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

Hayley Gillis, MSc[1]; Amanda Lang, PhD[1]; May Elsherif, MD[1]; Walt Demczuk, BSc[2]; Irene Martin, BSc[2]; Shelly A McNeil, MD, FIDSA[1] and Jason Leblanc, PhD[1]; [1]Canadian Center for Vaccinology, IWK Health Centre and Nova Scotia Health Authority, Dalhousie University, Halifax, NS, Canada, [2]National Microbiology Laboratory, Winnipeg, MB, Canada

Session: 245. Molecular & Sequence Based Diagnostics
Saturday, October 6, 2018: 12:30 PM

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

Violetta-Magdalini Darda, MD[1]; Elias Iosifidis, MD, PhD[1]; Eleni Volakli, MD, PhD[2]; Charalampos Antachopoulos, MD, PhD[3]; Anna-Bettina Haidich, PhD, MSc[1]; Eleni Vagdatli, MD, PhD[2]; Maria Sdougka, MD, PhD[2] and Emmanuel Roilides, MD, PhD, FIDSA[3]; [1]Aristotle University of Thessaloniki, Thessaloniki, Greece, [2]Hippokration Hospital of Thessaloniki, Thessaloniki, Greece, [3]3rd Department of Pediatrics, Aristotle University of Thessaloniki, Thessaloniki, Greece

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

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

Philip Zachariah, MD, MS[1,2]; Maria Messina, RN[1]; Alexandra Hill-Ricciuti, MPH[2]; Daniel Green, MD[3]; Susan Whittier, PhD[3]; Rakesh Sahni, MD[4] and Lisa Saiman, MD, MPH[1,2]; [1]Infection Prevention and Control, NewYork-Presbyterian Hospital, New York, New York, [2]Department of Pediatrics, Columbia University Medical Center, New York, New York, [3]Department of Pathology, Columbia University Medical Center, New York, New York, [4]Department of Neonatology, Columbia University Medical Center, New York, New York

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

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)

Archana Balamohan, MD, FAAP[1]; Joanna Beachy, MD, PhD[2]; Reeti Khare, PhD, D(ABMM)[3]; Nina Kohn, MBA, MA[4]; Sudhir Butala[5] and Lorry Rubin, MD, FIDSA[6]; [1]Pediatric Infectious Diseases, Cohen Children's Medical Center, New Hyde Park, New York, [2]Division of Neonatal-Perinatal Medicine, Cohen Children's Medical Center of New York, New Hyde Park, New York, [3]Northwell Health Laboratories, Lake Success, New York, [4]Feinstein Institute for Medical Research, Northwell Health, Manhasset, New York, [5]Microbiology Lab, Northwell Health Laboratories, New Hyde Park, New York, [6]Cohen Children's Medical Center of New York, Northwell Health, New Hyde Park, New York

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.

Results. MSSA BSI decreased from 0.37 per 1,000 hospital days (n = 15) to 0.00 (n = 0), P = 0.0092. All MSSA infections decreased from 0.62 (n = 25) to 0.11 (n = 2), P = 0.0078. Of 694 eligible neonates, 98.8% were screened at least once for MSSA colonization, which was detected in 92 (13.4%) infants. Median weekly prevalence of colonization was 6.7%. Median length of stay of neonates after initial detection of colonization was 30 days. Of colonized neonates, 92% received mupirocin treatment, with a median of 1 course of mupirocin treatment per patient (range, 1–7 courses). Of 54 isolates tested, all were mupirocin-susceptible. In contrast, there was no significant change in the rates of either MRSA (P = 0.71) or Gram-negative (P = 0.45) BSIs. In the comparison NICU, there was no significant change in rate of MSSA BSIs (P = 0.34).

Conclusion. Despite a substantial burden of MSSA-colonized neonates, the intervention was associated with elimination of MSSA BSI and an 82% reduction in rate of MSSA infections. A potential confounding factor was the occurrence of a cluster of mupirocin-resistant MRSA during the intervention period with the associated intensified infection prevention measures.

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

2305. *Staphylococcus aureus* Screening and Decolonization for Pediatric Patients Undergoing Cardiovascular Surgery at Texas Children's Hospital (TCH): A Trainee Quality Improvement Initiative

Catherine Foster, MD; Daniel Ruderfer, MD; Gabriella Lamb, MD; Juri Boguniewicz, MD; Ryan Rochat, MD PhD GEMS; Lucila Marquez, MD, MPH; Debra Palazzi, MD and Claire E. Bocchini, MD; Baylor College of Medicine and Texas Children's Hospital, Houston, Texas

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

Background. Colonization with *Staphylococcus aureus* increases the risk of developing healthcare-associated infections (HAIs) in adults, but its role in pediatrics remains unclear. We hypothesized that use of a *S. aureus* screening and decolonization protocol for pediatric patients undergoing cardiovascular (CV) surgery would result in a reduction of invasive *S. aureus* infections.

Methods. A *S. aureus* screening and decolonization protocol (Table 1) was implemented for patients undergoing CV surgery at TCH on January 1, 2018. We retrospectively identified and reviewed charts of pediatric patients with *S. aureus* infections following CV surgery pre-protocol (2017) and post-protocol (January 1, 2018–March 31, 2018). We defined invasive *S. aureus* infections as: bacteremia, mediastinitis, superficial and deep surgical site infections (SSIs) and ventilator-associated pneumonias (VAPs). A subset of charts were reviewed pre- and post-protocol for methicillin-resistant *S. aureus* (MRSA) polymerase chain reaction (PCR) result, use of mupirocin and chlorhexidine gluconate (CHG), and choice of intraoperative antibiotic. Data were analyzed with Fisher's exact.

Results. Of 694 pediatric CV surgery patients in 2017, we identified 13 patients with 15 invasive *S. aureus* infections: bacteremia (5), VAP (4), and SSI (6). Twelve of these infections were caused by methicillin-susceptible *S. aureus* (MSSA) and 3 were MRSA. The median time to infection was 19 days. In the first 3 month post-protocol period, there were 175 pediatric CV surgery patients with 0 invasive *S. aureus* infections. Seventy-five charts each were reviewed pre- and post-protocol to assess protocol adherence (Figure 1). Post-protocol MRSA screening peaked at 64%, which increased further to 70% when excluding infants <30 days. Of 40 patients screened with a MRSA PCR, only 1 (2.5%) was positive. Cefazolin use remained high pre- and post-protocol (72/75 vs. 73/75 respectively).

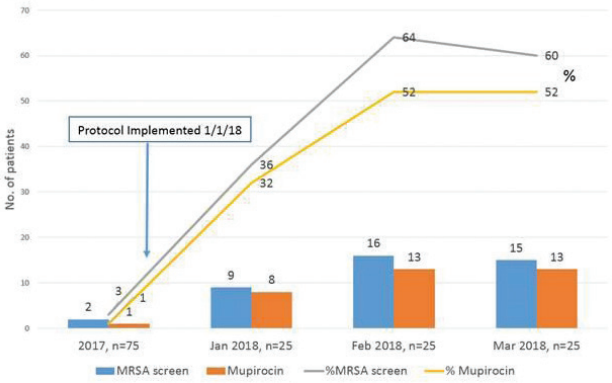
Conclusion. Most pediatric invasive *S. aureus* infections are caused by MSSA. Following protocol implementation, we observed a decrease in invasive *S. aureus* infections in CV surgery patients at TCH (P = 0.05), though continued monitoring for protocol compliance and development of *S. aureus* and other bacterial infections are needed.

Table 1. *Staphylococcus aureus* Infection Prevention Protocol for Pediatric Patients Undergoing Cardiovascular Surgery at Texas Children's Hospital

Recommendation	Description
Universal Decolonization	• Population: All patients undergoing CV Surgery • Action: Apply topical mupirocin to anterior nares BID for 5 days AND use 2% chlorhexidine gluconate antiseptic wipes as directed according to patient weight daily for 5 days[a] • Timing: Start 5 days prior to surgical procedure date
MRSA Screening	• Population: All patients undergoing CV Surgery • Action: Using a single swab, swab the nares, axilla, and groin of the patient for MRSA PCR testing • Timing: Perform at least 3-4 hours prior to surgical procedure
Screening-Directed Preoperative Antibiotic	• Population: All patients undergoing CV Surgery • Action: Administer cefazolin[b] • Timing: 0-60 minutes prior to incision; re-dose every 4 hours • Population: MRSA-positive patients undergoing CV surgery should receive cefazolin in addition to the following: • Action: Administer vancomycin • Timing: 0-120 minutes prior to incision; no re-dosing

[a]At preoperative visit, patients are given packets containing: chlorhexidine wipes, an instruction sheet, and a prescription for mupirocin.
[b]Cefazolin was the first-line agent for intraoperative prophylaxis at our institution pre protocol. In patients with a documented β-lactam allergy, may refer to A&I for penicillin allergy testing. If β-lactam allergy confirmed, administer clindamycin and re-dose every 6 hours or a one-time dose of vancomycin for gram-positive coverage.

Figure 1. *Staphylococcus aureus* Infection Prevention Protocol Use



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

2306. Molecular Epidemiology of and Risk Factors for *Staphyloccus aureus* (SA) Colonization in a Chinese Neonatal Intensive Care Unit (NICU)

Wenjing Geng, MD, PhD[1,2]; Thomas McConville, MD[2]; Alexandra Hill-Ricciuti, MPH[3]; Yujie Qi, MD[1]; Lisa Saiman, MD, MPH[3,4] and Anne-Catrin Uhlemann, MD, PhD[2]; [1]Beijing Children's Hospital, Beijing, China, [2]Columbia University Medical Center, New York, New York, [3]Pediatrics, Columbia University Medical Center, New York, New York, [4]New York Presbyterian Hospital, New York, New York

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

Background. SA infections place a significant burden on NICUs worldwide. However, little is known about the burden of SA in Chinese NICUs. In this study, we describe the molecular epidemiology of SA in the tertiary care 50-bed NICU of Beijing Children's Hospital and examine risk factors (RFs) for SA colonization in neonates.

Methods. From May 2015 to March 2016, we prospectively collected nasal swabs from 536 neonates <28 days of age admitted from the community, perinatal services, or other hospitals. SA isolates were characterized by multilocus sequence type (MLST), staphylococcal chromosomal cassette *mec* (*SCCmec*) type, *agr*, spa-type, cytotoxicity and superantigen (*SAg*) genes. The characteristics of MRSA vs. MSSA and infecting vs. colonizing isolates were compared using Mann–Whitney U and Fisher's tests. Logistic regression was used to compare characteristics of infants colonized vs. uncolonized with SA.

Results. We identified 96 (18%) and 23 (4%) neonates with SA colonization and/or infection on admission. Among the 96 colonized infants, 28 had MRSA and 68 had MSSA. ST59-SCCmecIVa-t437-agr-1 (20/28, 71%) and ST188-t189-agr-1 (11/68, 16%) were the common colonizing MRSA and MSSA clones, respectively. Among 23 isolates associated with infection, 17 were MRSA and ST59-SCCmecIVa-t437-agr-1 (6/17, 35%) was also the most common clone. Of the 119 SA isolates, 108 (91%) contained at least one *SAg* gene; however, none carried *sasX*. Cytotoxicity was significantly different among the main clones (P = 0.04). While MRSA and MSSA had similar cytotoxicity (83.7% vs. 85.9%, P = 0.45), infecting isolates had higher cytotoxicity than colonizing isolates (87.6% vs. 84.5%, P < 0.01). Female sex (OR_{ADJ} = 2.05, P < 0.01), age >7 days (OR_{ADJ} = 7.14, P < 0.01), and vaginal delivery (OR_{ADJ} = 2.16, P < 0.01) were RFs for SA colonization, while antibiotic use was protective (OR_{ADJ} = 0.25, P < 0.01).

Conclusion. SA colonization was common in infants admitted to our NICU and 2 clones predominated. MRSA and MSSA did not differ in cytotoxicity, although infecting isolates had higher cytotoxicity. Several non-modifiable risk factors for SA colonization were identified. Our results suggest that screening infants for SA is useful and interventions to target cytotoxic clones should be explored.

Disclosures. **A. C. Uhlemann**, Merck: Investigator, Grant recipient.

2307. Use of Whole-Genome Sequencing to Determine Adhesin and Biofilm-Associated Gene Profiles Among Pediatric *Staphylococcus aureus* Device-Related Infection Isolates Compared With Skin and Soft-Tissue Infection Isolates

Catherine Foster, MD[1]; Melissa Kok, BS[1]; Anthony Flores, MD, MPH, PhD[2]; Ruth Ann Luna, PhD[1]; Sheldon L. Kaplan, MD, FIDSA[1] and Kristina G. Hulten, PhD[1]; [1]Baylor College of Medicine and Texas Children's Hospital, Houston, Texas, [2]University of Texas Health Science Center, Houston, Texas

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

Background. Adhesins or microbial surface component recognizing adhesive matrix molecules (MSCRAMMs) and the *ica* locus help mediate *S. aureus* adherence to host tissue and biofilm formation and are thought to play important roles in the