Four-fifths of the population of the United States live in close proximity to the oceans or Great Lakes, and approximately 100 million Americans use the marine environment for recreation each year (Thurman 1994). Consequently, contamination of lakes, rivers, and coastal waters raises significant public health issues. Among the leading sources of chemical and biological contamination of these waters and associated beaches are sewer systems, septic tanks, stormwater runoff, industrial wastes, wastewater injection wells, cesspits, animal wastes, commercial and private boat wastes, and human recreation. In 1997, 649 beach closings or advisories were caused by sewage spills and overflows (NRDC 1998). In Florida alone, approximately 500 million gallons of sewage were released along the coast each year during the late 1980s (Neshyba 1987). Thus one of the primary concerns in public health is the risk that humans using the marine environment for recreational activities will encounter microbial pathogens.

The risk to human health due to recreational exposure—swimming where sewage contaminates marine waters, for example—has been documented (Cabell 1983, Rees et al. 1998). Studies conducted along beaches in Hong Kong reported that swimmers were at higher risk of gastrointestinal and respiratory illness and eye, ear, and skin infections than nonswimmers; not surprisingly, these risks were greatest at beaches known to be polluted (Cheung et al. 1990). Cheung and colleagues estimated that in 1990, approximately 58,000 episodes of illness in Hong Kong were the result of swimming at a single beach contaminated by sewage. In Great Britain, Alexander and colleagues (1992) concluded that children who swam in contaminated marine waters were more likely than those who did not to develop symptoms of illness. People who engage in other recreational activities, such as windsurfing, also face health risks in marine waters contaminated with human waste (Dewailly et al. 1986).

Although it is clear that those who use polluted marine waters for recreation have a higher risk of developing microbial disease than those who do not, no universal measurement of pollution in marine environments that reflects public health risk has been defined. For over 50 years the method of choice has been microbiological analysis of water samples using the “indicator concept.” The historical indicator concept, originally defined to assess drinking water quality, is based on the presence or absence of bacteria or groups of bacteria in a given body of water. The historical characteristics of the ideal water quality indicator are listed in the box on page 818. These indicator bacteria are typically found in the intestines of animals and humans and are shed in feces. The indicator itself...