

Comparison of the BDProbeTec™ ET System to Ligase Chain Reaction (LCR) for the Detection of *Chlamydia trachomatis* (CT) and *Neisseria gonorrhoeae* (GC)

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ABSTRACT

■ CT and GC infections were simultaneously detected by the BDProbeTec™ ET (BDPT) System (Becton Dickinson, Sparks, MD) in endocervical swabs (CT=468, GC=471) and male (CT=658, GC=663) and female (CT=461, GC=463) urine. BDPT is a semi-automated system based upon thermophilic Strand Displacement Amplification (SDA) and fluorescent energy transfer. Specimens from three STD study sites were tested using BDPT and LCR (Abbott Laboratories, Abbott Park, IL). For CT, BDPT sensitivity and specificity were 96.6% (56/58) and 97.3% (392/403) for female endocervical swabs. In urines (combined female and male), sensitivity and specificity were 91.9% (182/198) and 95.9% (847/883). The female and male urine sensitivity was 84.8% (39/46) and 94.1% (143/152), respectively. For GC, BDPT sensitivity and specificity were 98.2% (56/57) and 99.0% (404/408) for endocervical swabs; 94.7% (234/247) and 97.4% (810/832) for combined female and male urines. The female and male urine sensitivity was 86.3% (44/51) and 96.9% (190/196), respectively. The results provide evidence that BDPT is a simple, easy to use assay that is highly sensitive and specific for the simultaneous detection of *C. trachomatis* and *N. gonorrhoeae* in endocervical swabs, female urine, and male urine specimens.

INTRODUCTION

1. *C. trachomatis* (CT) and *N. gonorrhoeae* (GC) infections are highly prevalent diseases throughout the world. Sensitive and specific diagnostic assays, which are rapid and easy to perform, are needed.

2. Use of DNA amplification assays provide greater sensitivity than older nonculture methods, but often require complicated procedures and cold transport of specimens.

3. We evaluated the performance of a new DNA assay for the simultaneous amplification and detection of CT and GC, which employs Strand Displacement Amplification (SDA) and fluorescent energy transfer. The BDProbeTec ET System* (Becton Dickinson, Sparks, Maryland) was used in a clinical trial to detect CT and GC infections from patients attending sexually transmitted disease (STD) clinics. Results were compared to those obtained using Ligase Chain Reaction (LCR) (Abbott Laboratories, Abbott Park, IL) for female endocervical and female and male urine specimens.

*Pending FDA clearance

METHODS

1. Population: Genital specimens from patients attending STD clinics were collected and processed for testing on the BDProbeTec ET System and LCR. Female endocervical specimens (CT = 468, GC = 471), female urine samples (CT = 461, GC = 463), and male urine samples (CT = 658, GC = 663) were analyzed.

2. Samples were transported at room temperature for the BDProbeTec ET System and at 4°C for the LCR assay. For urine specimens tested by BDProbeTec ET System, a urine processing pouch (UPP) was added at the time of collection.

3. For the BDProbeTec ET System, urine specimens were mixed and 4 ml were centrifuged at 2,000 x g for 30 min. Following centrifugation, the supernatant was decanted and the sediment was reconstituted with 2 ml of sample diluent and vortexed for 5 sec. Swabs for testing by the BDProbeTec ET System were processed by inserting the swab into a pre-filled labelled sample diluent tube and swirled for 5-10 sec. Swabs were then expressed and specimens were vortexed for 5 sec.

4. Specimens were placed in the manufacturer's lysing rack, which was placed into the preheated (110°C) heat block for 30 min. Following heating, the rack was allowed to cool for 15 min.

5. The assay was completed in a 96 well format in a semi-automated instrument. By use of a multi-channel, programmable pipette, 150 µl of prepared sample were dispensed into CT, GC, and AC Priming microwells. After a 20 min room temperature incubation, the Priming microwells were placed in the priming heater for 10 min. One hundred microliters were then transferred into the CT, GC, and AC Amplification microwells. An amplification control (AC) well was included for each sample and control to test for specimen inhibition.

6. The BDProbeTec ET instrument incubated and monitored the reaction for 60 min. Results were generated in MOTA (method other than acceleration) scores and expressed qualitatively by the instrument as positive (P), negative (N), or indeterminate (I), representing inhibition. In this study, some results were expressed as an equivocal or gray zone (to be repeated).

RESULTS

Table 1.

FEMALES							
<i>Chlamydia trachomatis</i>							
BDProbeTec ET vs. Abbott LCR							
		LCR Swab				LCR Urine	
		+	-			+	-
BD	+	56	11	BD	+	39	12
Swab	-	2	392	Urine	-	7	377
Relative Sensitivity 96.6%				Relative Sensitivity 84.8%			
Relative Specificity 97.3%				Relative Specificity 96.9%			
Indeterminate Rate 1/468 (0.2%)				Indeterminate Rate 26/461 (5.6%)			
Equivocal Rate 6/468 (1.3%)				Equivocal Rate 0%			

Table 3.

FEMALES							
<i>Neisseria gonorrhoeae</i>							
BDProbeTec ET vs. Abbott LCR							
		LCR Swab				LCR Urine	
		+	-			+	-
BD	+	56	4	BD	+	44	7
Swab	-	1	404	Urine	-	7	375
Relative Sensitivity 98.2%				Relative Sensitivity 86.3%			
Relative Specificity 99.0%				Relative Specificity 98.2%			
Indeterminate Rate 1/471 (0.2%)				Indeterminate Rate 29/463 (6.3%)			
Equivocal Rate 5/471 (1.1%)				Equivocal Rate 1/463 (0.2%)			

Table 2.

MALES			
<i>Chlamydia trachomatis</i>			
BDProbeTec ET vs. Abbott LCR			
		LCR Urine	
		+	-
BD	+	143	24
Urine	-	9	470
Relative Sensitivity 94.1%		Relative Specificity 95.1%	
Indeterminate Rate 12/658 (1.8%)		Equivocal Rate 0%	

Table 4.

MALES			
<i>Neisseria gonorrhoeae</i>			
BDProbeTec ET vs. Abbott LCR			
		LCR Urine	
		+	-
BD	+	190	15
Urine	-	6	435
Relative Sensitivity 96.9%		Relative Specificity 96.7%	
Indeterminate Rate 17/663 (2.6%)		Equivocal Rate 0%	

CONCLUSIONS

1. The BDProbeTec ET System is a sensitive and specific method to detect CT and GC in both swab and urine specimens, providing comparable sensitivity and specificity to existing DNA amplification assays.

2. The BDProbeTec ET System employs the use of an amplification control which detects specimens demonstrating amplification inhibition. This amplification control may reduce the reporting of false negative results. Inhibition of amplification is a more common problem in urine specimens than in swabs.

3. This new assay has the advantage of ambient temperature transport of specimens and room temperature storage of reagents and specimens.

4. The BDProbeTec ET System is an easy to perform DNA amplification assay, requiring minimal technician hands-on-time, and has the flexibility to handle large or small numbers of specimens at one time. This assay format can provide for either CT, or combined CT and GC testing on the same specimen.