Host-Specific Viruses for the Detection of Faecal Pollution in Coastal Waters

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Aims
- Investigate the host-specificity and -sensitivity of human-specific adenoviruses (HS-AVs), bovine-specific adenoviruses (BS-AVs), and human-specific polyomaviruses (HS-PVs) for microbial source tracking in coastal waters.
- Application of viral markers to identify the sources of faecal pollution in a coastal river affected by faecal pollution in Southeast Queensland (SEQ), Australia.

Materials and Methods
- Culture based methods were used for the enumeration of faecal indicator bacteria (FIB).
- Host-specificity and -sensitivity of the markers were assessed by screening 182 wastewater and animal faecal samples.
- PCR and qPCR assays were used for the detection of MST markers and quantification of zoonotic pathogens in environmental water samples ($n = 20$).

Results

<table>
<thead>
<tr>
<th>Viral markers</th>
<th>Host-specificity</th>
<th>Host-sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS-AVs</td>
<td>1.0</td>
<td>0.78</td>
</tr>
<tr>
<td>BS-AVs</td>
<td>1.0</td>
<td>0.73</td>
</tr>
<tr>
<td>HS-PVs</td>
<td>1.0</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Table 1: Host-specificity and -sensitivity of viral markers

![Figure 1: Host-groups screened for the host-specificity and -sensitivity assays](image1)

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![Figure 2: Maroochy River sampling sites MR1-MR5](image2)

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![Figure 3: Percentage of samples exceeded ANZECC recreational water quality guideline value for primary contact](image3)

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![Figure 4: Percentage of samples positive for the viral markers and zoonotic pathogens](image4)

Figure 4: Percentage of samples positive for the viral markers and zoonotic pathogens

- The numbers of FIB in water samples collected ranged from 48 to 2906 (for *E. coli*) and from 60 to 1586 (for enterococci).
- The numbers of *Salmonella* spp. ranged from 350 to 430 genomic copies per 500 mL of water.
- Weak correlation was found between *E. coli* with HS-AVs ($p = 0.02$). However, significant correlations were observed between *E. coli* with BS-AVs ($p = 0.007$) and *Salmonella* spp. ($p = 0.007$).
- The numbers of enterococci correlated with BS-AVs ($p = 0.006$), *C. jejuni* ($p = 0.01$) and *Salmonella* spp. ($p = 0.006$). No significant correlations were found between *E. coli* and enterococci with HS-PVs.
- The results suggest that human and bovine specific viral markers detection using PCR could be a useful tool for the identification of human and bovine faecal pollution in coastal waters.