CALIFORNIA STATE SCIENCE FAIR
2007 PROJECT SUMMARY

Name(s)
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Project Number
S0719

Project Title
Sourcing and Quantification of Fecal Indicator Bacteria (FIB) in Aquatic Ecosystems: A Four Year Study

Abstract

Objectives/Goals
The objective of this study is threefold: firstly, to create and test a mathematical model for fecal indicator bacteria determinations in coastal aquatic ecosystems; secondly, to develop a novel method of bacterial contaminant determinations in sand samples and expand the capabilities of the aforementioned model to fecal indicator bacteria determinations in these samples; and lastly, to see if the API and VITEK testing systems, two procedures never before applied to environmental research, could be effective in identifying bacterial species in natural ecosystems.

Methods/Materials
Over four years, numerous samples were collected in three unique estuaries, the Ballona Wetlands, Del Rey Lagoon, and Mother's Beach. Samples were processed using YSI, IDEXX, HACH, API, and VITEK testing systems, coupled with tryptic soy agar, blood agar, and eosin methylene blue agar.

Results
Through regression analysis, t-tests, and two-way analyses of variance, a mathematical model was created and proven to have a high predictive value in both sand and water samples. Furthermore, the API and VITEK systems identified numerous bacterial species, many of which were pathogenic, in the three systems.

Conclusions/Discussion
This study represents the first mathematical model ever created to describe a coastal aquatic ecosystem, and the model's capabilities as a predictive tool were shown to be far-reaching, not only predicting fecal indicator bacteria levels in different, unique estuary communities, but also in predicting levels in different media, namely water and sand. Finally, this study shows that two testing systems never before used in environmental research, the API and VITEK systems, are extremely effective in determining bacterial species present in aquatic ecosystems.

Summary Statement
This study not only establishes the first mathematical model of an aquatic ecosystem but also provides new methodology for studying and identifying bacterial species in such ecosystems worldwide.

Help Received
Used lab equipment at Loyola Marymount University under the supervision of Dr. John Dorsey