WATER QUALITY

Assessment of Bacterial and Viral Contamination in Burns Ditch and Lake Water in Northwest Indiana

Objectives

- To study the sources and contamination levels of enteric bacteria and viruses in Burns Ditch, one of the most polluted streams that flow into Lake Michigan in Northwest Indiana;
- To determine the impact of the pollution of Burns Ditch on the microbial quality of lake front water off West Beach, located three kilometers west of the water outfall;
- To use a molecular approach to detect viruses in stream and lake waters; and
- To use a computer-based image analysis system to determine the quantity of viruses in water samples.

Methodology

Stream and lake water samples from five field sites were collected on three west days and four dry days. Water temperature, ambient temperature, specific conductance and pH values were measured in the field simultaneously with water sample collection for analysis. Local rainfall data were obtained from Lake Michigan Ecological Station, National Biological Survey. Bacterial studies completed include the enumeration of both *E. coli* and *Bifidobacterium. E. coli* levels in all five field sites were higher on wet days than those on dry days. The results of *Bifidobacterium* study revealed that the organism is not a good indicator for monitoring fecal pollution in stream and lake waters.

Viral detection studies were expanded to include enteroviruses in addition to specific polioviruses. Experiments on several different techniques were performed and critically evaluated to determine the most suitable one for this project. A positive charged filter system (1 MDS) and the beef extract-glycine (BEG) solution were used for initial adsorbing and eluting viruses, respectively. For viral concentration, two methods were chosen: (1) celite precipitation and (2) acid flocculation. An integrated cell culture-PCR method was determined to be the most effective method for viral detection. The interim cell culture was used to propagate the concentrated viruses and reduce the contaminated substances which may inhibit RT-PCR. RT-PCR amplified viral DNA was separated by agarose gel electrophoresis and confirmed by dot blot and Southern blot. One water sample collected at site 3 on one of the west days (August 18, 1997) showed positive contamination of polioviruses and possible other enteroviruses.

Accomplishments

The results of bacterial analysis indicated that the *E. coli* levels in stream and lake waters were higher on wet days than those on dry days. A suitable medium (TGYPA) for growing *Bifidobacterium* was determined; however, the experimental results revealed that this bacterium is not a good indicator for fecal pollution assays for stream and lake waters. An integrated cell culture-PCR technique was proven to be the most effective method for viral assays. One water sample collected at site 3 one of the wet days was tested positive to both polioviruses and enteroviruses. Three papers directly concerning this project were presented at the professional meetings during the past three years. Five graduate students and one undergraduate student were actively involved in this project.

Benefits

The viral detection technique is useful for detecting water-borne enteroviruses. Through technology transfer, this method may be adopted by environmental agencies for monitoring water safety of Lake

Michigan and the associated streams.

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Research Information

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