Use of Biofire® FilmArray® in a Medical Examiner's Office, A Case Series

Presenting Author: Megan Lee, M4

Boone/Callaway County Medical Examiner's Office
University of Missouri Health Care

Disclosures

- None
- No affiliation with bioMérieux
- All mention of BioFire® FilmArray® technology is for academic purposes only

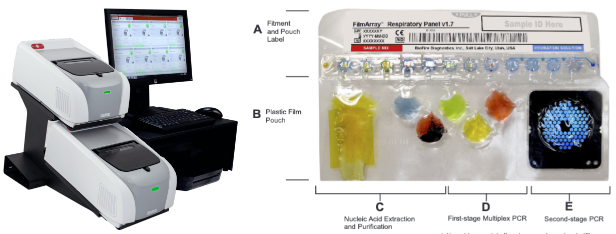
Post-Mortem Pathogen Testing Options

- Histopathology +/-
  - Special stains
  - IHC
  - ISH
- Culture
- Molecular genetics, including PCR

https://www.biofiredx.com/products/the-filmarray-panels/filmarray-gi/

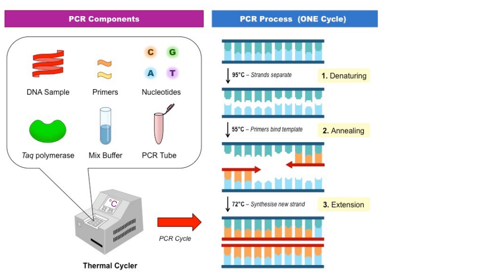
What is the BioFire® FilmArray®?

Automated, User-Friendly, Multiplex PCR



https://www.biofiredx.com/products/filmarray/

Polymerase Chain Reaction Overview



https://ib.bioninja.com.au/standard-level/topic-3-genetics/35-genetic-modification-and/pcr.html

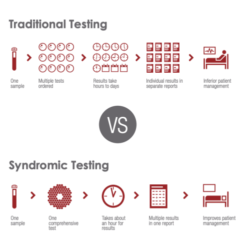
BioFire® FilmArray® Panels

The FilmArray® Respiratory Panels
Sample Type: Nasopharyngeal Swab

The FilmArray® Gastrointestinal (GI) Panel
Sample Type: Stool in Cary Blair FDA-cleared and CE-marked

The FilmArray® Meningitis/Encephalitis (ME) Panel
Sample Type: Cerebrospinal Fluid (CSF) FDA-cleared and CE-marked

The FilmArray® Blood Culture Identification (BCID) Panel
Sample Type: Positive Blood Culture FDA-cleared and CE-marked

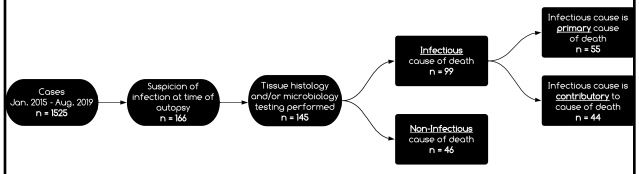


https://www.biofiredx.com/products/the-filmarray-panels/

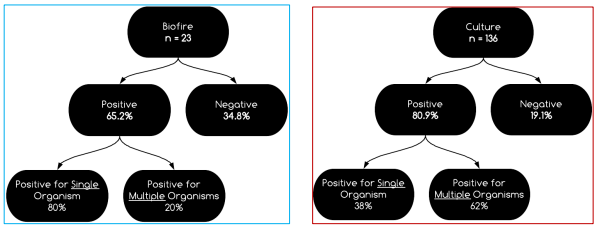
Cost

- Two Options
  - Purchase machine and pouches and run samples in-house
  - Send out to the closest lab with BioFire® FilmArray® capabilities
- Our office is associated with the University of Missouri Health Care System
  - We send out the sample (down the hall) and are charged **$460 per panel**

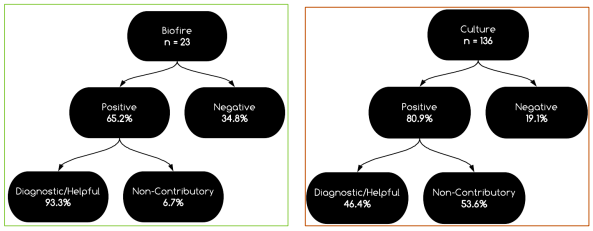
Methods



Results



Results



Case 1: 11-Year-Old Male

- Scene History
  - The decedent reportedly "had the flu" prior to death. Other family members were also ill, but no one had gone to see the doctor. He was found dead in bed by his mom.
- Autopsy Findings
  - Vitreous glucose greater than 500 and ketones present in blood
  - R. ventricular dilation
  - R. and L. lung parenchyma uniformly congested, edematous, and hemorrhagic

Case 1: 11-Year-Old Male

- Histologic Findings
  - R. and L. lungs: Edema and vascular congestion, mild autolysis, bacterial colonies present
- Culture Results
  - Lung: Heavy *Staphylococcus aureus* and scant *Klebsiella* species *oxytoca/Raoultella ornithinolytica*
- BioFire® FilmArray® Results
  - Respiratory: Positive for influenza A/H1-2009

Case 1: 11-Year-Old Male

- Cause of Death
  - Influenza complicating diabetes mellitus resulting in diabetic ketoacidosis

Case 2: 5-Year-Old Female

- Scene History
  - The decedent had been sick the entire week before death; she had a sore throat. She went to urgent care and was sent home. She went to take a nap and was found unresponsive later. 911 was called, and she was dead upon arrival in the ER.
- Autopsy Findings
  - Splenomegaly, enlarged cervical and mesenteric lymph nodes
  - R. and L. lung parenchyma uniformly congested and edematous
  - Moderate edema of the brain

Case 2: 5-Year-Old Female

- Histology Findings
  - R. and L. lungs: Vascular congestion; material consistent with aspirated stomach contents in some airways with no associated inflammatory reaction
  - Lymph node, R. upper neck: Paracortical lymphoid proliferation; IHC negative for EBV
- Culture Results
  - Blood: Positive for *Streptococcus salivarius*, likely a contaminant
- BioFire® FilmArray® Results
  - Respiratory: Positive for rhinovirus/enterovirus

Case 2: 5-Year-Old Female

- Cause of Death
  - Sudden unexplained death in a child with an infectious mononucleosis-like illness
  - Asner et al. describe two patients who died from a sepsis-like illness who had respiratory failure and possible pneumonia with no pathogens identified other than human rhinovirus/enterovirus

Case 3: 2-Year-Old Female

- Pertinent Medical History
  - The decedent had been to the ER, was diagnosed with Influenza A, and was sent home with Tamiflu
  - She had previously been diagnosed with strep throat
- Scene History
  - Mom found her unresponsive and took her back to the ER, where she was pronounced dead
- Autopsy Findings
  - Lung parenchyma uniformly congested, edematous
  - R. lower lobe consolidation

Case 3: 2-Year-Old Female

- Histology Findings
  - R. lung: acute bronchopneumonia consisting of neutrophils around bronchi. Abscesses consisting of focal necrosis containing bacterial colonies (cocci) surrounded by neutrophils
- Culture Results
  - Culture not performed
- BioFire® FilmArray® Results
  - Respiratory: Positive for influenza A/H3

Case 3: 2-Year-Old Female

- Cause of Death
  - Influenza A/H3 infection
  - Complicated by acute pneumonia, including abscess formation

Summary

- Biofire® FilmArray® is an easy to implement, all-in-one rapid PCR device that identifies the presence of disease-causing pathogens in a syndromic fashion
- It can be useful in a variety of cases, especially pediatric cases
- PCR is less likely to have the limitations and inherent confounders of microbiological culture testing
  - Interval time after death
  - Contamination
  - Viability
  - Antibiotic use

References

- Asner SA, Petrich A, Hamid JS, Mertz D, Richardson SE, Smieja M. Clinical severity of rhinovirus/enterovirus compared to other respiratory viruses in children. Influenza Other Respir Viruses. 2014;8:438-442.
- Schreckenberger PC, McAdam AJ. 2015. Point-counterpoint: large multiplex PCR panels should be first-line tests for detection of respiratory and intestinal pathogens. J Clin Microbiol 53:3110–3115. doi:10.1128/JCM.00382-15.
- Ritu Banerjee, Christine B. Teng, Scott A. Cunningham, Sherry M. Ihde, James M. Steckelberg, James P. Moriarty, Nilay D. Shah, Jayawant N. Mandrekar, Robin Patel, Randomized Trial of Rapid Multiplex Polymerase Chain Reaction–Based Blood Culture Identification and Susceptibility Testing, *Clinical Infectious Diseases*, Volume 61, Issue 7, 1 October 2015, Pages 1071–1080, https://doi.org/10.1093/cid/civ447

Acknowledgments

- Chris Stacy, MD – Chief Medical Examiner
- Deiter Duff, MD – Medical Examiner
- Kelly Bowers, DO – Resident Physician
- Chris Cunningham, MD – Resident Physician
- Jason Stewart – Forensic Technician
- Scott Noble – Forensic Technician
- Dori Burke – Forensic Investigator
- Stacey Huck – Forensic Investigator