Mitigation of Nucleic Acid Contamination Present in Blood Culture Media Formulations with an Enhanced Molecular Diagnostic Test

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Background

Molecular diagnostic tests provide faster, more objective, and generally more sensitive and specific results as compared to standard culture methods. The BioFire® FilmArray Blood Culture Identification (BCID) Panel tests positive blood culture (BC) samples to detect nucleic acids from patient pathogens implicated in bloodstream infections. Studies have shown that sterile blood culture media can contain residual nucleic acid (NA) from a variety of bacteria likely introduced from raw materials or manufacturing processes. NA was not detected by the BioFire BCID Panel when compared to sterile blood culture media bottles. Incubation of the blood culture media bottles tested resulted in no Enteric bacteria with the BioFire BCID Panel.

Methods

Sterile blood culture media bottles used during a pilot study as well as during development studies at BioFire Diagnostics, LLC were tested with both BioFire BCID and BioFire BCID2 Panels. This included 40 unique media lots of 6 different formulations manufactured by Becton Dickinson (BD) and 20 unique media lots of 4 different formulations manufactured by Becton Dickinson (BD). Controls and residual clinical PCR with Proteus spp. were also assayed with both Panels for comparison.

Results

Detection of Proteus Nucleic Acid Mass in Blood Culture Media Bottles (tested at BioFire)

• Overall results with the BioFire BCID Panel: 16/175 (9%) Proteus and 11/175 (6%) Enterobacteriaceae detections; overall rate of 27/175 (15%)
• Overall results with the BioFire BCID2 Panel: 2/175 (1%) Proteus and 1/175 (0.6%) Enterobacteriaceae detections; overall rate of 3/175 (1.7%)
• BD media bottles (25 lots of 5 formulations) contained detectable NA for Proteus at a rate of 13/175 (7.5%) with the BioFire BCID Panel.
• No detections in the BioFire BCID Panel.
• BD media bottles (20 lots of 5 formulations) contained detectable NA for Proteus at a rate of 1/175 (0.6%) with the BioFire BCID Panel.

Quantifying Proteus Nucleic Acid Present in Blood Culture Media Bottles

Blood culture media bottles that were positive for Proteus were extracted and amplified using the BioFire BCID Panel to determine the concentration of Proteus nucleic acid present in the media. Blood culture media bottles that were negative by BioFire were also tested for comparison.

Conclusions

This study has demonstrated that the updated BioFire BCID Panel is less vulnerable to false positive results caused by the presence of Proteus and Enterobacteriacea bacteria, as well as a reduction in false positive results caused by the presence of nucleic acid contamination. These results have been consistent in both sterile blood culture media bottles and clinical diagnostic tests. The BioFire BCID Panel can potentially be used to determine nucleic acid contamination in blood culture media bottles, which may reduce false positive results and improve diagnostic accuracy.