2139. *Rickettsia typhi* Detection in Clinical Infections by the Karius Test, a Plasma Microbial Cell-free DNA Next-Generation Sequencing Test

Fernando H. Centeno1, Asim A. Ahmed, MD2; David K. Hong, MD2; Sudeb Dalai, MD3; Laila Woc-Colburn, MD4; 1 Baylor College of Medicine, Houston, Texas; 2Karius, Inc., Redwood City, California

**Session:** 243. Bacterial Diagnostics
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**Background.** *Rickettsia typhi* typically causes a nonspecific syndrome characterized by fever, rash, and headache but can rarely progress to severe disease. *R. typhi* is transmitted by the rat flea and there has been an increased incidence in Houston, TX. Establishing the diagnosis can be challenging and is often made by serological studies. Prompt therapy with doxycycline is important especially in severe disease.

**Methods.** Karius Test results from the prior 2 years (Redwood City, CA) were reviewed for detections of *R. typhi*. The Karius Test is a CLIA-certified/CAP-accredited next-generation sequencing (NGS) plasma test that detects microbial cell-free DNA (mcfDNA). After mcfDNA is extracted and NGS performed, human sequences are removed and remaining sequences are aligned to a curated pathogen database of >1,000 organisms. Organisms present above a statistical threshold are reported. Chart review was conducted on the cases of *R. typhi* identified by the Karius Test.

**Results.** The Karius Test detected *R. typhi* in 6 adult patients, 4 women and 2 men, from a medical center in Houston, TX. In 2 patients, *R. typhi* mcfDNA was present in the raw sequencing data but at an abundance below validated statistical thresholds. *R. typhi* mcfDNA was not found in negative controls run simultaneously with the samples. All patients presented with fever, 4 presented with headache, 3 presented with gastrointestinal symptoms, 3 developed rash, 1 presented with hypotension. Laboratory data were available for 5 patients. Four patients developed thrombocytopenia, 5 had anemia, 4 had WBC < 5, 4 had transaminase elevation and 3 developed hyponatremia. 3 of 5 had *R. typhi* serology sent; all 3 were positive (including 2 of the patients with *R. typhi* mcfDNA levels below threshold). In the two other patients the Karius test was the means of establishing the diagnosis. 3 out of 5 patients where data were available were treated with doxycycline.

**Conclusion.** The Karius test was able to detect *R. typhi* in a cluster of 6 patients in one medical center in Houston, TX. NGS for mcfDNA offers a rapid means of detecting *R. typhi* infection. Accurate, rapid diagnosis of *R. typhi* has important public health implications given its vector-borne mechanism of transmission.

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2141. Potential for Harm From Rapid Campylobacter Antigen Test: Quality Improvement Process Reveals 84% False-Positive STAT! Campy Stool Antigen Results

John J. Farrell, MD1; Jessica Mathis, MLS2; Sarah J. Knapp, CLS3; 1University of Illinois College of Medicine, Peoria, Illinois; 2OSF Saint Francis Medical Center, Peoria, Illinois

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**Background.** The Immunocare STAT! Campy is known to have a poor correlation with Campylobacter culture, and bloody stools are thought to be the most common cause of false-positive tests. A CDC investigation of 11 cases of Campylobacter in premature infants with non-bloody stools between March and April, 2018 at the Children’s Hospital of Illinois identified a pseudo-outbreak secondary to false-positive stool antigen tests.

**Methods.** Beginning May 1, 2018, Immunocare STAT! Campy (Meridian BioScience) positive stools from 14-hospitals in the OSF network were sent to the OSF System lab for confirmation prior to resulting in the medical record (MR). Stools were placed into Cary Blair media and a STAT! Campy stool antigen test was repeated in the OSF System Lab. BioFire GI Panel (GIP) PCR was performed on STAT! Campy positive stools, and results reported in the MR.

**Results.** Between May 1, 2018 and April 30, 2019, 3,639 stools were submitted for culture. 372 tested positive by the STAT! Campy rapid antigen test and were referred for confirmation. Repeat rapid antigen tests were negative for 56% (208/372) of stools and were finalised in the MR as negative without GIP testing. GIP PCR was performed on 164 samples from 163 patients (mean age = 18). 43% (71/164) of GIP were completely negative; 16% (27/164) positive STAT! Campy antigens were confirmed by the GIP (84% were false positive). Pathogens detected by the GIP included: 30 viral infections (50% Norovirus), 27 cases of *C. difficile*, and 25 cases of *E. coli* (Table 1). Multiple pathogens were detected in 15% (25/163) patients (1 patient was positive for 4 pathogens). One case of Salmonella was not detected by GIP. One patient tested negative by the GIP but remained symptomatic and *C. difficile* was detected on repeat testing 10 days later.

**Conclusion.** *C. difficile* and Norovirus were the most common pathogens detected in stools that yielded false positive STAT! Campy results. These findings have important patient care and infection control implications. Currently neither FDA nor CDC requires Campylobacter culture (or other laboratory methods) of confirmation of positive Campylobacter stool antigen tests. Missed and incorrect diagnoses represent a significant risk of harm for patients (particularly *C. difficile* or Shiga toxin-inferred patients, Table 1), and outbreaks in institutional settings.

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**Table 1.** Shiga toxin detection results vs PCR

| Pathogenic E. coli in Stool | Shiga Toxin NEG | Shiga Toxin POS |
|----------------------------|----------------|----------------|
| Negative (N=19)            | 4              | 0              |
| Positive (N=4)             | 18             | 1              |

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2140. Utility of Respiratory Specimen Gram Stain for Predicting Final Culture Result in Patients with Clinically Diagnosed Pneumonia

Jessica Seadler, PharmD1; Terri Smith, PharmD1; Andrew C. Faust, PharmD, BCPS2; 1Texas Health Resources, Springfield, Illinois; 2Texas Health Presbyterian Hospital of Dallas, Dallas, Texas

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**Background.** Obtaining a high-quality respiratory tract specimen for Gram stain and culture in patients with suspected lower respiratory tract infections is recommended by the IDSA guidelines. However, conflicting results correlating Gram stain with final culture growth has led to questions about the utility of a respiratory specimen Gram stain. The purpose of this study was to assess the correlation of Gram stain with final culture in patients with pneumonia.

**Methods.** A retrospective chart review was conducted to evaluate adult inpatients with a diagnosis of pneumonia (based on the CDC surveillance definition) who had a respiratory specimen submitted for Gram stain and culture. A specimen was considered acceptable if less than ten epithelial cells were visualized under low power field. Each Gram stain was compared with the corresponding final culture. The primary outcome was to evaluate the correlation of Gram stain with final culture using positive predictive value (PPV), negative predictive value (NPV), sensitivity, and specificity. A culture was considered negative if no bacteria were isolated or if only normal flora grew. Secondary outcomes were PPV and NPV based on antibiotic exposure prior to specimen collection, semi-quantitative number of bacteria on Gram stain, and collection method. Additionally, discordance between Gram stain and final culture morphology was evaluated.

**Results.** A total of 269 acceptable specimens were assessed. Of the 72 specimens with a positive Gram stain, 41 yielded bacteria in final culture (PPV: 56.9%). In contrast, 154 of the 197 specimens with a negative Gram stain were associated with negative final culture (NPV: 76.7%). The NPV of Gram stain was decreased when antibiotics were given for > 24 hours pre-specimen. The PPV of Gram stain improved as an increasing amount of bacteria were reported. Less invasive collection methods had a lower PPV but a higher NPV in comparison to invasive collection methods. Finally, the discordance rate between Gram stain and final culture morphology was low.

**Conclusion.** This study shows inconsistent results regarding the ability of Gram stain to predict final culture. Pneumonia should continue to be managed clinically and culture obtained prior to adjusting empiric antimicrobial regimens based solely on the Gram stain.

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