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Comparison of total coliform, fecal coliform, and enterococcus bacterial indicator response for ocean recreational water quality testing

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ABSTRACT

In July 1999, California's ocean recreational bacterial water quality standards were changed from a total coliform (TC) test to a standard requiring testing for all three bacterial indicators: TC, fecal coliforms (FC), and enterococci (EC). To compare the relationship among the bacterial indicators, and the effect that changing the standards would have on recreational water regulatory actions, three regional studies were conducted along the southern California shoreline from Santa Barbara to San Diego, California. Two studies were conducted during dry weather and one following a large storm event. In each study, samples were collected at over 200 sites. Sites were selected using a stratified random design, with strata consisting of open beach areas and rocky shoreline, and areas near freshwater outlets that drain landbased runoff. During the dry-weather studies, samples were collected once per week for five weeks. For the storm event study, sampling occurred on a single day approximately 24 h following the storm. The three indicator bacteria were measured at each site and the results were compared to the single sample standards (TC >10,000; FC>400 and EC>104 MPN or cfu/ 100mL). EC was the indicator that failed the single sample standards most often. During the wet-weather study, 99% of all standard failures were detected using EC, compared with only 56% for FC and 40% for TC. During the summer study, EC was again the indicator that failed the single sample standards most often, with 60% of the failures for EC alone. The increased failure of the EC standard occurred consistently regardless of whether the sample was collected at a beach or rocky shoreline site, or at a site near a freshwater outlet. Agreement among indicators was better during wet weather than during dry weather. During dry weather, agreement among indicators was better near freshwater outlets than along open shoreline. Cumulatively, our results suggest that replacement of a TC standard with an EC standard will lead to a five-fold increase in failures during dry weather and a doubling of failures during wet weather. Replacing a TC standard with one based on all three indicators will lead to an eight-fold increase in failures. Changes in the requirements for water quality testing have strong implications for increases in beach closures and restrictions.

Full Text

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