2301. *Streptococcus pneumoniae* Serotyping: Assessing the Performance of a PCR- and Sequencing-Based Testing Algorithm

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Session: 245. Molecular & Sequence Based Diagnostics
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Background. *Streptococcus pneumoniae* is a bacterium that causes significant morbidity and mortality worldwide. Its capsular polysaccharides have been used successfully as vaccine antigens, and to characterize *S. pneumoniae* into 92 different serotypes. Phenotypic (Quellung reaction) or genotopic (PCR or sequencing) methods can be used for serotype assignment, but the performance may vary between methods. This study compared the performance of the Quellung reaction, to an algorithm using PCR- and sequence-based serotyping technologies for vaccine-preventable or closely related serotypes.

Methods. A panel of geographically diverse isolates of *S. pneumoniae* spanning 92 different serotypes was provided by various references laboratories worldwide. Each isolate was subjected to conventional multiplex PCR methods, using previously established methods. Sanger sequencing was performed using genetic signatures defined in the PneumoCaT database. When discrepant, Quellung reaction were repeated, and next-generation sequencing and comparative genomics was used to evaluate the sequence composition of the *cps* loci.

Results. As expected, PCR was unable to assign serotype in some cases, and some serotype results were insufficiently discriminatory. Following sequencing, 86.3% (404/468) of isolates were concordant with the Quellung serotyping. Discrepant analyses are underway.

Conclusion. An algorithm based on PCR and sequencing, or next-generation sequencing alone, shows much promise for serotyping of *S. pneumoniae*. However, discrepant results were noted, suggesting either our current understanding of genetic signatures conferring serotype-specificity might not be complete, or the Quellung reaction results were incorrect. Accurate methods for serotyping are essential to monitor the impact of pneumococcal vaccines, and understand the epidemiology of *S. pneumoniae* diseases.

Disclosures. **S. A. McNeil**, GSK: Grant Investigator, Research grant. Pfizer: Grant Investigator, Research grant. Merck: Collaborator and Consultant, Contract clinical trials and Speaker honorarium. Novartis: Collaborator, Contract clinical trials. Sanofi Pasteur: Collaborator, Contract clinical trials.

2302. Bloodstream Infections Due to Carbapenem-Resistant Gram-Negative Bacteria in Pediatric Intensive Care Unit (PICU): Risk Factors and Outcomes

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Session: 246. Pediatric Healthcare Associated Infections
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Background. Bloodstream infections (BSI) caused by multidrug-resistant bacteria are associated with poor outcome and increased cost. We investigated risk factors for carbapenem resistance (CR) and outcome associated with the development of BSI due to Gram-negative (GN) bacteria in PICU patients, a very vulnerable population.

Methods. We reviewed the records of 1 month–15 year old patients with documented GN BSI hospitalized in a PICU from 2005 to 2017. Isolates with meropenem MIC ≥16 mg/L were considered as resistant. Demographics, clinical characteristics, potential risk factors for acquisition of resistant strains, treatment, potential source control and outcome were recorded. Outcome was determined as microbiological response (negative blood cultures) within 5 days and mortality within 30 days. Both univariate and multivariable logistic regression analysis was performed and odds ratios (OR) with 95% confidence intervals (CI) were presented.

Results. 81 patients with GN BSI were studied (34.6% *Pseudomonas aeruginosa*, 34.6% *Acinetobacter baumannii* and 30.9% *Enterobacteriaceae*), 21 with CR isolates. Risk factors for CR BSI were: prior carbapenem use (OR: 3.86, 95% CI: 1.10, 13.82) and renal replacement therapy (OR: 3.86, 95% CI: 1.10, 13.82). In multivariable outcome analysis, high levels of CRP (OR: 0.99, 95% CI: 0.99, 0.999), renal replacement therapy (OR: 0.11, 95% CI: 0.01, 0.71) and inotrope administration (OR: 0.30, 95% CI: 0.09, 0.91) were associated with poor microbiological response, whereas source control (OR: 2.99, 95% CI: 1.01, 9.43) with better microbiological response. High PRISM score III (OR: 1.15, 95% CI: 1.04, 1.29) and CR (OR: 5.07, 95% CI: 1.47, 19.36) were both independently associated with worse outcome, whereas source control was the only independent factor preventing death (OR: 0.24, 95% CI: 0.06, 0.78). In patients with CR BSI, administration of at least two active antimicrobials was associated with better outcome (OR: 10.80, 95% CI: 1.33, 237.05).

Conclusion. Prior carbapenem use is associated with carbapenem-resistant BSI development in PICU, which in turn is an independent risk factor for mortality. Source control is associated with better microbiological response within 5 days, as well as with decreased mortality.

Disclosures. **All authors:** No reported disclosures.

2303. Differential Effects on MRSA and MSSA Epidemiology in a Neonatal Intensive Care Unit (NICU) During a Year-Long Surveillance and Decolonization Effort

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Session: 246. Pediatric Healthcare Associated Infections
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Background. *Staphylococcus aureus* (SA) causes morbidity and mortality in the NICU. While surveillance, with decolonization, is recommended for MRSA outbreak control, the impact of such strategies on endemic MSSA infections is less known. We compare the impact of a year-long surveillance and decolonization effort on MRSA and MSSA colonization dynamics and invasive infection rates in the NICU.

Methods. All infants hospitalized in our academically affiliated, regional perinatal NICU (1032 annual admissions) between January and December 2017 were screened twice monthly for SA colonization by culturing the anterior nares and three skin sites. Eligible patients with positive SA cultures underwent decolonization with mupirocin and/or chlorhexidine bathing. The following parameters for MRSA and MSSA were compared using frequencies and Fisher's exact tests: 1) Colonization density (proportion of positive surveillance cultures; 2) rates of effective decolonization (proportion of successful decolonization efforts); 3) rates of invasive infections; and 4) mupirocin resistance.

Results. Overall, 25 twice monthly surveillance efforts were undertaken from which 1351/1375 (98%) screening cultures were obtained. Screening identified newly detected MSSA vs. MRSA in 145 vs. 20 infants, respectively. Colonization density decreased more for MRSA (Q1 vs. Q4 decrease of 67%) vs, MSSA (Q1 vs. Q4 decrease of 5%). Decolonization was more effective for MRSA (78%) vs. MSSA (71%). Compared with 2016, rates of invasive infections decreased more for MRSA (2.4 vs. 1.6 /10,000 patient-days, 33%) than MSSA (9.4 vs. 7.8 /10,000 patient-days, 17%). Prevalence of mupirocin resistance through study period was higher for MSSA (24% vs. 10%). No outbreaks were detected.

Conclusion. A year- long surveillance and decolonization effort was more successful in decreasing MRSA colonization density and invasive infections compared with MSSA. These results are likely due to continual importation of MSSA into the NICU from the community. Since MSSA caused more invasive infections than MRSA, strategies primarily aimed to decrease the burden of MRSA need to be modified to decrease the burden of MSSA in NICUs.

Disclosures. **All authors:** No reported disclosures.

2304. Decreased Incidence of Methicillin-Susceptible *Staphylococcus aureus* (MSSA) Infections after Implementation of Routine Surveillance and Decolonization in a Level IV Neonatal Intensive Care Unit (NICU)

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Session: 246. Pediatric Healthcare Associated Infections
Saturday, October 6, 2018: 12:30 PM

Background. *Staphylococcus aureus* (SA) is a leading cause of hospital-acquired infection, including bloodstream infection (BSI), in NICUs. In this study, we evaluated the effect of screening and decolonization of MSSA-colonized babies with mupirocin on the rate of MSSA infection.

Patients and Methods. *Study design:* Sequential time series. Pre-intervention period, January 2015–March 2017; wash out period, April 2017; intervention period, May 2017–March 2018. *Population:* Neonates admitted to a Level IV NICU with anticipated stay of greater than 2 days. *Intervention:* A single swab of the nares, umbilicus & groin was sent weekly for SA surveillance culture. MSSA-colonized neonates were decolonized with mupirocin application to nares, umbilicus and abraded skin twice daily for 5 days. *Outcome measures:* Comparison of rates of MSSA infections during pre- and post-intervention periods. Infections included BSI and skin/wound infections, excluding patients with MSSA from only eye or respiratory specimens. *Comparators:* Change in rates of Gram-negative and MRSA BSI. Change in rates of MSSA BSI in an affiliated NICU with the same medical staff but no intervention.