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Water quality indicators and the risk of illness in non-point source impacted recreational waters

John M. Colford, Jr.[1], Timothy J. Wade[2], Kenneth C. Schiff, Catherine C. Wright[1], John G. Griffith, Sukhminder K. Sandhu[1], Susan Burns[1], Jackie Hayes[1], Mark Sobsey[3], Greg Lovelace[3] and Stephen B. Weisberg

[1]*University of California Berkeley, School of Public Health, Division of Epidemiology, Berkeley, CA*

[2]*United States Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Research Triangle Park, NC*

[3]*University of North Carolina, Chapel Hill, NC*

ABSTRACT

Numerous studies have demonstrated relationships between indicator bacteria and human illness at marine beaches impacted by point sources of pollution with known human fecal contributions, but extrapolating current water quality thresholds built upon these relationships at locations where nonhuman sources of fecal pollution is uncertain. A good example is Mission Bay, CA where tremendous resources have been expended eliminating human sources of fecal pollution, yet 20% of ongoing microbiological monitoring samples during dry weather exceed water quality objectives. This study answered two questions: 1) did water contact increase the risk of illness in the two weeks following exposure to water in Mission Bay? and 2) did the risk of illness increase with increasing levels of microbial indicators of water quality? Baseline health at the time of exposure and again two weeks later were measured in a cohort of 8,797 beachgoers during the summer of 2003. Nearly 2,000 water samples were analyzed for bacterial indicators (enterococcus, fecal coliforms, and total coliforms) using both traditional and non-traditional methods (chromogenic substrate or quantitative polymerase chain reaction), novel bacterial indicator (*Bacteroides*), and viruses (somatic and male-specific phage, adenovirus, Norwalk-like virus) and associations between water exposure and water quality indicators with health outcomes were assessed. While the incidence of diarrhea and skin rash were elevated in swimmers compared to non-swimmers, there was no statistically increased risk in 12 other symptoms measured, including highly credible gastrointestinal illness (HCGI). The incidence of illness was not associated with indicators traditionally used to monitor beaches nor with the non-traditional water quality indicators. These results contrast with most other recreational bathing studies, most likely because of the lack of human sources of fecal pollution.

Full Text

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