Epidemiology of Staphylococcus aureus in Neonates on Admission to a Chinese Neonatal Intensive Care Unit

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BACKGROUND

• Molecular characteristics and risk factors for S. aureus colonization and infection described for neonatal intensive care units (NICUs) worldwide[1-3]
• No previous reports describing molecular characteristics of S. aureus in tertiary care NICUs in Mainland China
• Neonates (≤ 28 days old) served by Chinese NICUs mostly admitted from home or transferred from outside hospitals; may have unique molecular characteristics.

OBJECTIVES

To describe the molecular epidemiology of S. aureus isolated from neonates on admission to Beijing Children's Hospital

METHODS

• Setting: Beijing Children’s Hospital, NICU
• Study period: May 2015-March 2016
• Procedures: Nasal swabs and clinical cultures from suspected infections were obtained on admission from 536 neonates admitted to BCH NICU over 11 months
    - 255 (48%) admitted with suspected infection
    - 16 MLST; ST188, ST5 and ST398 account for 12%, 12% and 11% respectively.
    - All isolates negative for sasX
    - ST398-t571 less cytotoxic than all other clones (median: 72%, IQR[64-87%] vs. 88%, IQR[80-88%], p=0.003)

RESULTS

1. Study cohort: 536 neonates admitted to BCH NICU over 11 months
   - 85% (n=456) admitted from home
   - 66 (12%) colonized with MSSA
   - 26 (4.9%) colonized with MRSA
   - 575 (109) culture confirmed MSSA
   - 66 (12%) colonization was common in infants S. aureus in tertiary care NICUs in Mainland China
   - MSSA culture 22/255 (8.7%) and targeting CI et al, 2017

2. Infection: 255 (48%) admitted with suspected infection
   - 17/255 (6.7%) culture confirmed MRSA
   - 6/255 (2.4%) culture-positive for MSSA

3. Risk factor assessment for MSSA vs. MRSA colonization (Table 1):
   - Female gender, older neonates, vaginal delivery
   - Antimicrobial susceptibilities tested
   - No previous reports describing molecular characteristics of S. aureus in tertiary care NICUs in Mainland China
   - Neonates (≤ 28 days old) served by Chinese NICUs mostly admitted from home or transferred from outside hospitals; may have unique molecular characteristics.

4. Molecular characterization:
   - MSSA (Figure 1): 16 MLST; ST188, ST5 and ST398 account for 12%, 12% and 11% respectively.
   - MRSA (Figure 2): 6 MLST, almost exclusively ST59
   - All isolates negative for sasX

5. Cytotoxicity: 96 colonizing, 23 infectious isolates
   - Lower in colonizing than in infectious isolates; median: 85%, IQR[73-87%] vs. 88%, IQR[82-88%], p<0.001
   - ST398-t571 less cytotoxic than all other clones (median: 72%, IQR[64-79%] vs. 86%, IQR[80-88%], p=0.003)

Figure 1: Distribution of MSSA spa types among sequence types (ST) in neonates at NICU of Beijing Children’s Hospital

Figure 2: Distribution of MRSA spa types among sequence types (ST) in neonates at Beijing Children’s Hospital

SUMMARY AND CONCLUSIONS

• S. aureus colonization was common in infants admitted to BCH NICU, mainly due to MSSA
• For both, MSSA (ST59-SCCmecIVa-t437) and MRSA (ST188-t189), community-associated clones predominated
• Cytotoxicity higher in infectious isolates and different by clonal background
• Several non-modifiable risk factors identified
• These results suggest that screening infants for S. aureus upon admission and targeting decolonization of high-risk infants and/or those colonized with high-risk clones could be useful to prevent transmission.

Table 1: Risk factors for Methicillin-susceptible and Methicillin-resistant S. aureus colonization

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>MSSA (n=36)</th>
<th>MRSA (n=26)</th>
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</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>2.03</td>
<td>1.00</td>
</tr>
<tr>
<td>Age 8-28 days</td>
<td>8.22</td>
<td>0.06</td>
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<tr>
<td>Vaginal delivery</td>
<td>3.26</td>
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<td>Antibiotic exposure prior week</td>
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<td>5.00</td>
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REFERENCES