Using Aliivibrio fischeri to Detect Water Toxins

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Conventional water analysis typically makes it difficult to efficiently determine a broad range of water contaminants. To improve health worldwide, an economical method for determining water toxicity must be developed. This research involved testing the effect of multiple toxins that can be found in water sources worldwide on the bioluminescence rate of Aliivibrio fischeri. The toxins included twenty contaminants: cyanide, phenol, nitrate, zinc(I), copper(I), lead(II), cadmium(IV), cobalt(II), nickel(II), silver(I), iron(II), ammonia, acetone, methylene chloride, mercury(II), arsenic, sulfur dioxide, atrazine, and acetylsalicylic acid. The bacteria was cultured in both broth and agar plates and the toxins were added in three different percentages corresponding to the EPA maximum contaminant levels. The bioluminescence was determined using a video recorder. The contaminated samples were cultured to determine whether the bacteria was effectively killed or whether the lux operon responsible for bioluminescence was inhibited while inside the toxic situations. Comparison of the results suggests that the bioluminescence of Aliivibrio fischeri can be used detect low levels of toxins in “polluted” fresh water and “polluted” saltwater systems.