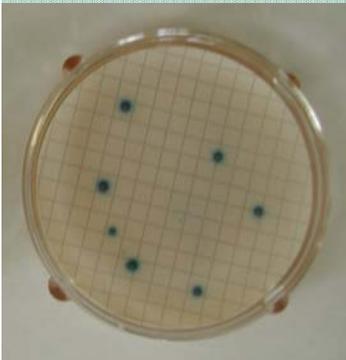


Summer 2011
Ocean County, NJ USA



New Jersey Marine Bathing Beach Demonstration Project Using Quantitative Polymerase Chain Reaction (qPCR)



How is beach safety evaluated?

Rather than testing beach water for every potential disease-causing microorganism, public health officials test for a subset of organisms that may affect public health. Traditional testing involves collecting a water sample and growing bacteria in a laboratory and counting the total number of organisms found. This traditional method takes approximately 24 hours to obtain results.

So, what's the problem?

Since current testing methods require about 24 hours for results, swimming bans and advisories are based on what conditions were at the beach yesterday. Studies have shown that most sources of contamination are intermittent and may last less than one day. At beaches where water quality may be impacted by non-point sources of pollution and rain we need quicker results to protect public health.



Is there a solution?

Yes, rapid methods are available that produce results the same day water samples are collected. qPCR is the most promising rapid method to date. This technology decreases the testing time by detecting and quantifying DNA from the microorganism of interest, rather than waiting a day for them to grow. That way bathers are warned and beaches are closed in a timely manner, when the water quality is actually impacted.

What is qPCR?



Just about all living things contain DNA (deoxyribonucleic acid). DNA is material that determines our eye color, hair color, and all of our other traits. All living organisms including plants, animals and bacteria have DNA and all species contain a portion of DNA code that is unique. The DNA of bacteria at beaches will be detected using a qPCR instrument called a thermal cycler. Basically, a thermal cycler is a DNA photocopying machine. Using qPCR at beaches will target the bacteria's unique sequence of DNA and replicate, or makes copies of, that portion of DNA and give a result of the amount of bacteria present in the water sample. This process can happen in as little as 4 hours.

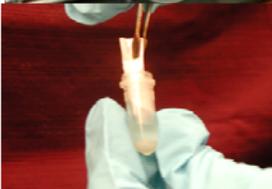
What is the qPCR process?



1: Collect water sample



2: Filter water sample onto membrane filter



3: Place filter into small tube with glass beads



4: Extract DNA; Add reagents, remove DNA from filters and centrifuge sample



5: Add chemicals and reagents



6: Place small amount of treated sample into reaction tube



7: Place reaction tube into thermal cycler



8: Each time a DNA copy is made a fluorescent signal is given off. **Results available in as little as 4 hours.**

Why qPCR?

Congress required USEPA to evaluate rapid methods for measuring bacteria at bathing beaches. Although method development is still ongoing, qPCR has shown promise as a more rapid beach water quality monitoring tool. In anticipation of further use of this technology, USEPA, NJDEP, and the Ocean and Monmouth County Health Departments have collaborated on rapid-method studies at a subset of beaches and bays in Ocean and Monmouth Counties. These studies have been conducted each summer from 2007 to 2010 to assess the feasibility and variability associated with this new technology. Available reports can be found at the following websites:

2008 Study Report:

www.epa.gov/region02/water/oceans/2008Report_QPCR_NJ_Final_Jan2010.pdf

2007 qPCR Study Fact Sheet:

<http://www.epa.gov/region02/water/oceans/BeachStudyFactSheet2007.pdf>

What is planned for Summer 2011?

A demonstration project is planned during the 2011 summer beach season which will monitor 4 bathing beaches in Ocean County, NJ. Samples will be collected and analyzed using the traditional 24-hour test method and the new qPCR method. Results will be available the same day for the qPCR samples.

For more information please visit the NJDEP website: www.njbeaches.org or contact:

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