Implementation of *E. coli* qPCR-based Method for Water Quality Monitoring Case Study: Challenges and Lessons learned

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Introduction

Quantitative polymerase chain reaction (qPCR) methods provide same-day enumeration of fecal indicator bacteria (FIB) in recreational waters. However, successful implementation requires extensive knowledge of the analytical procedure, rigorous staff training, and possible reorganization of physical laboratory space to optimize workflow. Hence, the widespread implementation of qPCR may be limited by the amount of resources and guidance available to first time users. In this case study, the qPCR-proficient City of Racine Health Department (RHD) (WI, USA) provided implementation guidance, staff training, and result evaluation (*E. coli* qPCR at three public bathing beaches) to the Wilmette Water Plant (WWP) (IL, USA), a facility with no previous experience in rapid molecular techniques.

Objective

To successfully implement a qPCR-based *E. coli* method into routine, regulatory monitoring at three recreational beaches utilizing a facility with no previous experience in rapid molecular methods.

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References


Introduction

Site assessment, reconstruction, instrument and supply acquisition and staff training (Sept. 2011 – June 2012)

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-_samples collected by lifeguards and analyzed by culture and qPCR (June 27 - Aug. 28, 2012)

- _Crude DNA extract (1:5 dilution), BioGx Smart Beads™, Cepheid Smart Cyclers® II platform_

- IDEXX Colibri*: 18

- Beach Sanitary Survey (BSS) data collected (July 20 – Aug. 31, 2012)

- Split samples testing performed using single source of reagents (*E. coli* calibrators and SPC, provided by RHD) (Oct. 2012).

**Figure 2. Laboratory space before (A) and after construction (B). Repurposed space includes segregated stations for unidirectional workflow.**

**Results**

<table>
<thead>
<tr>
<th>Site</th>
<th>Pearson’s correlation coefficient (r)</th>
<th>ANOVA (P-value)</th>
<th>Beach management decision agreement (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gilson Beach North</td>
<td>0.264</td>
<td>0.767</td>
<td>74.3%</td>
</tr>
<tr>
<td>Gilson Beach South</td>
<td>0.070</td>
<td>0.491</td>
<td>74.3%</td>
</tr>
<tr>
<td>Langdon Beach</td>
<td>0.059</td>
<td>0.165</td>
<td>79.3%</td>
</tr>
</tbody>
</table>

Table 1. Relationship between culture and qPCR methods. Log10 E. coli/100 ml (qPCR) and MPN/100 ml (culture).

**Conclusion**

This case study data demonstrated that successful implementation at a laboratory with no previous experience in rapid molecular techniques is possible. However, additional training and QA/QC work is needed.