



How do we determine when the beaches are safe for swimming?

The use of Lake Erie and other public waters for swimming is a valuable recreational resource for the people of Ohio and elsewhere in the United States. Water-resource managers and the scientific community have recognized the need for rapid methods to determine the quality of these recreational waters to adequately protect public health.

During 1995, United States ocean, bay, and Great Lakes beaches were either closed or under no-swimming advisories on more than 3,522 occasions (Natural Resource Defense Council, 1996).

Fecal-indicator bacteria, such as *Escherichia coli* (*E. coli*) and fecal coliforms, are used to determine the risk of contracting waterborne disease from fecal-contaminated recreational waters. Fecal-indicator bacteria are not necessarily pathogens (disease-

causing organisms), but their presence can indicate the possible presence of pathogens. Although improvements to existing sewage treatment systems are continuously being made in many areas, fecal contamination is still a possibility. Therefore, findings from carefully designed monitoring programs are needed to inform the public on the risk of swimming in fecal-contaminated waters.

Current methods to assess the concentrations of fecal indicators—that is, the number of bacteria in a certain volume of water—take at least 24 hours to complete. Due to the long time frame, some scientists have suggested using other water-quality or environmental surrogates (substitutes) to determine these concentrations. The U.S. Geological Survey (USGS) is working to address this concern in a study conducted at three Lake Erie beaches in the Cleveland, Ohio, area. The study has shown that turbidity (the amount of light scattered or absorbed by suspended materials in a water sample), rainfall, and wave height could be used in a statistical model to predict *E. coli* concentrations.



What are the problems with current methods to evaluate beach-water quality?

As noted, it takes at least 24 hours to determine whether or not a health-risk warning needs to be posted due to unsafe levels (concentrations above the state standard) of a fecal indicator in recreational waters. These methods involve culturing bacteria in a laboratory setting. Fecal-indicator concentrations may change dramatically between the time of sampling and the reporting of results. This means that the beaches may be posted with a warning when the bacterial water quality has already returned to safe levels. However, this also means that a warning may not be posted on a day when the bacterial water quality exceeds the state standard.

How can we improve these methods?

In the Lake Erie study, USGS scientists looked at using water-quality and environmental surrogates in a beach-specific statistical model to estimate *E. coli* concentrations. This statistical method, which uses turbidity, rainfall, and wave height, can provide results of recreational-water-quality conditions in 2 hours, as compared to the 24 hours needed by the current methods of culturing bacteria.

What needs to be done next?

Future research is focusing on improving and testing the use of water-quality and environmental surrogates as inputs to statistical models to predict recreational water quality. The USGS is working with local agencies in planning the next phase of these studies designed to assist water-resource managers who are responsible for alerting the public about the quality of recreational water in a timely and accurate manner.

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The Lake Erie study was done by the USGS in cooperation with Ohio Water Development Authority, Northeast Ohio Regional Sewer District, Cuyahoga County Board of Health, Cuyahoga County Sanitary Engineers, Cuyahoga River Community Planning Organization, and the Ohio Lake Erie Office.

Information on technical reports and hydrologic data related to the Lake Erie study can be obtained from:

U.S. Geological Survey
Attn: Information Officer
975 W. Third Ave.
Columbus, OH 43212
(614) 469-5553
<http://www-oh.er.usgs.gov>

Reference

Natural Resources Defense Council, 1996, Testing the waters—
Volume VI: New York, 116 p.



USGS scientists collect and record turbidity and wave height data at Sims Park, Euclid, Ohio.