Design, Construction and Optimization of a Low-Cost Portable Enterococci Test (PET) Kit

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The World Health Organization estimates that over two million deaths worldwide can be attributed to unsanitary water. High levels of fecal indicator bacteria (FIB) in freshwater environments are linked to increased risk of exposure to enteric pathogens. Standard methods for membrane filtration are used to quantify FIB in laboratories in developed countries, but many remote communities lack the proper infrastructure and financial support for such analyses. This disparity demonstrates the need for economical, portable, and criteria-specific testing equipment to become readily available to the public in these areas. Following current USEPA Method 1600 for membrane filtration to detect enterococci, the purpose of this experiment was to construct a water quality field testing kit to determine the safety of freshwater sources in remote areas. Construction of the Portable Enterococci Test (PET) Kit required basic techniques in mechanical, electrical and industrial engineering disciplines. The PET field kit includes a membrane filtration unit constructed from PVC, incubator adapted from commercial materials, and colony-counting stand for smartphone photography of the plates allowing for measurement of FIB. Testing of incubator indicated temperatures within the unit stabilized to within ±0.5°C of 41°C. Comparative laboratory testing using diluted stock culture of E. faecalis on mEI agar was conducted to establish the accuracy of the PET with results indicating no significant statistical difference between the two methods and P-values indicating a strong correlation of data. Therefore, it is feasible to provide economical, portable, and criteria-specific testing equipment to communities in remote areas lacking access to laboratory-based test methods.

Awards Won:

Third Award of $1,000