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Comparative evaluation of 2 automated molecular systems for the detection of HSV-1 and 2 from genital swab specimens

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ABSTRACT

BD ProbeTec HSV 1 & 2 Qx (on the BD Viper XTR) and the Aptima HSV 1 & 2 (on the Hologic Panther) assays were compared. Of 257 clinical samples, 96.6% positive and 88.5% negative results were concordant, respectively. The BD assay was more sensitive than the Aptima, but the latter was more specific.

1. Background and objectives

The accurate diagnosis of HSV-1 and -2 is essential for treatment, prevention of transmission, and counseling of patients. Molecular methods, alongside clinical examination, are widely used for the diagnosis of these infections, and there are a number of automated platforms available for the diagnosis of these viruses.

Although there have been several other studies assessing the performance of the new Aptima HSV 1 & 2 assay (Hologic Inc., San Diego, CA, USA) (Binnicker et al., 2017; Sam et al., 2018; Swenson et al., 2016), none have compared the performance of this assay against the older BD ProbeTec Herpes simplex Viruses (HSV 1 & 2) Q^x assay (Becton, Dickinson Ltd., Oxford, UK) (Van Der Pol et al., 2012). We compared the performance of the Aptima HSV 1 & 2 assay on the Hologic Panther platform to the BD ProbeTec HSV 1 & 2 Q^x assay on the BD Viper XTR system.

2. Study design

Genital swab virus transport medium (VTM, Sigma Virocult, MW951S. MWE Ltd., Corsham, UK) from 257 patients previously tested using the BD ProbeTec assay, as part of the routine care, were used in this evaluation.

These 257 samples were selected from samples archived (frozen at −80 °C) for periods ranging from 3 to 6 months that had sufficient volume for further testing with the Aptima assay on the Panther platform as per manufacturer's instructions.

Reproducibility of the Aptima assay was assessed by testing 5 samples across 3 different runs on 3 different days. Repeatability of the assay was assessed by testing 7 samples in triplicate within the same run. Samples which gave discordant results between the Aptima and the BD ProbeTec assay were resolved with a third in-house PCR assay, with the assumption that concordant results between the Aptima and BD assays would be concordant with the in-house assay (Namvar et al., 2005).

3. Results

For both HSV-1 and HSV-2, a higher number of samples were positive when tested on the BD ProbeTec compared to the Aptima assay. Of the 257 samples, 237 (92%) showed concordant results between the 2 assays, with 20 samples being discordant (Table 1).

The BD ProbeTec detected HSV-1 in 67 samples compared to Aptima which detected HSV-1 in 64 samples. Of the 67 samples positive for HSV-1 and the 62 samples positive for HSV-2 on the BD ProbeTec, 6/67 HSV-1 and 10/62 HSV-2 samples were not detected on the Aptima. Of the 64 samples positive for HSV-1 and the 53 samples positive for HSV-2 with the Aptima, 3/64 HSV-1 and 1/53 HSV-2 samples were not detected with the BD ProbeTec. One sample was HSV-1 and HSV-2 positive on both assays. A total of 123 samples had no HSV-1 or HSV-2

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Table 1
Number of samples tested on the BD ProbeTec and Aptima HSV-1 & 2 assays.

BD ProbeTec HSV 1 & 2	Aptima HSV 1 & 2				
	HSV-1 POS	HSV-1 + HSV-2 POS	HSV-2 POS	Not detected	Grand total
HSV-1 POS	61	0	0	6	67
HSV-1 + HSV-2 POS	0	1	0	0	1
HSV-2 POS	0	0	52	10	62
Not detected	3	0	1	123	127
Grand total	64	1	53	139	257

Table 2
Sensitivity and specificity of the Aptima and BD ProbeTec HSV 1 & 2 assays shown individually for each pathogen and combined for both of the assays.

Assay	Sensitivity	Specificity
Aptima		
HSV-1	94.1%	100%
HSV-2	85.4%	100%
Combined	90%	100%
BD ProbeTec		
HSV-1	97%	98.4%
HSV-2	98.3%	99.2%
Combined	96.9%	97.6%

detected by either assay. The positive and negative percentage agreement between the BD ProbeTec and the Aptima HSV 1 & 2 assays for the 2 targets combined was 96.6% and 88.5%, respectively.

A third (in-house) PCR assay was used to resolve discrepant results between the 2 assays. This in-house HSV-1 and 2 PCR assay had been adapted from previously published assays (Namvar et al., 2005). When tested using this in-house assay as a "gold standard," of the 20 samples that were discrepant between the BD ProbeTec and Aptima assays, those on the Aptima assay showed 13 false negatives (4 HSV-1, 9 HSV-2) and no false positives; the BD assay showed 4 false negatives (3 HSV-1, 1 HSV-2) and 3 false positives (2 HSV-1, 1 HSV-2). The samples where the BD ProbeTec gave false-negative results had a lower average CT (so a higher viral load) on the in-house PCR (21.585) than the false-negative results from the Aptima (30.279) (Table S1).

Using the in-house assay as the 'gold standard', the sensitivity and specificity were calculated for both the BD ProbeTec and the Aptima HSV 1 & 2 assays (Table 2). The calculations were made for each of the viruses separately and also with the HSV-1 and 2 results combined. The Aptima assay was found to be more specific than the BD ProbeTec, and the opposite was the case for sensitivity, with the sensitivity of HSV-2 on the Aptima assay being the lowest at 85.4%.

Reproducibility of the test results from the Aptima HSV 1 & 2 assay was assessed by testing 5 genital swab samples on different runs on different days. Concordance of the results for each sample was 100% (Table S2).

Repeatability of the Aptima HSV 1 & 2 assay was assessed by testing 7 (4 HSV-1 and 3 HSV-2) genital swab samples in triplicate on the same run. Concordance of the results for each sample was 100% (Table S3).

4. Discussion

A good positive and negative agreement was seen here between the older BD ProbeTec and the newer Aptima HSV 1 & 2 assay (FDA approved in 2017). The specificity of the Aptima assay was slightly higher, and the sensitivity was higher for the BD ProbeTec assay.

The Aptima HSV 1 & 2 assay was found to have 100% specificity for both of the targets, but the sensitivity here is slightly lower than previously reported (Binnicker et al., 2017). A limitation of this study was the use of frozen archived VTM samples. A higher limit of detection has been reported for the Aptima assay when VTM samples are used compared to samples collected in the Aptima specimen diluent due to a required dilution prior to testing (Sam et al., 2018). This is unlikely to explain all the false-negative results seen here as a significant proportion of the BD positive but Aptima negative samples had relatively low CTs when tested with the in-house assay. However, it does suggest that a higher sensitivity of the Aptima assay may be seen from prospectively collected samples in the Aptima specimen collection tubes.

In our population (Leicestershire and Rutland), samples tested for HSV-1 and 2 with these assays are taken from patients attending sexual health clinics. These patients are generally treated based on clinical assessment at their first visit, and laboratory-confirmed results are used to inform longer-term management.

Thus, a patient tested with a less sensitive test (i.e., the Aptima assay in this study, with more false negatives) may experience delays in commencing longer-term suppressive therapy. Whereas a patient tested with a less specific test (i.e., the BD ProbeTec assay in this study, with more false positives) may experience unnecessary longer-term suppressive therapy. However, all patients are reassessed at each visit.

Although the final decision on which assay is used may be made by the laboratory teams (often based on locally available manpower, institutional funding, and resources), reports such as this will inform clinical teams about which assays are available and how they compare. This will allow them to comment on any such laboratory-based decision to help optimize their local clinical pathway for the management of such genital herpesvirus infections.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.diagmicrobio.2018.07.010.

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