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What Are the Health Risks of Swimming in Santa Monica Bay?:
An Examination of the Issues Surrounding the Public Health Debate

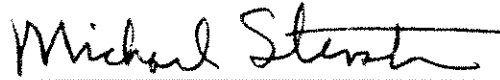
A dissertation submitted in partial satisfaction of the
requirements for the degree Doctor of
Environmental Science and Engineering

by

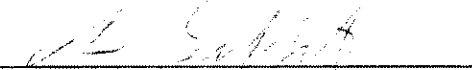
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1994


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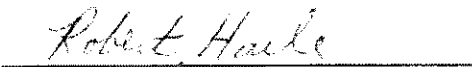


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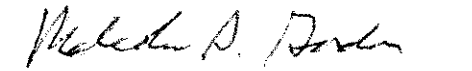


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Dedication

The dissertation is dedicated to my mother and father, who would have given anything to see me finally receive my doctorate. Their support of my academic endeavors never ceased and their will to learn, instilled within me at an early age, was the driving force in all that I have achieved both academically and professionally.

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Gold, M., Bartlett, M., Dorsey, J., and C. McGee (1990) An Assessment of Inputs of Fecal Indicator Organisms and Human Enteric Viruses from Two Santa Monica Bay Storm Drains. Prepared for the Santa Monica Bay Restoration Project (SMBRP).

Gold, M., Bartlett, M., Dorsey, J., and C. McGee (1991) Storm Drains as a Source of Surf-Zone Bacterial Indicators and Human Enteric Viruses to Santa Monica Bay. Prepared for the SMBRP.

Gold, M., Bartlett, M., Deets, G., and C. McGee (1992) Pathogens and Indicators in Storm Drains Within the Santa Monica Bay Watershed. Prepared for the SMBRP.

ABSTRACT OF THE DISSERTATION

What Are the Health Risks of Swimming in Santa Monica Bay?:
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by

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Doctor of Environmental Science and Engineering

University of California, Los Angeles, 1994

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In 1989, the state and federally sponsored Santa Monica Bay Restoration Project (SMBRP) was created. One of its three highest priorities was to assess the health risk to Bay swimmers because beach visitor populations were reduced from previous years, anecdotal evidence of illnesses caused by exposure to Bay waters was commonplace, and there were many unregulated sources of urban runoff to local beaches. The SMBRP lacked adequate information to accurately assess the risk to Bay swimmers, and it would not secure funding for an epidemiology study of recreational bathers in urban runoff contaminated waters until new information on pathogens and pathogen indicators in the storm drains and surf-zone was attained.

From 1990 to 1992, three studies completed by the author et al., demonstrated that high indicator bacteria densities were frequently present at ankle-depth shoreline locations up

to 100 yards from flowing storm drains, and human enteric viruses were present in runoff from three local storm drains.

The results of the storm drain virus studies brought greater state and local government focus on the problem of sewage contaminated urban runoff. The Los Angeles County Department of Health Services amended its beach closure and health warning protocol to make it more protective of human health. The State Legislature passed a bill, Senate Bill 1084, which required the completion of the SMBRP epidemiology study, and local cities implemented measures ranging from dry-weather runoff diversions to sewage treatment plants, to sanitary surveys designed to detect illegal discharges of sewage to storm drains.

Despite the lack of an accurate estimate of health risks to local swimmers and of health-based microbial water quality standards in California, the development of a strong beach closure and health warning protocol for Los Angeles County demonstrates that health risk management has become a priority to the public and local government. There are other policy and pathogen source reduction measures that, if executed, would further reduce health risks to swimmers. Until research on more effective human sewage indicators, the health risks of swimming in runoff contaminated waters, and a sanitary survey to detect sources of sewage to the shoreline is completed, implementation of risk management measures should prevent significant outbreaks of swimming associated illnesses.

Preface

The research included within this dissertation was completed during an internship at the local environmental group Heal the Bay, a non-profit environmental organization with more than 12,000 members working through research, advocacy and public education to make Santa Monica Bay and Southern California's beaches safe and healthy again for people and marine life. The dissertation includes three studies on pathogens and pathogen indicators in storm drain runoff and the surf-zone that were completed by Heal the Bay, the City of Los Angeles-Bureau of Sanitation-Environmental Monitoring Division, and the Orange County Sanitation Districts under the auspices of the Santa Monica Bay Restoration Project (SMBRP). The SMBRP, part of the National Estuary Program, is a federal, state and locally funded entity whose primary goal is the creation of a Comprehensive Conservation and Management Plan (CCMP) for the Bay.

As the staff scientist at Heal the Bay and the principal investigator (P.I.) of the three storm drain studies, my responsibilities on the studies included acquiring funding, study design, project management and oversight, sample collection for indicator bacteria analysis, assistance in statistical analysis, primary authorship and final editor of the reports. Also, the P.I. presented the study findings to the Technical Advisory Committee (TAC) and Management Committee of the SMBRP.

The report review and approval process of the SMBRP TAC was a seven-step process. All submitted reports met the SMBRP technical report formatting and presentation guidelines before they were reviewed by TAC members and outside reviewers. The Draft Final Reports were reviewed by two outside reviewers chosen by SMBRP staff and the Surf-Zone Pathogen subcommittee of the TAC. In addition, all members of the TAC had

the opportunity to review the three reports. All comments by the outside reviewers and TAC members were collected and compiled by a review coordinator for the reports. The review coordinator sent the comments to the P.I. for document revisions. After the Draft Final Reports were revised by the P.I., the documents were submitted to the review coordinator and the full TAC for their sequential final approvals. Following TAC approval, the reports were sent to the Management Committee for their final approval and subsequent public release of the reports.