



THE KNOWLEDGE BASE

The Tide Is Shifting

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The Beaches Environmental Assessment and Coastal Health Act of 2000 requires coastal states and those surrounding the Great Lakes to adopt by 2004 the Environmental Protection Agency standards for monitoring beach water quality.

No longer will beach operators be able to test water quality using *total* and *fecal coliform* levels.

The act also requires weekly testing of swimming waters, as well as public notification of waters containing dangerous levels of bacteria.

Grant funding is available to states through 2005 to create and maintain monitoring and notification programs.

While the act specifically addresses coastal waters, including the Great Lakes, the EPA guidelines released in 1986 also cover bacteria monitoring of freshwater beaches. Many states, including Massachusetts, already have revised their standards for water quality testing to reflect EPA recommendations for freshwater testing.

Beach testing

The result of these changes has been a dramatic increase in the number of temporary beach closings, including some in areas that previously had never been closed. These closings are due in part to the new testing criteria, more frequent testing and better reporting mechanisms.

Under EPA guidelines, beach operators must test all public ocean beaches for bacteria each week, using the enterococcus indicator organism. Freshwater beaches must be tested weekly for either *enterococci* or *Escherichia coli* (*E. coli*). Each of these tests provides an indicator of the presence of potentially disease-causing pathogens.

The EPA guidelines establish a two-tiered system for monitoring water quality. First, single-sample test

Fresh Water

Indicator Organism	Single Sample Not to Exceed	Five-Sample Geomean Not to Exceed
<i>Enterococci</i>	61 colonies/100ml	33/100ml
<i>E.coli</i>	235 colonies/100ml	126/100ml

Marine/Ocean Water

Indicator Organism	Single Sample Not to Exceed	Five-Sample Geomean Not to Exceed
<i>Enterococci</i>	104 colonies/100ml	35/100ml

results cannot exceed a specified number of bacteria colonies per 100/ml sample. If they do, the beach must be closed to swimming. Secondly, the geometric mean (“geomean”) of the most recent five samples must not exceed a much lower threshold.

Thus, beaches that pass the single-sample test with close-to-threshold levels are likely to fail the geomean requirement. To avoid lengthy closures, beach managers will need to resample frequently, with the hope of bringing the geomean back to acceptable levels. Because lab expenses can range from \$25 to \$250 per sample, water testing can quickly become costly.

While both the *enterococcus* and *E. coli* tests are recommended for inland water bodies, experts concur that the *enterococcus* test provides a more conservative or sensitive indicator of the presence of potentially harmful bacteria — thereby affording the greatest degree of protection to the public.

However, because of the greater survival of *enterococci* vs. *E. coli*, it is very possible to have violations only of the *enterococcus* beach standard. This forces beach managers to choose whether to test for *enterococci*, which is likely to result in a greater number of closures, or to test using the less protective but equally accepted *E. coli* standard. In some instances, beach managers must balance the moral obligation to provide safe facilities against the practical obligation to keep beaches open.

Playing detective

Before selecting a testing standard, you should first conduct a preliminary sanitary survey to identify potential sources of pollution. Examine historical data on bacteria levels, rainfall, storm-water runoff, combined sewer overflows and failed septic systems, as well as urban and agricultural effluents.

Understanding possible sources of pollution before the swim season begins will allow you to take steps to mitigate or reduce the introduction of contaminants into the swimming area.

While current analytical methods for measuring water quality are unable to distinguish between human and animal fecal contamination, anecdotal evidence suggests that *E. coli* criteria may be a practical choice, resulting in fewer beach closings where contamination is determined to be from waterfowl. In fact, one of the greatest contributors to elevated bacteria levels (in both water and sand) at many public beaches is waterfowl, including Canada geese and sea gulls. A year-round waterfowl control program could assist greatly in controlling geese populations at beach areas.

A challenge to water-quality monitoring is that current technologies allow results to be available only after a 24-hour incubation period. This means that the public may be swimming in water that could be potentially harmful while management awaits test results from the lab.

Similarly, beaches may remain closed following a failed water sample even though bacteria levels may have fallen below the threshold limits. This is particularly true at ocean beaches, where changing tides every 12 hours wash bacteria away from the beach at least twice while the water sample is being tested.

Upon noticing high bacteria counts (24 hours after sampling), the beach operator must close the beach to swimming, causing swimmers to select other beaches. However, it is very likely that changing tides may have carried bacteria from one beach to another along the coast. In essence, people are prohibited from swimming in waters now within accepted bacteria limits and instead are sent to areas that may have developed unacceptable bacteria counts.

Until technology develops a “real-time” test, public education becomes a critical factor in

protecting the public health and safety.

Safety suggestions

The U.S. Centers for Disease Control and Prevention recommend that persons with diarrhea stay out of water shared by others. Also, swimmers should always avoid swallowing water at beaches and pools because many recreational water illnesses are spread by accidentally swallowing water contaminated with fecal matter. Beach operators must stress public education through signage, announcements and interpretive programs. Additional public information is available online at www.healthyswimming.org and www.epa.gov/OST/beaches.

Not only should the public be taught specific practices to avoid contamination, but beach operators also should provide clear public notice whenever bacteria levels exceed limits. “No Swimming” signs should be posted.

Beach operators ought to consider implementing a flag system, too. A green flag with the universal symbol for swimming would be appropriate when the beach is open for swimming. A red flag with the universal “no swimming” symbol should be flown whenever elevated bacteria levels close the beach.

Beach operators should carefully work with members of the public and their local/state health agencies to survey swimming areas. Together, they can isolate possible sources of contamination and determine which indicator organism should be used for testing purposes.

A carefully monitored system of sample collection should be planned to incorporate training in proper sampling procedures and documentation of environmental conditions at the time of sampling, as well as to address chain of custody concerns.

Beach operators should research local costs of testing (and retesting) swimming waters to determine budgetary needs. A system of storing lab results and monitoring geometric mean calculations should be developed, and a means of notifying the public of elevated bacteria levels must be in place before the start of the swim season.

For Additional Reading

■ The Beaches Environmental Assessment and Coastal Health Act of 2000 is available at www.epa.gov/ost/beaches/beachbill.pdf

■ Information on grant funding through the EPA is available at www.epa.gov/waterscience/beaches/grants/index.html.

■ For more information on CDC recommendations and recreational water illnesses, visit www.cdc.gov/healthyswimming.

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