Efficacy of an Enzyme Immunoassay with Uncentrifuged First-Voided Urine for Detection of Gonorrhea in Males

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An enzyme immunoassay (Gonozyme; Abbott Laboratories, North Chicago, Ill.) for detection of Neisseria gonorrhoeae antigens was used to screen 184 urethral or uncentrifuged first-voided urine or both specimens from males and 78 cervical specimens. When compared with culture, the sensitivity and specificity of Gonozyme for cervical and urethral specimens were comparable to those in published reports. The sensitivity and specificity for urine specimens were 91.6 and 97.9%, respectively.

Among the sexually transmitted diseases, gonorrhea still ranks as the most prevalent of bacterial etiology, with an annual occurrence of ca. 1 million reported cases and up to an additional 1 million unreported cases (1). Patients suspected of having gonorrhea are frequently screened by a Gram stain or culture or both. Although Gram stains of urethral exudates from symptomatic males are almost as sensitive as culture for diagnosis, cervical smears are positive in only about 50% of culture-proven cases of gonorrhea in females (5). Several investigators (4, 6; C. E. Rosey and E. M. Britt, Sex. Transm. Dis., in press) have also cultured uncentrifuged first-voided urine (FVU) as an alternative to urethral swabs for detecting gonorrhea in males. The sensitivity of FVU culture in their studies ranged from 95.6 to 100%.

Recently, an enzyme immunoassay (EIA) for detecting gonococcal antigen has become commercially available (Gonozyme, Abbott Laboratories, North Chicago, Ill.). This test has been compared with culture for cervical and urethral swabs by several investigators (2, 7, 8). In general, these reports showed high degrees of sensitivity and specificity for urethral specimens when compared with culture; the sensitivity and specificity for cervical specimens were somewhat less, however. To gain experience with this new noncultural bacteriological procedure and to corroborate the reported sensitivity and specificity for urethral and cervical specimens, we elected to evaluate the new system. Since one of us (E.M.B.) had studied FVU as an alternative for urethral culture, we also elected to apply the EIA to urine specimens from males.

The patients evaluated in the study were individuals visiting the Washtenaw County Venereal Disease Clinic. Patients visiting the clinic for premarital exams were excluded. Cervical swabs were collected from 78 symptomatic and asymptomatic females, and 120 urethral swabs or first-voided uncentrifuged urines or both were collected from 50 symptomatic and 70 asymptomatic males. Urethral or cervical specimens taken with the Gonozyme swab were immediately inoculated to a modified Thayer-Martin plate. The swab was then placed in a tube containing a storage reagent (Abbott Laboratories). First-voided urines were inoculated to modified Thayer-Martin plates with a sterile cotton swab. A second cotton swab was dipped into the urine, allowed to drain, and placed in a tube containing storage reagent.

Inoculated media were transported to a central facility and incubated at 35°C in air containing 5% CO₂ for 48 h. Isolates were presumptively identified as Neisseria gonorrhoeae by colony morphology, production of cytochrome oxidase, and demonstration of gram-negative diplococci by Gram stain. Swabs for the EIA test were refrigerated at 2 to 8°C for not more than 4 days after being transported in ambient air to a central laboratory. Swabs were processed, and the EIA was performed as directed by the manufacturer. Results were determined at 492 nm with the Quantum spectrophotometric analyzer.

Results of the comparison of the Gonozyme and conventional culture techniques for urethral, cervical, and FVU specimens are shown in Table 1. The overall sensitivity and specificity for these specimens were 93.5 and 96.5%, respectively. Results for the cervical swabs yielded the lowest degree of correlation, with a sensitivity of 86.7% and a specificity of 93.7%. Results of the urethral specimens resulted in a higher degree of correlation, with 100% sensitivity and 97.6% specificity. The EIA data presented here agreed well with the findings of other investigators (2, 7, 8), in which the sensitivity for urethral specimens ranged from 87 to 97.3%, whereas the specificity ranged from 91 to 100%. The results for cervical specimens presented by the same investigators showed lower sensitivity (range, 79.2 to 94.3%) and specificity (range, 87.2 to 100%), which also agrees with our data. Hence, we found the Gonozyme test workable in our hands, and this portion of our data correlated well with those of other investigators.

However, our study with urine specimens yielded new data which has been neither published previously by other investigators nor investigated by the manufacturer (A. Armstrong, Abbott Laboratories Diagnostics Division, personal communications). The results of the comparison of the Gonozyme and conventional culture techniques for FVU specimens (Table 1) yielded a 91.6% sensitivity and a 97.9% specificity. A breakdown of the results based on symptomatology showed that the two false-positive and two false-negative results by Gonozyme occurred in the 50 symptomatic males studied, whereas both the sensitivity and specificity from the 70 asymptomatic males studied were 100%. However, since only 2 of the 70 asymptomatic males were positive by Gonozyme and culture, this sampling may be too small to extrapolate to the general population.

Further analysis of the data revealed that, of these 120 specimens, 44 patients had urethral specimens collected simultaneously. The results of these conventional cultures

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TABLE 1. Comparative results of Gonozyme and culture for 
N. gonorrhoeae

<table>
<thead>
<tr>
<th>Source</th>
<th>No. tested</th>
<th>Gonozyme result*</th>
<th>Culture result</th>
<th>Sensitivity (%)</th>
<th>Specificity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical</td>
<td>78</td>
<td>Positive 13 Negative 2</td>
<td>4 59</td>
<td>86.7</td>
<td>93.7</td>
</tr>
<tr>
<td>Urethral</td>
<td>64</td>
<td>Positive 23 Negative 0</td>
<td>1 40</td>
<td>100</td>
<td>97.6</td>
</tr>
<tr>
<td>Urine</td>
<td>120</td>
<td>Positive 22 Negative 2</td>
<td>2 94</td>
<td>91.6</td>
<td>97.9</td>
</tr>
</tbody>
</table>

* For all sources, the sensitivity was 93.5% and the specificity was 96.5%.

(Table 2) yielded a urine sensitivity of 93.3% and a specificity of 100%. These data further confirm the FVU studies previously cited.

Furthermore, utilizing the urethral Gonozyme results (sensitivity, 100%) for these 44 patients as a standard, the urine Gonozyme sensitivity was 93.8% and specificity was 100% (data not shown).

When comparing tests for efficacy in detecting gonorrhea, culture is usually employed as the standard against which all other methods are measured. However, culture may not be 100% sensitive. Approximately 3 to 10% of N. gonorrhoeae strains may be inhibited by the concentration of vancomycin present in isolation media (3). In this study, two false-positive cervical specimens by Gonozyme are probably false-negatives by culture since a known contact of the woman had a positive urethral specimen detected by both culture and EIA. The Gonozyme test for urines yielded two false-positive results when compared with culture. However, since urines are frequently collected as a test for cure at the clinic, nonviable or metabolically injured organisms may be detected by EIA but not recovered by culture.

The sensitivity (100%) and specificity (97.6%) of the Gonozyme system for urethral specimens from males make this test a reasonable alternative to culture for establishing a presumptive diagnosis of gonorrhea. Additionally, the Gonozyme procedure for urines with a sensitivity of 91.6% is also an acceptable alternative to culture. Use of urine specimens would probably result in better patient compliance by eliminating the manipulation involved in obtaining urethral swabs. Additionally, using urines for Gonozyme testing is a useful procedure for screening large patient populations.

In summary, the Gonozyme test appears to be adequate for the diagnosis of gonorrhea in males, but it may not be a suitable replacement for culture in females. This test also can be effectively applied to urine specimens from males with only a slight decrease in sensitivity when compared with urethral results.

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**LITERATURE CITED**