

Simulated gastrointestinal risk from recreational exposure to Southern California stormwater and relationship to human-associated Bacteroidales marker HF183

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ABSTRACT

Stormwater may contain pathogens that pose a health risk to recreators. In this study, we use quantitative microbial risk assessment (QMRA) to simulate the human health risk associated with recreational exposure to stormwater using a regional dataset of pathogen concentrations measured over two wet seasons during wet weather events in Southern California, USA, a location where stormwater and sewage systems are separate. We model risk using a Monte Carlo simulation using *Salmonella*, *Campylobacter*, adenovirus, and norovirus concentrations in stormwater, the volume of water ingested during a recreational swimming event, and pathogen-specific dose–response functions. We estimated the median probability of illness from recreational exposure to stormwater to be approximately 190 illnesses per 1000 swimmers (19%). However, stormwater sampling sites are not always designated for recreational use, so we simulated exposures to diluted stormwater, which may be encountered in downstream receiving waters designated for swimming. We determined that if stormwater is diluted 18% into receiving, pathogen-free, ambient waters, the median health risk meets the US EPA's threshold of 32 illnesses per 1000 swimmers. At this dilution, the concentration of HF183, a human-associated fecal marker, is expected to be 100 copies per 100 milliliters. This study provides a risk-based threshold for HF183 concentrations in stormwater-impacted ambient waters from pathogen and indicator concentrations measured in stormwater. Implementing this risk-based threshold will require many policy considerations.

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