Tides, Pollution, and Human Health: Exploring the Relationship Between Tidal Phases and Water Contamination in a Coastal Inlet

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Enterococci is a bacteria that is found in animal feces and is used by scientists as a measure of water quality. The Environmental Protection Agency (EPA) associates high enterococci colony counts (those that exceed 104 cfu per 100 mL) with polluted water that can cause sicknesses, such as skin disease, stomach illness, and irritation of the skin, eyes, and ears. This research project explores how tidal phases alter the water quality at coastal inlets and therefore impact health risks for swimmers. While environmental officials often warn the public of the health risks associated with swimming in local waterways after rain events, as rain can wash pollutants and sewage into waterways, officials do not offer similar health warnings regarding the relationship between water quality and tidal phases. This study hypothesizes that enterococci contamination at coastal inlets will be greatest during outgoing tides, when pollution is being carried from the land. The study also predicts that pollution will be lowest during incoming tides, when ocean water inundates coastal estuaries. To test these hypotheses, an original dataset was created that combined water quality results from the Loxahatchee River District WildPine Laboratory and tidal phase data from NOAA. The dataset includes the results from 272 water samples taken between 2014 – 2019 at the Jupiter Inlet (Palm Beach County, FL). The study found that during incoming tides, the enterococci count averaged 35, well lower than the EPA limit for safe swimming. During outgoing tides, the average enterococci count spiked to 107, which exceeds the EPA's level for safe swimming. The findings support the idea of using tidal phases as a tool for predicting water conditions in coastal areas.

Awards Won:

Drexel University: Full tuition scholarship