Broad Range PCR of Pleural Fluid Improves Diagnosis of Bacterial Pneumonia Complicated by Parapneumonic Effusion

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Background:

Bacterial pneumonia complicated by a para pneumonic effusion is frequently encountered in hospitalized patients. However, identifying the etiology of pneumonia remains elusive. Published data report rates of bacteremia ranging from 13-26% among patients with pneumonia complicated by parapneumonic effusion. Good quality sputum samples are difficult to obtain in children. Gram stain and culture of pleural fluid is helpful, but most patients are already pretreated before a specimen is obtained limiting utility. Nucleic acid assays of pleural fluid have reported sensitivities from 40-80%[1, 2]. We wanted to review our experience with pleural fluid nucleic acid assay at Akron childrens hospital.

Methods:

Using help from our laboratory data support team, we retrospectively reviewed the records of all pleural fluid isolates that were sent out to Washington University Medical Center for 16 S rRNA sequencing (broad range polymerase chain reaction assay). The review covered a 8-year time period ranging from January 2014 to March 2022. Negative blood and pleural fluid cultures were a prerequisite before the send out for nucleic acid assay.

Results:

A total of 29 pleural fluid samples were sent out for 16S rRNA sequencing. 22 of these had a detectable target. This translated into a yield of about 75%. The following table summarizes our findings.

Results

Number of Pleural Fluid Samples Sent	Organisms Detected	Percentage Positivity	Comments
29	14 - *Streptococcus pneumoniae* 2 - *Staphylococcus aureus* 2 - *Streptococcus intermedius* 1 - *Streptococcus mitis* 2 - *Streptococcus pyogenes* 1 - *Porphyromonas*	22/29 – ~ 75%	All patients had negative blood and pleural fluid cultures before nucleic acid studies

Conclusions:

In our experience, nucleic acid assay of the pleural fluid is valuable in making a bacteriological diagnosis of pneumonia with para pneumonic effusion. Its benefit remains in patients pretreated with antibiotics. For the individual patient it may help narrow antibiotic therapy. At an institutional level it would allow for developing guidelines for empiric antibiotic management. However, in most institutions' nucleic acid assay of pleural fluid remains a send out test and optimizing work flows to reduce turnaround time remains a challenge.

References:

1. Lampejo T, Ciesielczuk H, Lambourne J. Clinical utility of 16S rRNA PCR in pleural infection. J Med Microbiol. 2021 May;70(5). doi: 10.1099/jmm.0.001366. PMID: 34038341.

2. Gollomp K, Rankin SC, White C, Mattei P, Harris MC, Kilpatrick LE, Sheffler-Collins S, McGowan KL, Shah SS. Broad-range bacterial polymerase chain reaction in the microbiologic diagnosis of complicated pneumonia. J Hosp Med. 2012 Jan;7(1):8-13. doi: 10.1002/jhm.911. Epub 2011 Oct 12. PMID: 21994146.