

Using rapid indicators for *Enterococcus* to assess the risk of illness after exposure to urban runoff contaminated marine water

John M. Colford Jr.^a, Kenneth C. Schiff^b, John F. Griffith^b, Vince Yau^a, Benjamin F. Arnold^a, Catherine C. Wright^a, Joshua S. Gruber^a, Timothy J. Wade^c, Susan Burns^d, Jacqueline Hayes^d, Charles McGee^e, Mark Gold^f, Yiping Cao^b, Rachel T. Noble^g, Richard Haugland^h and Stephen B. Weisberg^b

^aUniversity of California Berkeley, School of Public Health, Berkeley, CA

^bSouthern California Coastal Water Research Project, Costa Mesa, CA

^cUnited States Environmental Protection Agency, National Environmental Health Effects Research Laboratory, Chapel Hill, NC

^dUniversity of California Berkeley, Survey Research Center, Berkeley, CA

^eOrange County Sanitation District, Fountain Valley, CA

^fHeal the Bay, Santa Monica, CA

^gUniversity of North Carolina at Chapel Hill, Institute of Marine Sciences, Morehead City, NC

^hUnited States Environmental Protection Agency, National Exposure Research Laboratory, Cincinnati, OH

ABSTRACT

Traditional fecal indicator bacteria (FIB) measurement is too slow (>18 h) for timely swimmer warnings. Assess relationship of rapid indicator methods (qPCR) to illness at a marinebeach impacted by urban runoff. We measured baseline and two-week health in 9525 individuals visiting Doheny Beach 2007-2008. Illness rates were compared (swimmers vs. non-swimmers). FIB measured by traditional (*Enterococcus* spp. by EPA Method 1600 or Enterolert™, fecal coliforms, total coliforms) and three rapid qPCR assays for *Enterococcus* spp. (Taqman®, Scorpion-1, Scorpion- 2) were compared to health. Primary bacterial source was a creek flowing untreated into ocean; the creek did not reach the ocean when a sand berm formed. This provided a natural experiment for examining FIB-health relationships under varying conditions. We observed significant increases in diarrhea (OR 1.90, 95% CI 1.29 - 2.80 for swallowing water) and other outcomes in swimmers compared to non-swimmers. Exposure (body immersion, head immersion, swallowed water) was associated with increasing risk of gastrointestinal illness (GI). Daily GI incidence patterns were different: swimmers (2-day peak) and non-swimmers (no peak). With berm-open, we observed associations between GI and traditional and rapid methods for *Enterococcus*; fewer associations occurred when berm status was not considered.

Due to distribution restrictions, the full-text version of this article is available by request only.

Please contact pubrequest@sccwrp.org to request a copy.