



## Rapid diagnostic test kits for influenza

Influenza is a respiratory infection which can result in significant morbidity and excess mortality especially in the elderly, the immunosuppressed and the very young<sup>1, 2</sup>. In children, influenza has been associated with increased outpatient visits, hospital admissions and antibiotic usage<sup>3, 4</sup>. However, rapid diagnosis of influenza has been shown to significantly alter the management of the patient's illness, resulting in a reduction in diagnostic tests performed, reduced antibiotic use, correct use of influenza antivirals and reduced length of stay in hospital emergency departments<sup>5</sup>.

A number of laboratory tests are used for the diagnosis of influenza but most require highly skilled laboratory staff, specialised equipment and are often too time consuming to be useful in determining treatment options. Recently, however, an increasing number of rapid tests (also known as near patient, or point of care tests) for influenza have become available (Figure 1 shows the tests most commonly used in Australia). These are simple and can be performed outside the laboratory (such as in the doctor's surgery) without specialised equipment or extensive training<sup>6, 7</sup>.

While in general the specificity of the kits is good (99-100%), the major limitation in their use for influenza detection has been in the lack of sensitivity (which can be as low as 44%<sup>8</sup>) when compared to standard laboratory tests such as cell culture virus isolation, which is typically the gold standard (Table 1).

Most of the rapid tests for influenza can use a range of specimen types (Table 1); however, variable results have been observed depending on the type of specimen tested. Typically, the highest sensitivity has been reported using specimens containing cellular material such as nasopharyngeal aspirates, nasal washes or nasopharyngeal swabs, with lower sensitivity demonstrated with nasal

**Aeron Hurt &  
Ian Barr**  
WHO Collaborating Centre for Reference  
and Research on Influenza  
45 Poplar Rd, Parkville VIC 3052  
Tel: (03) 9389 1392  
Fax: (03) 9389 1881  
E-mail: Aeron.Hurt@influenzacentre.org  
and  
Monash University  
School of Applied Sciences  
Churchill VIC 3842

or throat swabs. In addition, due to the increased viral shedding in young children, samples from this demographic (especially in patients aged under 2 years) often give higher overall sensitivity than specimens from older children or adults which have a lower viral load.

While some of the earlier rapid tests could only detect influenza A and took up to 45 minutes to perform, the majority of

recent tests now detect and differentiate both influenza A and B in 15 minutes or less (Table 1). The bulk of tests are based on a lateral-flow immunoassay platform that utilises monoclonal antibodies specific to the nucleoprotein of influenza virus A or B. The conserved nature of the nucleoprotein means that anti-A nucleoprotein monoclonal antibodies should be effective in capturing any influenza A virus (of human or animal origin) regardless of the subtype and anti-B nucleoprotein monoclonal antibodies will detect only influenza B.

It is worth noting, however, that few kits have been fully evaluated or titrated against a wide range of influenza A subtypes. An example of this is in initial testing of rapid kits to detect highly pathogenic avian influenza H5N1 in humans in South East Asia which has given poor results in preliminary findings<sup>9</sup>. This may reflect differences in optimal sampling sites (throat swabs

Figure 1. A selection of the rapid influenza test kits currently available in Australia.



1 – Binax Now Influenza A&B

2 – Quidel QuickVue Influenza test

3 – Biostar Flu OIA

4 – Remel Xpect Flu A & B

5 – BD Direction 'EZ' Flu A+B kit

6 – BD Directigen Flu A+B



Table 1. Summary of characteristics from selected rapid influenza test kits currently available in Australia.

Test name	Detect both influenza A & B?	Differentiate between A & B?	Storage reqs; storage life	Suggested specimen types	Assay time	Technician attendance time	Ease of use	Ease of interpretation	Overall sensitivity	Overall specificity
Binax Now Influenza A&B*	Yes	Yes	15-30°C; 1 year	NW, NA, NPS	15 min	1 min	Easy	Easy	A: 75% <sup>f</sup> B: 50% <sup>f</sup>	A: 100% B: 100%
Becton Dickinson Directigen Flu A+B †	Yes	Yes	2-25°C; 1 year	NPS, NPA NS, TS, BW	15 min	12 min	Moderate	Easy	A: 86% B: 81% A: 43-81% B: 29-50% <sup>10,13</sup>	A: 91% B: 96% A: 99-100% B: 99-100%
Biostar Flu OIA	Yes	No	2-8°C; 1 year	TS, NPS, NA, SP	20 min	15 min	Difficult	Moderate	A & B: 62-88% A & B: 48-100% <sup>14</sup>	A & B: 52-80% A & B: 93-97%
Quidel Quick Vue Influenza A+B Δ	Yes	Yes	15-30°C; 2 years	NW, NA, NS	12 min	2 min	Easy	Easy	A: 83-94% B: 67-74%	A: 89-90% B: 97-98%
Remel Xpect Flu A & B	Yes	Yes	2-25°C; 1 year	NW, NPS, TS, TA, SP, BW	15 min	2 min	Easy	Easy	A: 92% B: 98% A: 92% B: 98% <sup>15</sup>	A: 100% B: 100% A: 100% B: 100%

NW = nasal wash  
NA = nasal aspirate  
NS = nasal swab  
NPS = Nasopharyngeal swabs  
NPA = Nasopharyngeal aspirates  
TS = throat swabs  
TA = tracheal aspirates  
SP = Sputum  
BW = Bronchoalveolar wash

Figures expressed in bold type indicate manufacturers' figures taken from kit inserts, figures in italics indicate data reported from selected independent studies.

\* This kit has combined both the A and B tests that were previously produced separately. Because it is relatively new, very little data is available; however, manufacturers' data comparing the new with the old version suggests equivalent sensitivity and specificity to the individual Binax Now Flu A and Binax Now Flu B tests.

† A new format Becton Dickinson Direction 'EZ' Flu A+B kit is now available. Preliminary data suggests that although it is easier to perform, sensitivity and specificity are lower than the Directigen Flu A+B kit<sup>15</sup>.

Δ This kit is a new format that differentiates between A and B influenza. No independent performance data are available yet.

<sup>f</sup> Data based on only 4 influenza positive specimens.



appear to be better than other sites for H5N1 infections) or possibly the fact that in developing countries patients do not present until later in their illness.

Rapid tests have a number of potentially useful roles in different clinical situations. Given that the clinical presentation of patients with influenza-like illness can be due to a number of etiological agents, and that antiviral agents such as Relenza or Tamiflu are effective only against influenza, pre-testing of influenza is likely to both improve the impact of antiviral therapy and reduce wastage. Apart from their use in patient management in a hospital or other health care setting, the rapid tests also have application in investigating institutional outbreaks (e.g. nursing homes), testing of international travellers arriving with suspected influenza and assisting in influenza surveillance (particularly in remote areas with limited laboratory resources).

Apart from the lower clinical sensitivity compared to other laboratory tests, an important factor that appears to be preventing the widespread use of rapid influenza test kits in Australia is the cost. Depending on the type and number of kits being purchased, costs directly from the manufacturer or supplier range from \$12-20 per test. In Japan the use of the kits is very high, mainly because the costs of influenza rapid tests are covered by reimbursement from health insurance companies where their use is a prerequisite to prescription of antivirals such as Tamiflu.

A further, minor, issue with the majority of the influenza rapid tests currently available is their relatively short shelf life which is usually less than 1 year from the time they are received (Table 1). This has particular implications in regions that experience annual seasonal influenza where, if large numbers of kits are purchased and not used (due to low influenza activity), they will have expired prior to the start of the next season. On the positive side, many of these kits can be stored at room temperature. Table 1 gives a summary of the characteristics of some of the rapid tests for influenza which are available in Australia at the time of this article.

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