene and the fragment can be detected by the new PCR method. Using such methods can better protect people from diseases that result from human feces-polluted water.

Environmental *E. Coli* causes false alarms.



Future Research

The two new methods were tested locally with fecal samples from farms and sewage water treatment plants in City of Columbia and Jefferson City, Missouri. They need to be verified using samples collected from a variety of locations nationwide.

This study is funded by the United States Department of Agriculture (USDA) - National Institute of Food and Agriculture (NIFA). The project is a joint effort of scientists from Lincoln University of Missouri, University of Missouri, Missouri State Parks and a local environmental group, Lake of the Ozarks Watershed Alliance. The project addresses the NIFA priority areas of "Sustainable Environment" and "Food Safety."

**For more information, contact
Project Director,
Dr. Guolu Zheng,
Principal Investigator,
ZhengG@LincolnU.edu or
(573) 681-5109.**