PATHOGENS

Introduction

The LISS identified two major questions that the pathogens component of the LIS Monitoring Program should address.

- What is the geographic extent, temporal duration, and frequency of pathogenic contamination affecting the use of Long Island Sound's bathing beaches and shellfish beds?

- What are the sources of pathogens affecting the uses of Long Island Sound and its resources?

The pathogens work groups at both workshops agreed that these are appropriate questions for the Long Island Sound Monitoring Program.

Background

The Management Conference recommended that management actions be taken to control the major sources of pathogens and that site-specific management plans for each harbor, embayment, or discrete shellfish bed area be developed and implemented. This can be best accomplished by directing priority attention at four categories of source control in the following order: combined sewer overflows, nonpoint source runoff, sewage treatment plant malfunctions, and vessel discharges. These and other sources of pathogens should be identified by conducting site-specific surveys leading to better control of local sources of pathogens.

Minimalist Program

Programmatic Monitoring

The LISS management plan highlights within tables specific actions to manage pathogens. Following are general programmatic areas for which progress must be tracked and evaluated.

- The implementation of CSO abatement programs in Connecticut and New York according to developed schedules.

- The development of general stormwater permit programs in New York and Connecticut according to national regulations.

- The number of enforcement actions against malfunctions at sewage treatment plants that result in improperly treated municipal discharges.

- The creation of No Discharge Zone, development and implementation of best management practices at marinas, and number of boat pump-out facilities available as part of efforts to control waste from vessel discharges.

Environmental Monitoring

There are a number of state and local agencies which already conduct extensive monitoring programs for both the certification of shellfishing areas and bathing beaches. To avoid duplication of effort and to conserve

scarce resources, the pathogens component of the LIS Monitoring Program should rely on these agencies for data. It was noted, however, that there are differences among the agencies in the indicators used and in the sampling frequencies. Steps to reconcile these differences are outlined in the following section.

Measuring Enterococci Concentrations in Bathing Waters

Where: The Working Group recommended that NY agencies also measure *Enterococci*, at least off Long Island Sound beaches.

How: The group strongly recommended that the two States use the modified mE method (1,2). The group does not recommend that NY must necessarily adopt *Enterococci* as a new standard.

Why: In New York State, the concentrations of Total and Fecal coliforms are used to determine bathing water quality, whereas in Connecticut, the concentration of *Enterococci* is used. NY should also measure Enterococci for two reasons: (1) epidemiological studies have shown a correlation between *Enterococci* levels in bathing waters and the incidence of gastroenteritis in swimmers (and no such correlation has been shown for other fecal indicators); and (2) *Enterococci* measurements off New York beaches

would allow comparison of New York data with those from Connecticut.

Pathogens Monitoring in Shellfish

The Working Group recommended that the current pathogens monitoring programs in New York and Connecticut be adopted by the LIS Monitoring Program.

How: Both states must follow National Shellfish Sanitation Program (NSSP) guidelines to allow the interstate shipment of shellfish harvested from their waters.

Why: The NSSP specifies which indicators are to be used, sets limits on indicator levels and requires sampling under the "worst" hydrographic and pollution conditions -- those conditions that would maximize concentrations of indicator organisms. The NSSP also requires that areas must be closed if they are not sampled periodically by state agencies.

The group also recommended the periodic re-evaluation of closed shellfishing grounds, if hydrographic and pollution conditions improve significantly.

Paralytic Shellfish Poisoning (PSP)

Where: In addition to the ongoing state monitoring programs, the group recommended that a few stations should be established for the purpose of monitoring for PSP. There is an existing program in Connecticut to monitor shellfish for PSP, primarily in a few harbors rather than in Long Island Sound. The details of the monitoring program need to be determined. New York State has proposed a program but currently funding is not available.

How: The blue mussel should be tested, and the mouse bioassay should be used to detect the presence of the toxin.

Why: This is a precautionary aspect of the monitoring program to prevent potential health problems.

Citizens' Monitoring

Trained volunteers could assist in collecting rainfall data to be used in developing a rainfall model (see research recommendation #4).

Desirable Additions

The Pathogens work group recommended the following areas of research in order of decreasing priority.

- For nonpoint sources of pollution, methods are needed to differentiate between pathogens from human sources and those from non-human sources. One possible approach might be to sample waters for the F+ male-specific phage as a preliminary assessment in highly populated areas. If the results are positive, appropriate tests should be run to determine human vs. non-human sources of contamination (e.g. perhaps attempt to identify the Norwalk virus). The problem: currently used bacterial indicators do not allow investigators to identify unambiguously nonpoint sources of human fecal contamination such as illegal connections to storm drains or faulty septic systems, nor do they allow a proper assessment of the public health significance of pathogenic contamination.

- Research is needed to assess the cleansing of viruses from shellfish. Shellfish are routinely relayed from contaminated waters to certified waters. This practice may not result in reduction of viruses. As a result, harvesters may be collecting shellfish from areas which have been designated as safe based on bacteriological data but that may not be safe based on viral indicators.

- Research is needed to develop localized rainfall models for correlation with pathogen indicator concentrations for bathing waters and shellfishing grounds. The problem: current procedures don't yield real-time information on pathogen

contamination (it takes a minimum of two days between rainfall/sampling and test results).

- Research is needed to determine the effects of methods of pathogen reduction (such as chlorination) on living marine resources in LIS. The problem: living marine resources may be adversely affected by current methods of disinfection -- chlorination may be forming chloramines, and possible adverse effects of other disinfection methods are unknown.

- Research is needed to determine the efficacy of chlorination in viral inactivation relative to other disinfection methods such as UV or ozonation. The problem: chlorination of sewage effluents may reduce bacterial indicators, but not viruses which are the pathogens of greatest concern for public health. NYCDEP is conducting a literature review of this topic as part of its SPDES requirement.

QA/QC

Protocols used by EPA, State programs and NSSP should be followed. Methods used by the two states should be reviewed and standard methods agreed upon. The LISS should conduct a workshop, as recommended in its management plan (p.89), to determine appropriate and consistent methods for bathing beach monitoring and laboratory analysis and work to adopt common methods.

Informational Products

"Red Flag" reports such as notices of beach closures, shellfish area closures and other health advisories should continue to be issued by the responsible local or state agencies. A "State of the Sound" synthesis report on long-term trends in beach closures and shellfish beds should be produced at least every two years. The Pathogens Working Group recommends that, for bathing beach data, the responsible health and/or conservation agencies should take an active role in developing these synthesis reports.

References:

(1). Levin, M.A., J.R. Fischer, and V.J. Cabelli (1975) Membrane Filter Technique for Enumeration of Enterococci in Marine Waters. Applied Microbiology 30:66-71.

(2). Dufour, A.P. (1980). Annual Meeting of American Society for Microbiology, Abstracts, Abstract Number 069.