



Evaluation of MP Diagnostics Multisure® HIV Rapid Test Device

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INTRODUCTION

- Differentiating HIV-1 from HIV-2 antibody is an integral part of most HIV diagnostic algorithms.
- We evaluated the MP Diagnostics Multisure® HIV rapid test device (RTD) which gives results in 20 minutes using plasma, serum or whole blood and can be read visually or by an electronic reader.
- Multisure® HIV is a Reverse Flow Rapid Test Device (RTD) that utilises 4 antigens to detect antibodies to gp-120 and gp41 (HIV-1), p24 (HIV1/2) and gp36 (HIV-2).
- In-house company studies suggest this assay has a sensitivity of 100% and a specificity of 99%.
- Use of an assay such as Multisure® may reduce the need to use more expensive, and time consuming, methods to differentiate HIV-1 from HIV-2.
- The assay has the potential to be used for near patient testing.
- This poster describes data generated up to January 2019.

METHODS

- 208 clinical specimens received for HIV confirmation at a National Reference Laboratory were evaluated.
- Expected HIV confirmation and typing results were generated using standard algorithms including two Ag/Ab 4th Generation assays, an in-house antibody only typing assay, HIV Immunocomb assay and HIV Western blot where typing assay was inconclusive or demonstrated dual reactivity.
- Subsets of specimens were used to determine inter-reader variability.
- External Quality Assurance specimens were used to determine the difference between use of an electronic reader and reading by eye.

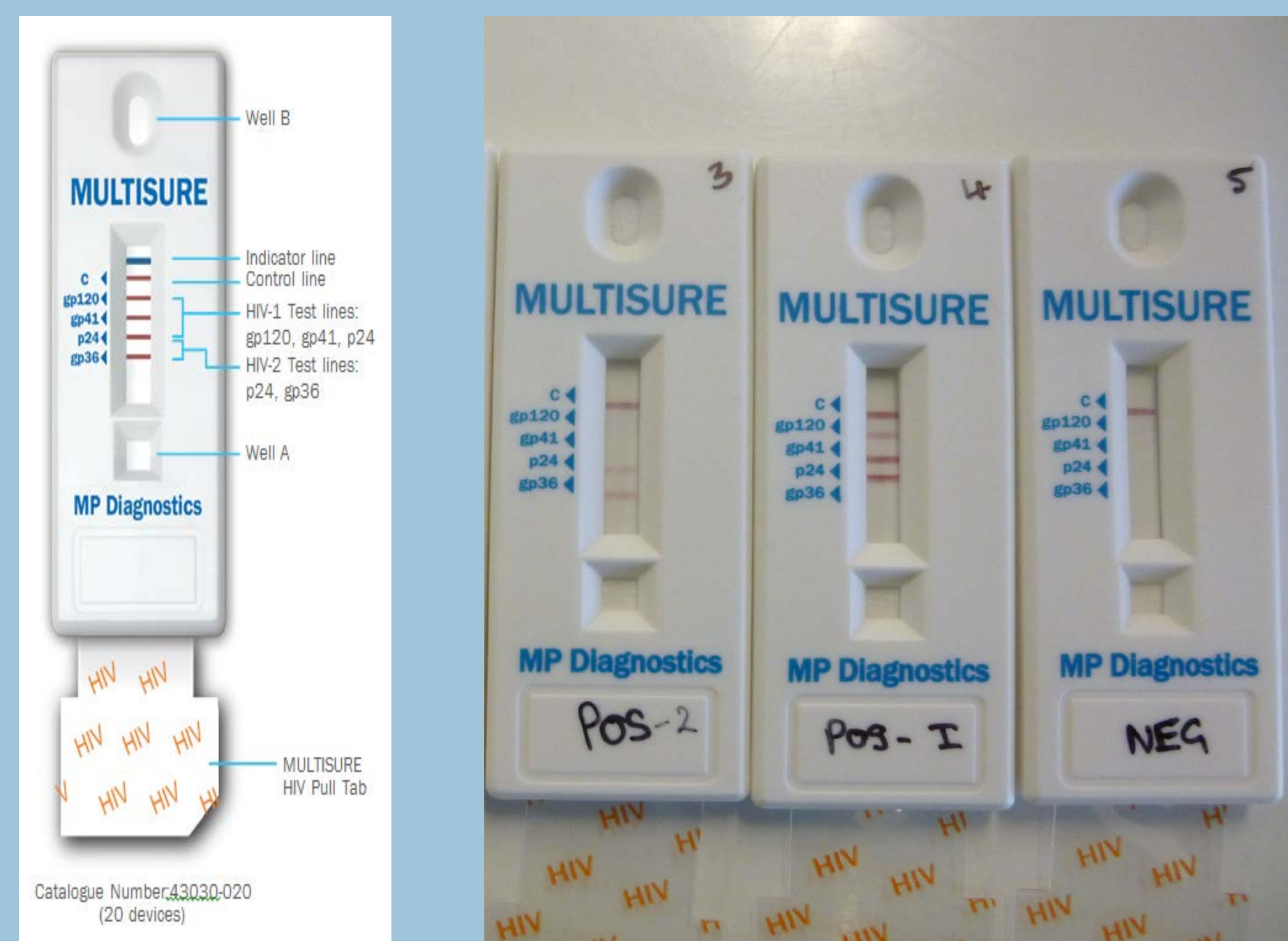


Figure 1. MP Diagnostics Multisure® promotional diagram and examples of test device in use with negative and positive control specimens.

RESULTS

- Figure 2 compares the Multisure® result and the Reference Laboratory final interpretation and demonstrates a 90% concordance between them.
- In most cases where discordance occurred (17/24 – 71%), it was due to the Multisure® device indicating a dually reactive specimen where Reference Laboratory testing concluded either HIV-1 or HIV-2 only reactivity.
- Two HIV-1 positive specimens were falsely declared HIV negative on Multisure®.
- One HIV-1 positive specimen was wrongly classified as HIV 2 by Multisure®.
- One HIV- 1 and HIV-2 dually reactive specimen was classified by Multisure® as positive to HIV-2 only.
- Two HIV negative 2 specimens were deemed HIV positive by Multisure®, one HIV-1 Positive and one HIV-2.

		Reference Laboratory Final Interpretation			
		HIV-1	HIV-2	HIV-1/2	HIV Neg
Multisure® Results	HIV-1	147	0	0	1
	HIV-2	1	15	1	1
	HIV-1/2	12	6	11	0
	HIV Neg	2	0	0	13
	Total	162	21	12	13

Figure 2. Comparison of Multisure® result and final results issued by Reference Laboratory on 208 clinical specimens.

- Figure 3 shows the frequency and average intensity (determined by eye on a 0 to 3+ scale) to antigens from a subset of specimens.
- In HIV-1 positive patients the gp41 glycoprotein was always detected, with gp120 and p24 detected less frequently. The average intensity of the gp41 band was also greater than that of the gp120 and p24 bands
- In HIV-2 positive patients strong reactivity in the gp36 antigen was observed. Weak p24 reactive was observed in one specimen.
- In dually reactive patients both gp36 and gp41 were present in all samples. However, the average reactivity to the gp36 antigen was reduced compared to that seen in HIV-2 only positive patients.
- There was no difference between reactivity to the gp41 antigen in dually reactive specimens compared to that seen in HIV-1 only positive specimens.

Final result	Antigen (average reactivity)			
	gp120	gp41	p24	gp36
HIV-1 (n=72)	65 (1.25)	72 (2.26)	64 (1.78)	0
HIV-2 (n=6)	0	0	1 (1)	6 (3)
HIV -1/2 (n=10)	8 (2.375)	10 (2.3)	8 (1.625)	10 (1.15)

Figure 3. The frequency of antigens present dependent on final results and the average intensity to the antigen observed.

Specimen	Reader 1				Final Result	Reader 2				Final result
	gp120	gp41	p24	gp36		gp120	gp41	p24	gp36	
1	3	3	3	3	HIV 1	3	3	3	3	HIV 1
2	3	3	2	1	HIV 1	3	3	2	1	HIV 1
3	3	3	2	1	HIV 1	3	3	2	1	HIV 1
4	2	3	2	1	HIV 1	2	3	2	1	HIV 1
5	3	3	2	1	HIV 1	3	3	2	1	HIV 1
6	3	3	2	1	HIV 1	3	3	2	1	HIV 1
7	3	3	1	1	HIV 1	3	3	1	1	HIV 1
8	1	1	2	1	HIV 1	1	1	2	1	HIV 1
9	1	1	1	1	HIV 1	1	1	1	1	HIV 1
10	3	3	3	3	HIV 1	2	3	3	3	HIV 1
11	3	3	2	1	HIV 1	3	3	1	1	HIV 1
12	3	3	1	1	HIV 1	3	3	1	1	HIV 1
13	2	2	1	1	HIV 1	2	2	1	1	HIV 1
14	1	3	1	1	HIV 1	1	3	1	1	HIV 1
15	3	3	3	3	HIV 1	2	2	3	3	HIV 1
16	1	1	1	1	HIV 1	1	1	1	1	HIV 1
17	3	3	3	3	HIV 1	2	3	2	2	HIV 1
18	2	3	2	1	HIV 1	2	3	2	1	HIV 1
19	1	3	3	3	HIV 1	1	3	3	3	HIV 1
20	2	3	3	3	HIV 1	1	1	1	1	HIV 1
21	1	1	1	1	HIV 1	1	1	1	1	HIV 1
22	1	1	1	1	HIV 1	1	1	1	1	HIV 1
23	2	3	3	3	HIV 1	1	3	2	2	HIV 1
24	3	3	1	1	HIV 1 & 2	3	3	1	1	HIV 1 & 2
25	1	1	1	1	HIV 1 & 2	1	1	1	1	HIV 1 & 2
26	1	1	3	3	HIV 1 & 2	3	3	3	3	HIV 2
27	3	3	3	3	HIV 1 & 2	3	3	3	3	HIV 1 & 2
28	3	3	2	1	HIV 1 & 2	3	3	2	1	HIV 1
29	3	3	3	1	HIV 1 & 2	3	3	3	1	HIV 1 & 2
30	3	3	3	1	HIV 1 & 2	3	3	3	1	HIV 1 & 2
31	3	3	1	1	HIV 1 & 2	3	3	1	1	HIV 1 & 2
32				3	HIV 2				3	HIV 2
33				3	HIV 2				3	HIV 2
34				3	HIV 2				3	HIV 2
35				3	HIV 2				3	HIV 2
36		1	3	3	HIV 2		1	3	3	HIV 2
37				3	HIV 2				2	HIV 2
38					Negative					Negative
39					Negative					Negative
40					Negative					Negative

Figure 4. Comparing the variability of presence and intensity of antigen bands between two readers.

- Figure 4 shows a subset of 40 specimens where the assay was read by two different individuals and the results compared.
- In 30 cases (75%) each reader gave concordant results in relation to presence and band intensity.
- In seven cases (17.5%) the difference between readers was limited to band intensity on a single band only.
- In three cases (7.5%) the difference between readers was related to the presence or absence of a band (in each case where one reader observed a band but the other didn't the band intensity recorded was only 1+).
- In two cases the difference between the readers led to a change in the final interpretation.

Specimen	Manual Read					Electronic Read				
	gp120	gp41	p24	gp36	Result	gp120	gp41	p24	gp36	Result
1	2	3	2	-	HIV1	Pos	Pos	Pos	-	HIV1
2	-	-	-	-	Neg	-	-	-	-	Neg
3	-	1*	-	-	HIV1	-	Pos	-	-	HIV1
4	3	3	3	-	HIV1	Pos	Pos	Pos	-	HIV1
5	-	1*	-	-	HIV1	-	Pos	-	-	HIV1
6	2	3	2	-	HIV1	Pos	Pos	Pos	-	HIV1
7	2	3	2	-	HIV1	Pos	Pos	Pos	-	HIV1
8	-	-	-	-	Neg	-	-	-	-	Neg
9	2	3	2	-	HIV1	Pos	Pos	Pos	-	HIV1
10	2	3	2	-	HIV1	Pos	Pos	Pos	-	HIV1
11	-	-	-	-	Neg	-	-	-	-	Neg
12	-	-	-	-	Neg	-	-	-	-	Neg
13	-	-	-	3	HIV2	-	-	-	Pos	HIV2
14	2	2	1	-	HIV1&2	Pos	Pos	Pos	-	HIV1
15	-	1	3	-	HIV1	-	Pos	Pos	-	HIV1
16	-	1	-	-	HIV1	-	Pos	-	-	HIV1

Figure 5. Comparison of manual and electronic reads on EQA specimens.

- Figure 5 demonstrates excellent concordance between manual and electronic reads though two samples were extremely faint (1*) when read by eye

DISCUSSION

- The Multisure® device is a rapid HIV test that is useful for distinguishing HIV-1 from HIV-2.
- The performance shown in this evaluation is less convincing than that described by the manufacturer in their Instructions for Use document primarily due to specimens being falsely classified as dually reactive.
- The potential for false negative and false positive specimens remains therefore this must be considered when deciding on how and when to use the assay
- However, it must be remembered that this evaluation was undertaken in an HIV Reference Laboratory that receives specimens primarily because they have been identified as difficult to classify.
- The rapid and simplistic nature of the test makes it ideal for use in near patient settings
- However the potential for weakly reactive (potentially non-specific) bands when read by eye to be deemed positive by the electronic reader (Figure 5) shows that caution must be used when using a qualitative electronic reading

CONCLUSIONS

- Multiple antigens may reduce potential for misclassification. However, detection of weak bands may lead to misclassification which may be corrected by modification of an interpretative algorithm whereby weak reactive results (1+) are reflexed for further testing
- Provision of an electronic reader means that results can be stored long-term, and appended to reports, thereby reducing the potential for data entry errors; however a simple positive/negative interpretation by the electronic reader may lead to misclassification of weakly reactive, non-specific bands
- As part of a testing algorithm Multisure® enables rapid differentiation of HIV-1 from HIV-2 and reduces the numbers of more expensive differentiation assays that are performed thus improving turnaround time and reducing costs.
- Laboratories should put in place mechanisms to ensure that weak reactivities are not reported without further confirmation.
- Further evaluation of the assay to determine whether all antigens need to be included, and whether the presence of certain antigens improves assay performance or not, should be undertaken.
- If an electronic reader is not used there remains the potential for inter-reader variability. Laboratories should ensure a comprehensive training programme for staff on how to interpret the assay to ensure standardised interpretations are made.

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