Respiratory Viral Panel by PCR (RVPPCR)

Background Information

Respiratory viruses are responsible for an estimated 80% of respiratory tract infections annually. These infections can range from a mild, self-limiting illness to severe disease that can cause death. More severe disease is seen in the young, the immunocompromised and the elderly. It is estimated that an average 24,000 deaths each year are attributed to influenza in the United States.[1] In children, respiratory syncytial virus (RSV) is the most common cause of severe lower respiratory tract infection worldwide. Timely detection of these viruses can lead to initiation of proper antiviral treatment, decreased use of unnecessary antibiotics, reduced transmission of disease from person to person and better clinical outcomes.[2]

Due to low sensitivity of respiratory viral rapid antigen tests and the long turn-around time of viral culture, many laboratories are using PCR-based methods for detection of respiratory viruses.[3] Many laboratories have used multiplexed Respiratory Viral Panel (RVP) tests during the past two to three years.

These multiplex RVP tests have demonstrated the ability to detect many respiratory viruses in most patients with influenza-like illness (ILI). eSensor technology from GenMark Diagnostics (GenMarkDx, Carlsbad, CA) is a novel assay with results comparable to the gold standard viral culture and DFA. Discordant results were minimal. In addition, the RVP detected co-infections, which is important for cohorting of patients.

Clinical Indications

The Respiratory Viral Panel is a comprehensive assay for the detection of a broad range of viruses and subtypes representing the majority of circulatory respiratory disease-causing pathogens of particular importance to children, elderly and immunocompromised patients. The following virus types and subtypes are identified using the eSensor RVP:

- Influenza A, Influenza A H1, Influenza A H3, Influenza A H1N1 2009,
- Influenza B,
- Respiratory Syncytial Virus A, Respiratory Syncytial Virus B,
- Parainfluenza Virus 1, Parainfluenza Virus 2, Parainfluenza Virus 3,
- Human Metapneumovirus,
- Human Rhinovirus,
- Adenovirus B/E, C.

Interpretation

The RVP test has a high sensitivity and specificity, therefore a positive test in the appropriate clinical setting indicates infection by the virus and a negative test largely excludes infection by the particular virus.

Limitations of the Assay

Due to the genetic similarity between human rhinovirus and poliovirus, the eSensor RVP cannot reliably differentiate them. If a polio infection is suspected, a positive eSensor RVP human rhinovirus result should be confirmed by using an alternate method (e.g., cell culture).

Methodology

eSensor technology uses a solid-phase electrochemical method for determining the presence of one or more of a defined panel of virus target sequences. Purified DNA/RNA is isolated from the patient specimen and the extracted nucleic acid is reverse transcribed and/or amplified using viral specific primers with RT-PCR enzyme mix. The amplified DNA is converted to single-stranded DNA via exonuclease digestion and is then combined with a signal buffer containing ferrocene-labeled signal probes that are specific for the different viral targets. The mixture of amplified sample and signal buffer is loaded onto a cartridge containing single-stranded oligonucleotide capture probes bound to gold-plated electrodes. The cartridge is inserted into the XT-8 instrument where the single-stranded targets hybridize to the complementary sequences of the capture probes and signal probes. The presence of each target is determined by voltammetry, which generates specific electrical signals from the ferrocene-labeled signal probe.

References

1. Thompson MG, Shay DK, Zhou H, *et al*. Estimates of deaths associated with seasonal influenza – United States, 1976-2007. *MMWR*. 2010;59:1057-1062.
2. Falsey AR, Murata Y, Walsh EE. Impact of rapid diagnosis on management of adults with influenza. *Arch Intern Med*. 2007;167:354-360.
3. Welch DF, Ginocchio CC. Role of rapid immunochromatographic antigen testing in diagnosis of influenza A virus H1N1 infection. *J Clin Microbiol*. 2009;48:22-25.
4. Pierce VM, Hodinka RL. Comparison of the GenMark Diagnostics eSensor respiratory viral panel to real-time PCR for detection of respiratory viruses in children. *J Clin Microbiol*. 2012;50(11):3458-65.

Test Overview

Test Name	Respiratory Viral Panel by PCR
Ordering Mnemonic	RVPPCR
Reference Range	Negative
Methodology	Reverse Transcription/Polymerase Chain Reaction (RT/PCR)
Specimen Requirements	Nasopharyngeal swab in M4; Refrigerated
Billing Code	89720
CPT Code	87633

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