Epidemiological and genomic investigation of a cluster of MRSA cases in a neonatal intensive care unit

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Background

• Transmission of methicillin-resistant Staphylococcus aureus (MRSA) in neonatal intensive care units (NICU) is of concern due to the vulnerability of the population
• This report follows transmission of MRSA in a NICU at a large tertiary hospital in British Columbia between December 2021 and July 2022

Methods

• All Fraser Health NICU admissions are tested for MRSA with a subsequent test 14 days post-admission
• After initial cases identified at this site, weekly prevalence testing was initiated across the NICU along with comprehensive infection control measures
• All positive specimens were submitted to the provincial reference laboratory for whole genome sequencing (WGS) to supplement epidemiological investigation
• WGS analysis consisted of multi-locus sequence typing (MLST) and core genome SNP profiling

Discussion & Conclusions

• WGS can be a powerful tool when used in conjunction with epidemiological data to understand transmission patterns of MRSA strains detected in the NICU
• In this investigation, we were able to genetically and epidemiologically link cases that clustered within Cluster A and Cluster B, with the exception of Cluster A cases that were detected in May and June 2022, which have no clear epidemiological link
• Further investigation into Cluster A is required to identify other potential sources of transmission
• These data highlight the importance of enhanced Infection Prevention and Control practices in NICUs

Table 1. Patient line list

<table>
<thead>
<tr>
<th>Cluster ID</th>
<th>Number of Patients</th>
<th>Positive Specimen</th>
<th>Case Admit Date</th>
<th>Case Discharge Date</th>
<th>Link Type</th>
<th>WGS Cluster</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cluster A</td>
<td>20</td>
<td>Colonization</td>
<td>2021-Dec-11</td>
<td>2021-Dec-21</td>
<td>A</td>
<td>A</td>
</tr>
<tr>
<td>Cluster B</td>
<td>12</td>
<td>Colonization</td>
<td>2021-Nov-27</td>
<td>2021-Dec-24</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>Cluster C</td>
<td>6</td>
<td>Infection</td>
<td>2021-Jul-30</td>
<td>2021-Jul-31</td>
<td>Unknown</td>
<td>A</td>
</tr>
</tbody>
</table>

Figure 1. Phylogenetic Tree of MRSA WGS Clusters

Figure 2. Epidemic Curve of MRSA Cases by Cluster Group

Figure 3. Patient Timeline with Specimen Collection Date by Cluster Group

We gratefully acknowledge our acute care IPC practitioners, IPC regional team, Medical Microbiologists, clinicians and operational teams who supported the investigation and management of this cluster.