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Questions and Answers

What microorganisms could be in recreational water?

Recreational waters at ponds, lakes and coastal beaches are sometimes polluted by pathogens (bacteria, viruses and protozoans) from fecal contamination. These microorganisms can come from untreated sewer discharges (e.g. sewer overflows or sewage treatment plant malfunctions), failing septic systems, storm water, boat wastes, pets, wildlife (e.g. geese) and farm animals.

Why is this a concern?

Some of the pathogens found in contaminated water can cause minor illnesses such as gastroenteritis (characterized by vomiting, diarrhea, abdominal pain or fever) or upper respiratory (ear, nose and throat) infections to exposed swimmers. Highly polluted water can occasionally cause more serious diseases such as typhoid fever, dysentery, hepatitis and cholera. To protect public health, beaches must be closed, or an advisory posted, when the potential for fecal contamination is too high.

What are indicator bacteria and where do they come from?

Public health agencies use measurements of fecal indicator bacteria such as *E. coli* or enterococci to determine the potential for fecal contamination and to compare to public health-based thresholds. Like the pathogens they represent, fecal indicator bacteria are found in feces of both human sources (e.g. sewer discharges, and failing septic systems) and non-human sources (e.g. pets, waterfowl, and farm animals). Indicator bacteria are used because it is difficult to measure the actual pathogens themselves.

What levels of indicator bacteria are considered acceptable?

Based on studies conducted in the 1980s, EPA has determined that a *geometric mean* (a measure of an overall average) in samples from recreational waters of less than 126 *E. coli* per 100 milliliters (ml) of fresh water or 35 enterococci per 100 ml of salt water is acceptable for protection of swimming. The geometric mean should be calculated from more than five samples within the previous 30 days. If a single sample exceeds 235 *E. coli* per 100 ml in freshwater and 104 enterococci per 100 ml in salt water, EPA recommends that the beach be closed, or posted, for swimming until levels are lower. (Some states, such as New Hampshire and Vermont, recommend that advisories be posted at more protective levels of indicator bacteria.) Because elevated fecal indicator bacteria are often associated with storm water runoff, some agencies post beaches preemptively if rainfall exceeds a set amount, based on site-specific studies.

What laboratory methods are recommended for indicator bacteria?

There are several EPA-approved laboratory methods for measuring the abundance of *E. coli* or enterococci in recreational waters. These methods generally take 24 or 48 hours before a result is known. EPA recommends that 24 hour methods be used to minimize the time between sample collection and swimmer exposure. EPA approved 24 hour membrane filtration methods are available at the [Analytical Methods web site](#). Alternative popular 24 hour tests, such as the multiple-well fermentation tests for enterococci and *E. coli* (Enterolert® and Colilert®, respectively) manufactured by IDEXX Laboratories (Westbrook, ME) are also approved for recreational waters.

How should beaches be monitored?

State public health or environmental agencies are ultimately responsible to determine appropriate regulations and protocols for beach sampling and closure thresholds, based on EPA recommendations and their own experience.

EPA recommends that the frequency and locations for sampling depend on the size of the beach, the amount of use, potential pollution sources, and the history of beach closures. For most beaches, EPA recommends water quality sampling at least once weekly during the swimming season before, during or right after high swimming activity (usually on the weekends). In addition, testing should be conducted after rain events, which often result in elevated indicator bacteria levels. For beaches with chronic water quality problems, samples should be collected more frequently. For beaches with low potential for pollution sources, and a demonstrated history of clean water, a less frequent sampling regime is sufficient.

Samples should be collected in areas of high bather density, and between swimming areas and potential pollution sources. To better characterize the water quality at a beach, multiple samples should be collected at longer beaches. Both Connecticut and Rhode Island recommend that two samples be collected if the linear length of the beach is greater than 300 feet, and three samples if greater than 700 feet. New Hampshire recommends that two samples be collected at each beach; three samples if the beach length is greater than 100 feet.

EPA recommends that water samples be collected in water between knee and waist depth (about three feet). Samples should be collected between six and twelve inches below the surface, and no greater than one foot from the bottom. Recent research has indicated that indicator bacteria are slightly more abundant in shallower waters, possibly due to resuspension of sand or sediment.

Samples should be collected in the morning for two reasons. Given the 24 hour laboratory incubation time, this allows health authorities sufficient time to post a beach before swimmers are exposed. In addition, recent research has suggested that indicator bacteria are slightly more abundant in the morning, than in the afternoon.

Who monitors beaches and makes decisions on posting advisories?

Ponds, lakes and coastal beaches are usually regulated and monitored by State or local authorities. If a beach is town-owned and operated, usually the town (or district) health department monitors the water quality and closes the beach (or posts an advisory) if indicator bacteria levels exceed the public health-based thresholds. In some cases, a sewer district may be responsible for monitoring water quality at beaches. If the beach is state-owned or operated by a state park, the state usually monitors the beaches on a regular basis. For example, the state of Connecticut routinely monitors beaches at its state parks, and the Metropolitan District Commission in Massachusetts monitors beaches under its jurisdiction in the Boston area. In addition, the U.S. Army Corps of Engineers is responsible for monitoring water quality in the twelve New England reservoirs in which beaches are maintained and the National Park Service is responsible for monitoring water quality at Cape Cod National Seashore and Acadia National Park beaches.

How do I find out if a beach is posted or closed?

Most beaches will have a sign or a flag indicating the status of the beach. State public health agencies have also established web sites or telephone hot lines to notify the public of water quality conditions (see " [Beach Monitoring Programs](#)"). Some states issue press releases to the media to announce whether a beach has been posted, or re-opened after a closure.

Who should I contact for more information for the beaches in my state?

For EPA New England beach staff and related web sites: [EPA Contacts](#).

For state beach staff and links to information on beaches in your state: [Beach Monitoring Programs](#).