



H122 Evaluation of the Role of Polymerase Chain Reaction (PCR) -Based Postmortem Respiratory Infectious Disease Panels in Infant Death Investigations

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Learning Overview: After attending this presentation, attendees will better understand the difficulties in identifying the role of infectious diseases in apparent Sudden Unexplained Infant Deaths (SUIDs).

Impact on the Forensic Science Community: This presentation will impact the forensic science community by examining the contribution from microbiological testing to the investigation of infant deaths.

In 2016, there were 23,161 infant deaths (under one year of age) in the United States, of which most were attributed to congenital malformations, low birth weight, and SUIDs.¹ Although the utility of postmortem microbiology in infant deaths is frequently debated, it is essential in understanding the factors that may have contributed to the death of an infant.² Many respiratory pathogens are potentially fatal, including Respiratory Syncytial Virus (RSV), which is the most common cause of bronchiolitis and pneumonia in children under one year in the United States.^{3,4} Previous studies examining the role of respiratory infections in infant deaths have found that rhinovirus/enterovirus and RSV were the most commonly detected pathogens, with 60% of cases testing positive for RSV actually contributing to the cause of death.³ No single respiratory infection has been causally linked to SUIDs, but many studies have demonstrated higher rates of respiratory pathogens isolated from SUID cases in comparison to controls.⁵

For this study, respiratory infectious disease panel results were reviewed. This testing uses a multiplexed nucleic acid test using a FilmArray instrument for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs. This testing includes the detection of: adenovirus, coronavirus 229E, coronavirus HKU1, coronavirus NL63, human metapneumovirus, human rhinovirus (1, 2, 3, and 4), enterovirus, influenza A (H1-2009, H1 and H3), influenza B, parainfluenza (1, 2, 3, and 4), respiratory syncytial virus (RSV), *Bordetella pertussis*, *Chlamydia pneumoniae*, and *Mycoplasma pneumoniae*. *Bordetella parapertussis* was added to the respiratory infectious disease panel in late 2017. Of note, rhinovirus and enterovirus are of the same genetic family and cannot be definitively distinguished using molecular testing.

This study reviewed 100 infant deaths investigated by medical examiners and/or coroners from multiple counties in Michigan and Indiana from 2014 to 2018. This study was restricted to infants, defined as age zero to one year for a more specific analysis. Of these 100 infant deaths, a respiratory infectious disease panel was performed on a nasopharyngeal swab in 70 cases. Of these 70 cases, 39 infants (56%) tested positive for one or more respiratory pathogens. A total of 53 respiratory pathogens were detected among these 39 infants; nine infants tested positive for more than one respiratory pathogen. Of the 39 infants testing positive for a respiratory pathogen, 24 infants (61%) tested positive only for rhinovirus/enterovirus, with another 9 infants testing positive for one or more of pathogens that included rhinovirus/enterovirus, for a combined total of 33 infants (85%) testing positive for rhinovirus/enterovirus. Adenovirus was positive in 5 cases; coronavirus OC43 and parainfluenza 3 were positive in 3 cases each; influenza B and RSV were positive in 2 cases each; and coronavirus HKU1, metapneumovirus, influenza A, parainfluenza 1, and *Mycoplasma pneumoniae* were positive in 1 case each.

Of the 39 cases with positive respiratory infectious disease panels, the forensic pathologist reported a respiratory infection as a contributing factor to the death in only 16 (41%) of the deaths. Even with a contributing respiratory infection, 13 (81%) of these deaths were still certified as indeterminate due to other possible contributing factors, such as unsafe sleeping conditions.

Reference(s):

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3. Baker, T., Schandl, C., Presnell, S., Madory, J., Nolte, F., and Batalis, N. Use of an Automated Nested Multiplex Respiratory Pathogen PCR Panel Postmortem in the Pediatric Forensic Setting. *Journal of Forensic Sciences*, 2017; 62(5), 1223-1228.
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Infant Deaths, Microbiology, Respiratory Infections