MARYLAND
Department of the Environment

Facts About...

BACTERIOLOGICAL WATER QUALITY MONITORING

Why is Maryland Department of Environment (MDE) collecting bacteriological water quality data?

The federal Clean Water Act requires MDE to establish water quality standards, to monitor water quality and to assess attainment of these standards. Waters of the State identified as not meeting bacteriological water quality standards are listed on the Maryland 303(d) list of impaired water bodies. MDE is required to develop pollution budgets (TMDLs) for improving water quality for impaired water bodies by establishing pollutant goals and control targets.

What are Maryland Bacteriological Water Quality Standards?

Water quality standards vary depending on how a body of water is used. In Maryland, we have different standards for shellfish harvesting areas, swimming beaches and water contact recreation. The standards are established in the Code of Maryland Regulations, and are based on recommendations from the National Shellfish Sanitation Program and the Environmental Protection Agency (EPA).

Regular monitoring of water quality allows us to detect fecal pollution from human or animal waste in surface waters, and thus to evaluate and minimize the risk of human exposure to harmful pathogens. It is impossible to monitor all potential pathogens in water, but by watching for certain indicator organisms, we are able to assess health risk. In the past, we used fecal coliform for shellfish waters and recreational waters, and enterococcus or *E. coli* for swimming beaches. However, we changed our standards, following EPA guidance, and now use enterococcus/*E. coli* in all recreational waters.

What information is being collected for water bodies not meeting bacteriological water quality standards?

MDE routinely monitors fecal coliform in shellfish harvesting waters year round. Local health departments collect water samples at bathing beaches during the summer. Routine bacteriological water quality monitoring has been conducted for fresh water (non-tidal) streams and rivers through the Maryland Core/Trend monitoring network. MDE is conducting intensive (short term, one year) monitoring to address almost all of the listed non-tidal bacterial impaired water bodies. The non-tidal intensive monitoring began in November 2002 and was completed in November 2004.

How is Maryland determining the sources of bacteria?

Since the indicator organisms (fecal coliform, enterococcus or *E. coli*) used to monitor bacteriological water quality do not identify the source of fecal pollution, MDE is using bacteria source tracking (BST) to determine the relative contribution of bacteria from various categories of sources. BST is a new and innovative method of estimating bacterial sources and is based strongly on field collected information, laboratory and statistical analysis. There are several different BST methods to choose from. Maryland is using the Antibiotic Resistance Analysis (ARA) Bacteria Source Tracking methodology.

How does Antibiotic Resistance Analysis (ARA) Bacteria Source Tracking work?

This method uses enterococci patterns of antibiotic resistance for identifying bacteria sources. The premise is that human fecal bacteria will have a high level of resistance to certain types of antibiotics, while domestic animals will have lesser resistance, but to a different suite of antibiotics and concentrations. Wildlife is expected to have little resistance to any antibiotic, since they are usually not exposed to any.

For this method to be applied, a source library must be developed, using scat (feces) samples from potential contributors in the watershed (human, livestock, wildlife, etc). The known sources are analyzed for antibiotic resistance. The antibiotic resistance patterns in the source library are tested with known sources to calculate the "confidence" in the library, which is the rate at which the known bacteria sources are correctly classified. The unknown antibiotic resistance patterns in water samples are then compared to the source library to estimate the contributing sources in the water sample. It is important to note that ARA of water samples is not able to determine the specific geographic location of the source, only the relative contribution of sources in the water samples collected.