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 case units (NICUs) worldwide[1,2,3]
- 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 and cultured on blood agar
- Antimicrobial susceptibilities tested
- *S. aureus* isolates characterized by SCC*mec*, *spa* and MLST sequencing and *sasX* PCR
- Cytotoxicity assayed using differentiated neutrophil-like cells (PMN-HL60)
- Logistic regression applied to identify risk factors for colonization.

REFERENCES

[1]Washam M et al, Am J infect cont 2017; [2]Kong H et al, Infect drug resist 2018; [3]Andrade-Figueiredo M et al, BMC microbio 2016.

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
2. **Infection:** 255 (48%) admitted with suspected infection
   - 17/255 (6.7%) culture-positive for 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
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

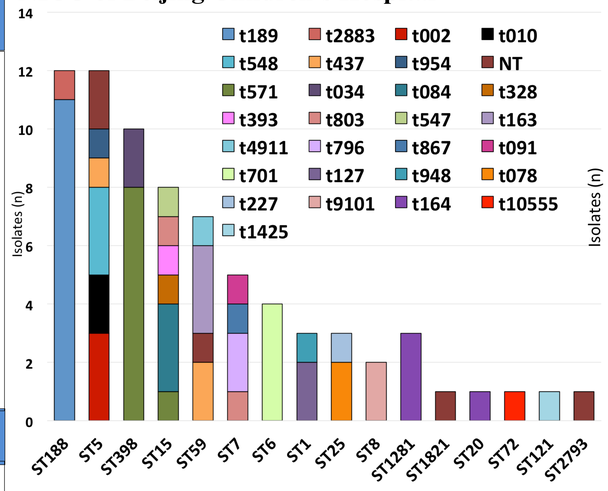
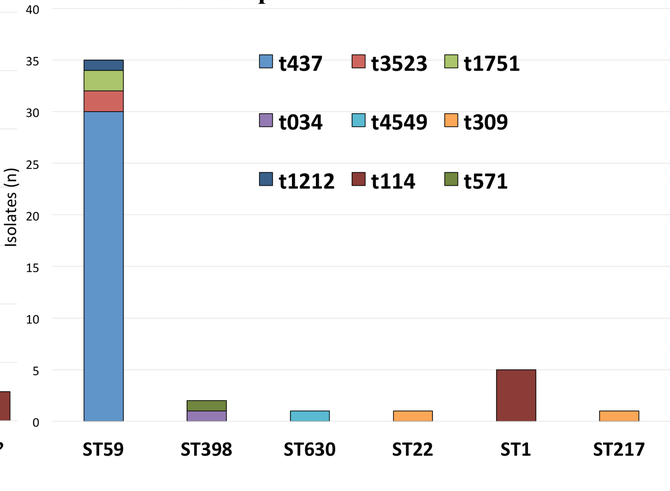


Figure 2: Distribution of MRSA *spa* types among sequence types (ST) in neonates at Beijing Children's Hospital



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

Characteristics	MSSA (n=66)			MRSA (n=26)		
	$OR_{ADJ\ 1,2}$	CI_{95}	p-value	$OR_{ADJ\ ,2}^{1}$	CI_{95}	p-value
Female sex	2.03	(1.14, 3.59)	0.02	2.45	(1.07, 5.60)	**0.03**
Age 8-28 days	8.22	(4.04, 16.73)	<0.0001	5.00	(1.97, 12.72)	**0.001**
Vaginal delivery	3.26	(1.78, 5.97)	<0.0001	1.23	(0.54, 2.79)	**0.003**
Antibiotic exposure prior week	0.26	(0.14, 0.51)	0.0001	0.21	(0.07, 0.58)	**0.62**