CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY

Name(s)

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Project Number

S1505

Project Title

An Analysis of False Positives in the Enterolert Test Under Turbid Conditions

Abstract

Objectives/Goals

The objective of this project was to test for the occurrence of false positives in the Enterolert (TM) enterococci test manufactured by IDEXX Laboratories, especially under conditions of high turbidity due to incomplete processing of sewerage.

Methods/Materials

Autoclaved samples of varying mixes of primary and secondary effluent from a water treatment plant were used to create sterile substrates with gradient turbidity. The samples are prepared for the Enterolert (TM) test. The tray is allowed to incubate for 24 hours, and then observed under a UV lamp for fluorescence; cells that fluoresce blue are counted as positive, and the numbers of large and small cells that show positive are compared to the MPN table that is included with the test. Samples of cells that seemed dimmer or fainter than the other positives are transferred to Bile Esculin agar plates, and the plates are allowed to incubate for 24 hours. After 24 hours, colonies on the plates that had turned the surrounding Esculin black were transferred to two tubes of Brain-Heart infusion broth at 6.5% sodium chloride. One tube was incubated for 24 hours at 35 degrees centigrade and the other at 45 degrees. Samples that were positive in both of these tubes at the end of the 24 hour period are confirmed positives; any samples not fulfilling the two-tube Brain-Heart infusion broth positive or that do not blacken the BE agar are false positives and recorded as such.

Results

In approximately 15.9% of the tested, fainter samples, the two-tube Brain-Heart infusion broth test was failed; all tested samples passed the BE agar plate test.

Conclusions/Discussion

The 15.9% false positive rate demonstrates that there is still a significant degree of error or inaccuracy. While still a low percentage of the overall count of positive cells, it can be statistically significant when calculating MPN for tests to pass government regulations. Assuming that all bright cells, large and small, were true positives, the 15.91% faint cell false positive rate represents an error of 4%. An error this large may seem small, but in reality it can still have an impact on agencies that are now being required to test for enterococcus in their effluent waters. This test should be perfected before it is made a mandatory test. If this test is required, organizations will need to buy all of the pertinent equipment, including a machine for sealing the Quanti-trays before incubation.

Summary Statement

This project is about testing whether or not a government standard water quality test is inaccurate, and if so, by what degree.

Help Received

A machine borrowed from the Sausalito-Marin City Sanitary District was used for this test, which took place in the Sewerage Agency of Southern Marin lab, and used many of the lab's facilities and materials. My mother is employed at this lab, and assisted me with lab procedures. I also consulted the Vallejo Flood