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INTRODUCTION

Tracheal Aspirate cultures (TA) are routinely drawn from intubated NICU patients in the diagnostic workup for infection. Clinicians must interpret TA results in the clinical context of colonization versus infection. Antibiotic stewardship improves neonatal outcomes. This study aims to measure the tracheal microbiome and determine diagnostic utility of TA in ventilated NICU patients.

CDC Diagnostic Criteria for Ventilator-Associated Pneumonia (VAP):

- New **and** persistent (>48-h) or progressive radiographic infiltrate
- **Plus two of the following:**
 - Temperature of >38°C or <36°C
 - Blood leukocyte count of >10,000 cells/ml or <5,000 cells/ml
 - Purulent tracheal secretions
 - Gas exchange degradation

METHODS

TAs were prospectively monitored from a Level IV NICU for one year, beginning February 2022. Positive cultures represent the tracheal microbiome of intubated NICU patients. Following each positive culture, physicians completed a survey to query the basis of their diagnosis and therapeutic interventions. We subsequently assigned a diagnosis of pneumonia, tracheitis, or colonization via independent chart review. Discrepancies in physician survey versus independent chart review are used to assess diagnostic accuracy of VAP and tracheitis.

RESULTS

Of the 158 TAs collected from the NICU during the study period, pathogenic bacterial species grew in 72 cultures (46%), most commonly *Staphylococcus aureus*. Thirteen infants (17%) simultaneously grew a pathogenic organism from blood, urine, or CSF.

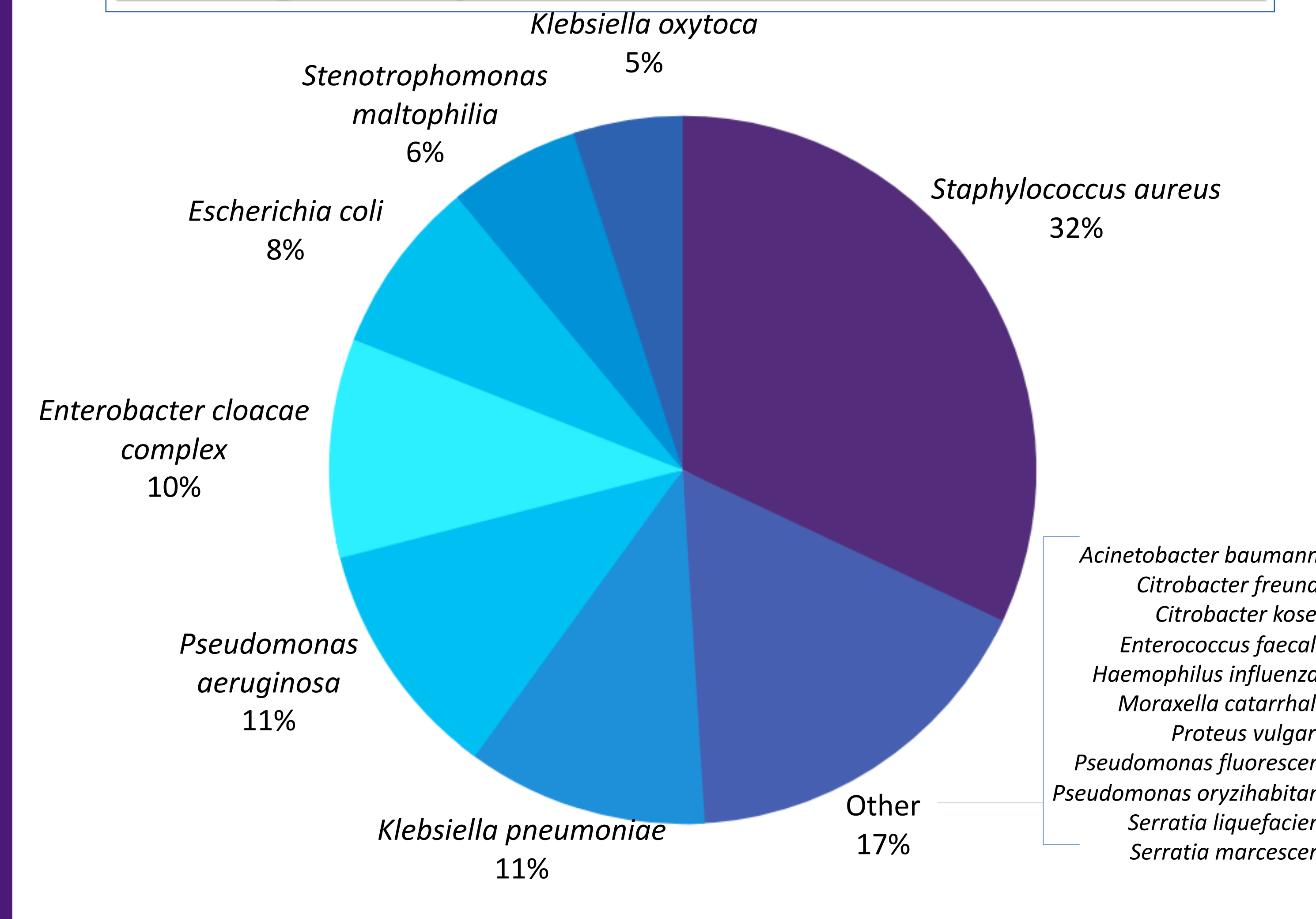
Among infants with pathogenic TA growth, 92% were treated with more than 2 days of antibiotics. Physician diagnoses of treated infants included pneumonia (37%), tracheitis (35%), colonization (26%), and contamination (2%). Chart review revealed that 28/75 (37%) positive cultures corresponded with cases which did not meet the clinical criteria for infection based on CDC definition. Physicians accurately identified those cases 28% of the time.

CONCLUSIONS

Most (92%) of infants received a prolonged course of antibiotics when a pathogenic organism was identified from TA, even after a physician diagnosis of colonization (26%). Independent chart review reveals physicians also overestimated the incidence of true infection, leading to unnecessary antibiotic use.

Developing and implementing a more rigorous set of clinical guidelines for the interpretation of TAs is an opportunity to improve antibiotic stewardship in the NICU.

Pathogenic Species Identified in TA Cultures



Physician vs Independently Validated Diagnosis of VAP and Tracheitis

	Physician Diagnosis		Chart Validated Diagnosis	
	Infected	Not Infected	Infected	Not Infected
Tracheal Aspirate Culture +	41	16	47	28
Tracheal Aspirate Culture -	0	83	0	83
Specificity	83.8%		74.8%	
PPV	71.9%		62.7%	

* 18 Physician surveys incomplete