Prevalence and Distribution of methicillin-resistant Staphylococcus aureus (MRSA) on Three Seattle-Metro Beaches

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Abstract

Objective: Methicillin-resistant Staphylococcus aureus (MRSA) has become a major community acquired pathogen. The aim of this study was to spatially and temporally survey two marine and one fresh water public beach, in the Seattle-Metro area for the presence of MRSA. Multiple sand (50 g) and water (1 L) samples were collected from each beach multiple weeks during the summer of 2010. The sites sampled included multiple low and high tide water sand, ankle deep and one meter deep water, and fresh water streams that flow through the beaches. The same sites were sampled during each sampling event during the summer. Methods: The samples were enriched in DiFos™ mStaphylococcus Broth 75 μg/ml polymyxin and 0.01% potassium tellurite. Positive samples that turned black were 10-fold diluted and plated onto Mannitol Salt Agar and Bacto® Staphylococcus Medium 110 agar supplemented with 0.01% potassium tellurite and 10 μg/ml methicillin. Colonies were placed on 5% sheep blood agar plates and those that were β-hemolytic were biochemically verified as S. aureus. The presence of the mecA and the type of SCCmec chromosomal element carried was determined by PCR assays. Results: Each beach was sampled 2-3 different weeks and a total of 196 samples collected. Twenty-nine (14.8%) different samples were MRSA positive from all three beaches. Nineteen (27.5%) of the 69 stream samples were MRSA positive, 5 (7.5%) of 87 sand (3/87 (3.5%) marine and 2/87 (2.3%) fresh) and 5 (8.9%) of 56 water (1/56(1.8%) marine and 4/56 (7.1%) fresh). Conclusion: Sand, water and stream samples from both the marine and fresh water beaches were MRSA positive with highest % coming from the streams suggesting that urban run-off might be a major source of MRSA found at the marine/fresh water beaches.

Introduction

Methicillin-resistant Staphylococcus aureus (MRSA) is a type S. aureus which carries the mecA gene coding for altered penicillin binding protein which confers resistance to all useable beta-lactam antibiotics, the drug of choice for therapy. Community acquired MRSA infections are commonly found on the skin and soft tissue. The potential risk of MRSA in recreational marine and fresh waters to the public is unknown.

Materials & Methods

Beaches Sampled

- 2 urban marine public beaches
- 1 urban fresh water beach
- Beach samples were collected 2-3 different weeks
- Samples included 50 g sand samples at high & low tide line, ankle and 1L water samples

Results

Each row for each table represents one sampling event.

Conclusions

- 14.8% of sand, water and stream samples from marine and fresh water beaches were MRSA positive
- Highest % coming from the streams
- Urban run-off might be a source of MRSA at beaches
- First report of MRSA from freshwater beach sand/water

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