Staphylococcus Protein A (spa) Typing Demonstrates Genetic Heterogeneity of Methicillin-Susceptible Staphylococcus aureus (MSSA) in a Neonatal Intensive Care Unit (NICU)

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BACKGROUND

While MSSA infections are more common in the NICU, infection prevention and control (IP&C) strategies generally focus on MRSA. An increased understanding of MSSA molecular epidemiology could enhance IP&C strategies targeting MSSA.

OBJECTIVES

To use spa typing to characterize the molecular epidemiology of MSSA isolates during a 1-year NICU S. aureus screening and decolonization program.

METHODS

Setting and Study Population

58-bed academically-affiliated tertiary care NICU
Infants hospitalized in the NICU in 2017 (1032 admissions)

Surveillance strategies:

- All infants screened bi-weekly for S. aureus colonization
- Transferred infants 27 days old screened on admission
- Surveillance cultures of anterior nares and 3 skin sites: axilla, umbilical stump, groin.
- Specimens processed by clinical microbiology lab to differentiate MSSA vs. MRSA.
- Culture-positive infants decolonized with mupirocin and/or chlorhexidine.1

Molecular Typing

MSSA isolates from surveillance or routine care of suspected infection were genetically characterized by spa typing and surveillance isolates were tested for mupirocin resistance.

Analysis

- Relative frequency of each spa type, including > 1 isolate from same infant, was determined
- Incidence, defined as initial detection of unique spa type(s) in an individual infant, was determined

RESULTS

- During 2017, 187 infants were colonized and/or infected with MSSA
- Initial MSSA detection: 145 (78%) by bi-weekly surveillance, 24 (13%) by clinical cultures, and 18 (9.6%) by admission surveillance
- 268 MSSA isolates from 166 infants available for spa typing
- 60 spa types identified; 31 (50%) only detected in one infant.
- Figure 1 shows frequency of 9 most common spa types, those detected in one infant, and those detected in 1-2.5% of infants.
- 12/14 (86%) multiple gestations shared same spa type as their sibling(s).
- 53/150 (35%) infants had new spa types detected over time (e.g., t1451 -> t279; 6/13 (46%) changed to t279
- Figure 2 shows incidence of 9 most common spa types
- Epidemiology of spa types varied, e.g., t279 detected in 10 infants and 113985 detected in 3 months
- 91% of t279 surveillance isolates tested were resistant to mupirocin.
- t1451 and t571 are part of ST398, a community-associated MSSA clone in Northern Manhattan, New York2

SUMMARY AND CONCLUSIONS

- Overall, MSSA isolates in our NICU were genetically heterogeneous.
- However, several spa types had frequencies of 3-17%.
- These data suggest potential transmission and multiple introductions of MSSA into the NICU, including the community and family members, as suggested by detection of t1451 and t571.
- Spa typing can identify:
  - community- vs. healthcare-adapted MSSA clones
  - transmissible clone
- These data can inform targeted IP&C strategies
- Our decolonization program may have lead to selective pressure resulting in spa type t279, detected in 25 infants during 10 months.
- Future studies should utilize sequencing and/or chlorhexidine.

REFERENCES


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