Title
Detection of Human Viruses in Coastal Waters of Southern California

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Detection of Human Viruses in Coastal Waters of Southern California

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Summary

Using a technique developed to track pathogens in sewage, Dr. Sunny Jiang of the University of California at Irvine has shown that human viruses, not just fecal bacteria, are contaminating a significant percentage of river mouths in Southern California.

Her test does not tell whether the viruses are virulent, but their presence does indicate that human waste is making its way into urban waterways. Because of the health risks associated with human waste, some groups are beginning to test creeks and drainage culverts for signs of human viral contamination.

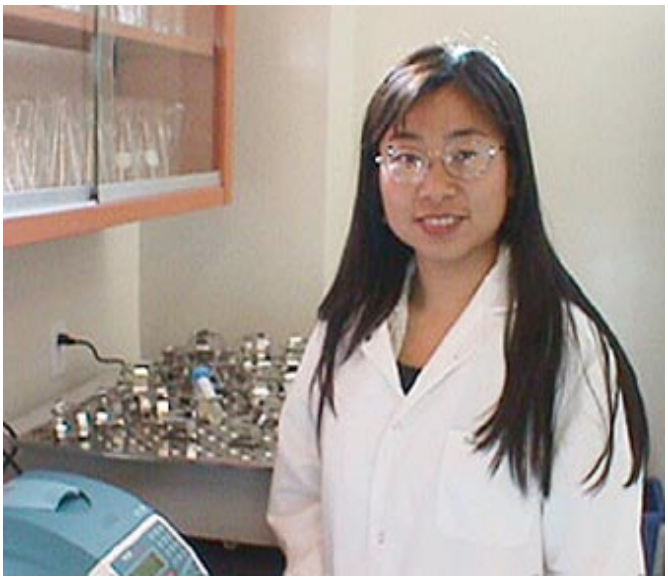
Coastal pollution is nothing new to Southern California. Many coastal waterways in Southern California fail to meet water-quality standards set by the federal Clean Water Act, and California has more beach closures than any other state. However, none of these standards are based on viral contamination. Dr. Jiang's work draws attention to the limitations of current water-testing standards.

The Project

In her study, Dr. Jiang analyzed water samples collected at 12 major river mouths in San Diego, Orange and Los Angeles counties for the presence of the human adenovirus—a cousin of the hepatitis A virus found in the human intestinal track.

The adenovirus, one of dozens of pathogenic viruses found in human feces, was tracked because of its unusual genetic signature. Unlike many human viruses, which contain fragments of RNA, the adenovirus is made of pieces of DNA.

Based on her analysis, four of the 12 sites tested positive for the presence of the adenovirus: the Los Angeles, San Gabriel, Santa Ana and Tijuana river mouths. Of these four, only the Los Angeles river mouth also registered as having high fecal bacteria levels—the standard criteria for evaluating water quality, closing beaches and monitoring compliance with federal clean water laws.



Dr. Sunny Jiang, a water quality expert at the University of California, Irvine, is developing tools for measuring viruses in coastal waters. To detect viruses, she must collect 20-liter water samples.
Photo: University of California, Irvine.

Implications

Dr. Jiang's work raises questions about whether current water-quality standards adequately protect human health. Some of her experiments, for example, have shown that indicator bacteria counts can be normal even when waters are contaminated with human viral pathogens.

"Our current bacterial indicators may not reflect the safety of water," she said. "When the presence of the virus is uncorrelated with high bacterial levels, beaches are not closed, and people are potentially exposed to health risks."

Collaborations

Dr. Jiang has worked with the Public Facilities and Resources Department in Orange County to test chronically polluted waters in the Aliso Creek watershed. She is also working with other University of California researchers on a project to study the impact of the Santa Ana River on beach pollution in Huntington Beach in Orange County. Their work may lead to an explanation of what caused a spate of beach closures in Huntington Beach in 1999 and 2000.

She currently has funding from the Water Environment Research Foundation to develop a rapid, more automated technique for monitoring human viruses in seawater samples. The new instrument will be able to count viral loads—an improvement over the current method, which only detects the absence or presence of the human adenovirus.

Cooperating Organizations

Southern California Coastal Water Research Project

Publications

Jiang, S., R. Noble, and W. Chu. 2001. Human adenoviruses and coliphages in urban runoff-impacted coastal waters of Southern California. *Appl. Environ. Microbiol.* 67(1):179–184.

Technical Report

Southern California Bight 1998 Regional Monitoring Program: Winter Shoreline Microbiology. Prepared by Southern California Coastal Water Research Project.

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