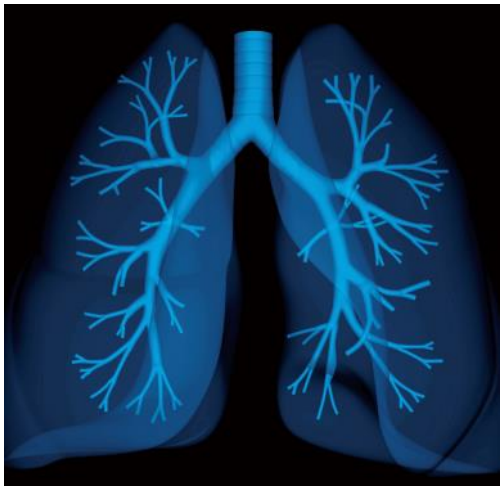
What is xTAG Respiratory Viral Panel (RVP)?

What makes this test stand out among others?

How will it benefit patients?

How will it support Clinicians?

According to Health Facts 2014 published by the Malaysian Ministry of Health, disease of the respiratory system is the top two principal causes of hospitalization and deaths amongst Malaysians.[1] In support of this, a retrospective study conducted by University Malaya between the years 1982-2008 on respiratory viral infections in Kuala Lumpur found out that Respiratory syncytial virus (RSV) is by far the commonest identified respiratory virus in children ≤ 6 months, accounting for 81.3% of the positive samples in this age group, but this declined to 56.7% in those aged 1-5 years, respectively. Correspondingly, the relative importance of influenza viruses and adenovirus increased with age in the ≤ 6 months to the 1-5 years age groups, from 5.5% to 20.2%, and 2.6% to 8.8%, respectively. RSV showed the most pronounced seasonality, with peak activity at the year-end (September- December), and lowest activity in mid-year (April-June). Influenza A was seen throughout the year, with peak activity in May, while there was more obvious increased influenza B virus activity between November-March. Adenovirus activity was present all year-round, with a peak in February-March.[2]



Molecular testing has greatly improved the laboratory's ability to diagnose respiratory viral infections. Several studies showed that using multiplex molecular diagnostic test for respiratory virus infections significantly reduced the length of hospitalization, inappropriate antibiotic usage and unnecessary lab testing and other medical procedures performed. [3,4] Hendrickson et al. reported that rapid respiratory virus diagnosis can lead to benefits in several areas, including up to a 50% reduction in hospital days, 30% reduction in antibiotic use and 20% reduction in unnecessary diagnostic tests and procedures.[3] Mahony J. B. and colleagues concluded that the use of the xTAG RVP test is the least costly strategy for the diagnosis of respiratory virus infections in children and would generate a significant savings for hospitals.[4]

Most of the respiratory viruses presented similar symptoms and signs. Therefore it is very important to identify specific respiratory viruses in order to initiate appropriate antiviral drugs and medical procedures.[5] Poehling et al. also stated that respiratory viruses cause similar illnesses and diagnosis based on clinical symptoms alone can be highly inaccurate. Therefore establishing the viral etiological characteristic of the illness is often highly dependent on accurate diagnostic testing.[6] Ginocchio et al. reported that the RVP test provided the best diagnostic option as RVP demonstrated superior sensitivity for the detection of all influenza strains, including the novel H1N1, provided accurate influenza A subtyping and identified a significant number of additional respiratory pathogens.[7] A study by Bryce L. showed that the use of the RVP test assisted the Landstuhl Regional Medical Centre (LRMC) to provide accurate and timely results that were vital to reducing misdiagnosis of patients, and subsequently, incorrect treatment and ele-

vated patient care costs. This RVP assay is an invaluable tool in monitoring seasonal outbreaks and pandemic events. It not only detects newly emerging influenza strains, but also allows the throughput of thousands of clinical specimens in a timely manner, reducing the turnaround time from weeks to days, when compared to cell culture.[8]

In addition to cost savings the advent of multiplex PCR and its application to the diagnosis of viral respiratory tract infections has indicated recently that dual and even triple respiratory tract infections occur in both children and adults. In some studies up to 45% of respiratory infections were found to be dual infections.[5] The ability to detect dual infections provides the means and impetus for studies to examine the clinical importance of dual infections and in particular whether certain individuals are at greater risk for dual infections or whether they result in a poorer outcome for the patient.[9] The use of PCR not only increases the detection of multiple infections, the technique is much less labour intensive than traditional methods. Through using the RVP assay, we are capable of detecting multiple and triple infections that would otherwise be extremely difficult to detect using traditional methods.[8] Mahony et al. reported that the use of RVP assay has consistently detected a dual respiratory virus infection rate of 5% to 8% for symptomatic patients and even some triple virus infections.[10]

Table 1 shows the 19 targets that the Luminex xTAG Respiratory Viral Panel FAST V2 can capture with just one nasopharyngeal swab. However what makes this test stands out is its ability to identify Influenza A between its H1 and H3 subtype. Hence decreasing number of further tests to run should there be a concern or a need to.[11]

Viral Types and Subtypes detected by RVP *FAST* v2

Influenza A	Adenovirus
Non-specific influenza A	
H1 subtype	Entero-Rhinovirus
H3 subtype	
H1N1 (2009) subtype	Coronavirus NL63
Influenza B	Coronavirus HKU1
Respiratory Syncytial Virus (RSV)	Coronavirus 229E
Parainfluenza 1	Coronavirus OC43
Parainfluenza 2	Human Bocavirus
Parainfluenza 3	MS-2 Bacteriophage Internal Control
Parainfluenza 4	Bacteriophage Lambda DNA Positive Control
Human Metapneumovirus (hMPV)	

In addition to that, there is a target called “Non-Specific influenza A” which will detect novel strains of influenza that has not yet been recognized.[11] According to Table 2 and Table 3 the overall panel clinical sensitivity and specificity exceeds 90%.[12]

Virus (Analyte)	Sensitivity		95% Confidence Interval for Sensitivity	Specificity		95% Confidence Interval for Specificity
	TP / (TP +FN)	Percent		TP / (TP +FN)	Percent	
Parainfluenza 4	1/1	100%	2.50% - 100%	283/284	99.65%	98.05% - 99.99%
Entero-rhinovirus*	55/57	96.49%	87.89% - 99.57%	204/228	89.47%	84.74% - 93.14%
Coronavirus OC43	6/6	100%	54.07% - 100%	275/279	98.57%	96.37% - 99.61%
Coronavirus NL63	2/2	100%	15.81% - 100%	283/283	100%	98.70% - 100%
RSV	114/125	91.20%	84.80% - 95.53%	1366/1393	98.06%	97.19% - 98.72%
Parainfluenza 1	32/40	80%	64.35% - 90.95%	1467/1478	99.26%	98.67% - 99.63%
Parainfluenza 2	19/25	76%	54.87% - 90.64%	1483/1493	99.33%	98.77% - 99.68%
Parainfluenza 3	74/97	76.29%	66.58% - 84.34%	1405/1421	98.87%	98.18% - 99.35%
Entero-rhinovirus*	45/45	100%	92.13% - 100%	859/963	89.20%	87.07% - 91.09%
Adenovirus	67/69	97.10%	89.92% - 99.65%	1433/1449	98.90%	98.21% - 99.37%
Meta-pneumovirus	35/36	97.22%	85.47% - 99.93%	961/972	98.87%	97.98% - 99.43%

Table 2. Sensitivity and specificity of RVP FAST in the combined dataset (n = 1518)

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Table 3. Sensitivity and Specificity of RVP FAST against Real-Time RT-PCR (N = 285)

Magpix system uses xMAP Technology that performs discrete assays on the surface of colour coded beads known as microspheres, which are then read in the analyzer. Using multiple lasers (LEDs) and high-speed digital-signal processors, the analyzer reads multiple assay results by reporting the reactions occurring on each individual microsphere.[16]

xTAG® Technology uses a proprietary universal tag system that allows development and optimization of nucleic acid assays such as xTAG® Respiratory Viral Panel. The TAG portion of the name represents TAG technology. TAG technology constitutes the proprietary sequences designed by Luminex that have been optimized to minimize cross-hybridization, thus preventing cross-talk in multiplexed nucleic acid assays.[13]

The RVP test is highly cost-effective and superior sensitivity for detecting respiratory viral infections. The implementation of this test improves the capabilities of hospitals and public health laboratories for diagnosing viral respiratory tract infections and certainly assists public health authorities in investigating respiratory outbreaks given the large number of viruses that it can detect.[5]

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