Bacteriophage as an Alternative Indicator for Microbiological Pollution at Marine Beaches

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INTRODUCTION

- The US EPA recommends detection of Enterococci group bacteria as an indicator for pollution in marine recreational waters. In Georgia, this indicator has been used for beach monitoring since 2004.
- Studies show that Enterococci are not associated with certain waterborne pathogens such as enteric viruses.
- Bacteriophages have been proposed as an alternative indicator for fecal pollution in water. These viruses are relatively easy to enumerate and require less intensive technical training.

RESULTS

<table>
<thead>
<tr>
<th>Precipitation (mm)</th>
<th>Air Temperature (°C)</th>
<th>Water Temperature (°C)</th>
<th>Salinity (ppt)</th>
<th>pH</th>
<th>Turbidity (NTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 0.025</td>
<td>16.0±8.5</td>
<td>14.6±4.6</td>
<td>19.2±6.1</td>
<td>7.4±0.7</td>
<td>61.9±51.9</td>
</tr>
<tr>
<td>February 0.025</td>
<td>16.3±9.0</td>
<td>15.7±4.0</td>
<td>20.1±4.5</td>
<td>7.5±0.4</td>
<td>20.8±1.8</td>
</tr>
<tr>
<td>March 0.05</td>
<td>20.5±4.5</td>
<td>17.2±7.4</td>
<td>21.7±3.8</td>
<td>7.6±0.2</td>
<td>22.6±15.3</td>
</tr>
</tbody>
</table>

Figure 1. Study area.

Figure 2. Bacteriophage and Enterococci mean concentration (PFU/100mL) at Saint Andrews Beach.

Figure 3. Bacteriophage and Enterococci mean concentration (PFU/100mL) at Clam Creek Beach.

CONCLUSIONS

- Enterococci significantly correlated with somatic coliphage ($r_s$=0.657, $p$<0.002).
- Two beaches significantly differ from each other in terms of indicator levels ($p$<0.001).
- Colder temperature seems to be a driver for somatic coliphage occurrence ($r_s$=-0.621, $p$=0.003). Summer sampling results will prove more information on the environmental factors and their relation with coliphage distribution.
- USEPA is currently developing guideline values for monitoring coliphage contaminated recreational waters. One major milestone will be assessing the risk of gastrointestinal disease by testing beaches for these alternative indicators.
- Ongoing studies include detecting enteric viruses and their relation with the occurrence of these viruses.

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REFERENCES