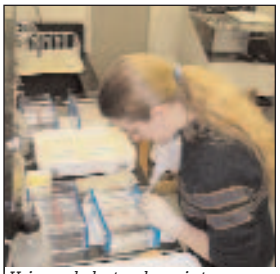
Straight to the Source: Researchers test a new technique to track the source of microbial contamination in watersheds.

Challenge

Agricultural, wastewater, and stormwater runoff containing pathogenic viruses and bacteria causes thousands of beach and shellfish bed closures each year. While these microbes pose a significant risk to human health and the environment, their sources are difficult to pinpoint. Traditional methods of measuring contamination quantify the concentration of microbes in a water body, yet they offer no clues about the source of the contaminant. Knowing the source of a pathogenic bacteria—be it human or from a wild or domestic animal—is key to making proper management decisions. In this project, researchers explored the effectiveness of ribotyping as a method of tracking the source of contaminants.



Using gel electrophoresis to separate DNA.

Science

DNA Fingerprinting

Each bacterial strain has a genetic "fingerprint" by which it can be recognized. Scientists can distinguish, for example, human-specific from cow-specific bacterial strains, by comparing their DNA. When genetic material is run through the ribotyping process, it produces an image, showing the bacteria's unique "fingerprint." By comparing this to a database of genetic fingerprints of bacterial strains from known sources, scientists can identify the source of the unknown contaminant.

The ribotyping "fingerprint' for *E. Coli*

The Approach

Investigators sampled water from the Webhannet and Little River watersheds in Southern Maine, and collected fecal material found in each area. Water samples that tested positive for bacterial contaminants, specifically *E. coli,* were run through the ribotyping process. The resulting images were compared to regional and watershed libraries of bacterial fingerprints to find matches, and identify the sources.

A Volunteer collects samples from the Webhannet watershed in Wells, Maine.

Results

In both watersheds, people, pets and livestock account for approximately 40 % of contamination. Wild animal sources were also significant contributors. Researchers determined that while ribotyping represents a significant advance in identifying sources of fecal contamination, its considerable expense makes it advisable only for highly targeted testing (such as for shellfish beds), establishing baseline data, and conducting short-term regional sampling.

Application

Outreach: A Fundamental Component of Prevention

Investigators are conducting extensive outreach work, teaching managers in the northeast and other areas how to integrate microbial source tracking/ribotyping techniques into their existing monitoring programs. Project staff have given over 30 presentations to local, state, regional, and national audiences.

Managing the Webhannet and Little Rive Watersheds

Since the project's inception, a steering committee representing community, municipal, regional, state, and federal interests has worked closely with researchers to guide the project in each watershed. Members of the committee helped to draft remediation strategies best suited to the needs and resources of the communities involved. To implement these strategies, committee members and researchers are cooperating with state agencies, municipalities, and legislators to fill in data gaps, revise local ordinances, and discuss future steps in contaminant prevention and control.

Project Essentials

Title: Microbial Source Tracking in Two Southern Maine Watersheds

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