Assessing the Impact of Urban Runoff in Recreational Beaches in South Carolina and Florida Using Culturable and QPCR Fecal Indicators

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Abstract:
Urban/suburban runoff carries a variety of pollutants that often includes bacterial pathogens and indicators of fecal contamination. The objective of this study was to assess the microbial water quality of recreational beaches impacted solely by urban runoff through the use of culturable (enumeration of enterococci and *Pseudomonas aeruginosa)* and molecular (end-point PCR and qPCR for *Escherichia coli*, enterococci and *Bacteroidales*) methodologies. At each of three South Carolina beaches and two Florida beaches water samples and physico-chemical parameters were collected from three to five locations perpendicular to the shoreline. Sampling was also conducted at several locations in the ditch (swash) or storm drain stream directly impacting each SC beach. No storm drain discharge directly affected the FL beaches. Results indicate that although swash-associated (SA) beaches (i.e., SC beaches) had a higher concentration of enterococci (25-163 CFU/100 ml) than beaches with no direct urban drain inputs (12-20 CFU/100 ml), the counts did not always correlate with the high swash counts (163-654 CFU/100 ml). *P. aeruginosa* was detected in low concentrations during baseflow conditions (2-12 CFU/100 ml) only in SA-beaches. Enterococci and *P. aeruginosa* concentrations went up at the SA-beaches transects as the result of rain episodes of over 0.50". Regression analysis indicated a poor correlation between the qPCR enterococci 1 assay and the enterococci culture method across all sampling sites. Most of the detectable qPCR enterococci values were observed at the beach transects after storm events. Data suggest that correlations between qPCR and culture-based approaches can change dramatically from one beach site to another suggesting that site specific factors such as physico-chemical properties of the water matrix and the presence of a swash zone are important factors. High concentrations of fecal indicators in urban runoff sources (ditches) seem to impact beach waters when the beach is not protected by extensive pervious surfaces (i.e., long sandy shorelines) and/or transport is facilitated by measurable storm events.