

Accuracy of Presumptive Criteria for Culture Diagnosis of *Neisseria gonorrhoeae* in Low-Prevalence Populations of Women†

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The accuracy of presumptive criteria for identification of *Neisseria gonorrhoeae* was assessed in two separate populations of women with a low prevalence of gonorrhea. Of the presumptively positive cervical isolates available for confirmation, 98.5% were identified as *N. gonorrhoeae*. Of 25 isolates that could not be confirmed, 20 failed to grow on subculture, and of the remaining 5, only 2 (0.6% of all viable recoveries) were identified as nongonococcal isolates (*N. meningitidis*). Our study confirms earlier findings that meningococcal isolates are rarely found in endocervical specimens. The benefits from early treatment and counseling of women for gonorrhea on the basis of presumptive criteria outweigh the risks occasioned by the rarely encountered nongonococcal isolate.

Growth on selective medium of oxidase-reactive colonies containing typical gram-negative diplococci is considered diagnostic of *Neisseria gonorrhoeae* infection for material obtained from anogenital sites in women. The accuracy of these presumptive criteria, however, is based on studies among women with a high prevalence (25 to 70%) of gonococcal infections. Gonorrhea screening programs have been extended to female populations with a low prevalence (1 to 4%) of gonococcal infection. Among very low-prevalence populations, even a small number of false-positive tests could account for a large percentage of all positive test results. Thus, for a population with a 1% gonococcal prevalence, using a test with specificity of 99%, at least 50% of all positive tests would be false-positives. As the specificity approaches 100%, the proportion of false-positives decreases toward zero. We report here observations made in two separate public health laboratories on the accuracy of the presumptive criteria for identification of *N. gonorrhoeae* in female populations with a low prevalence of gonorrhea.

MATERIALS AND METHODS

Both the Seattle-King County Health Department Laboratory, Seattle, Wash., and the Columbus Health Department Laboratory, Columbus, Ohio, examined selective media inoculated with materials from the endocervical canal. Routine gonorrhea screening cultures obtained from the endocervix by private physi-

cians and family planning agencies in Seattle and private physicians in Columbus form the basis of this report. In Columbus, matched controls (age, race, date) were selected from cultures submitted by the Venereal Disease Clinic, where gonorrhea prevalence in women exceeded 25%. No special instructions were given, nor was culture material handled differently during the studies.

Health care providers were supplied check-tested, modified Thayer-Martin medium (7, 8) by routine carrier delivery and were given standard instructions for specimen collection, medium inoculation, and medium handling (2). When received in the laboratory, cultures were cross-streaked and incubated at 35 to 36°C in candle extinction containers. Cultures were examined after 48 h of incubation in Columbus and at 24 and 48 h of incubation in Seattle.

Growth of typical oxidase-reactive colonies containing typical gram-negative diplococci on the modified Thayer-Martin medium was considered presumptive identification of *N. gonorrhoeae* in both laboratories. Presumptive *N. gonorrhoeae* colonies were subcultured to antibiotic-free, enriched chocolate agar for confirmatory testing. In Columbus, a second technologist separated the presumptive colonies, matching them with presumptive colonies from isolates in the Venereal Disease Clinic, and separated them for blinded confirmatory testing. In Seattle, a technologist performed carbohydrate utilization tests using cysteine-Trypticase agar sugar tubes (4). (A total of 217 of these 299 isolates survived shipment and were also confirmed as *N. gonorrhoeae* at the Center for Disease Control by carbohydrate utilization tests.) In Columbus, carbohydrate utilization tests were done by the cysteine-Trypticase agar sugar tube method (4) at the Columbus Health Department Laboratory; the Ohio Department of Health Laboratory simultaneously performed a second confirmation on each specimen by

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the rapid sugar fermentation procedure as modified by Brown (1).

Organisms that utilized glucose, but not maltose, lactose, or sucrose, were identified as *N. gonorrhoeae*. Most nonviable isolates were tested by the Seattle-King County Health Department Laboratory with the Gono-tect FA System (Abbott Laboratories, N. Chicago, Ill.) and identified as *N. gonorrhoeae* if they were positive by this method.

RESULTS

Overall, 363 presumptively positive cultures (1.4%) were found among nearly 26,000 cervical cultures performed in low-prevalence populations. Of the presumptively positive isolates, 343 were available for confirmation. Of these, 338 (98.5%) were confirmed as *N. gonorrhoeae*, and 2 (0.6%) were confirmed as *Neisseria meningitidis* (Table 1). Of the 25 presumptive specimens not confirmed, 20 (80%) had failed to grow on subculture because of a delay in transporting the specimen after collection, whereas three additional specimens in Seattle failed to ferment sugars. Only 2 of 25 (8%) nonconfirmed specimens were proven to be other *Neisseria* species, and at least one of these was thus suspected to be nongonococcal, based upon colony morphology.

In Columbus, all presumptive isolates available for testing (61) were confirmed as *N. gonorrhoeae*. Fifty-three study and 55 control isolates were confirmed positive at both facilities. Four study and two control isolates were found nonfermentative by the Columbus Health Department and positive at the Ohio Department of Health. One study isolate and one control isolate were found to be nonfermentative at the Ohio Department of Health and positive at the Columbus Health Department. There were three study cultures that failed to grow on sub-

culture; these three and their matched controls were not forwarded to the Ohio Department of Health for testing. All three were confirmed positive at the Columbus Health Department.

DISCUSSION

Considering the specificity of presumptive techniques (ability to detect true negatives), *N. meningitidis* is probably the organism most likely to be confused as *N. gonorrhoeae*. Therefore, the relative frequency of its isolation from sites cultured for *N. gonorrhoeae* is important in evaluating the accuracy of these techniques. Our study supports earlier findings that *N. meningitidis* infrequently inhabits female anogenital sites (3, 5, 6). We found the organism in 2 of 25,936 endocervical specimens; however, only one of these isolates confused the presumptive identification of *N. gonorrhoeae* (Table 1). The specificity of the test exceeded 99.99% in this study in a low-prevalence population. Using a different selective medium, other investigators claim less difficulty differentiating the two pathogenic *Neisseria* (5).

Presumptive diagnosis of specimens obtained from the pharynx or male rectum is inadequate since *N. meningitidis* can be detected in these sites with relative frequency (3, 5, 6). However, detection of meningococci in cervical specimens appears to be much less frequent. In 1975, Faur and co-workers examined 120,000 cultures submitted by various medical providers in New York city; they isolated *N. meningitidis* from seven cervical specimens and nine male urethral specimens (5). Over a 26-month period (1974 to 1976), a group in Toronto, Canada, found the organism in only two cervical specimens (6).

Confirming presumptively positive specimens by sugar fermentation can cause a 24- to 72-h

TABLE 1. Comparison of presumptive criteria and definitive methods for identification of *N. gonorrhoeae* from endocervical cultures

Population	No. of patients cultured	No. of presumptive positives (%)	No. available for confirmation (C)	No. confirmed as <i>N. gonorrhoeae</i> (% of C)	No. confirmed as <i>N. meningitidis</i>
Low prevalence					
Columbus	9,485	64 (0.7)	61 ^a	61 (100%)	0
Seattle	16,451	299 (1.8)	282 ^a	277 ^b (98.2)	2 ^c
Total	25,936	363 (1.4)	343	338 (98.5)	2
High prevalence					
Columbus	~250	61 (24)	61	61 (100)	0

^a Three of 64 presumptively positive specimens in Columbus and 17 of 299 specimens in Seattle failed to grow on subculture.

^b A total of 254 were confirmed by sugar fermentation, and 23 were confirmed by the fluorescent-antibody system.

^c One of these specimens was previously considered likely to be *N. meningitidis* based upon colony morphology.

delay in reporting results and can also confuse or alter a correct diagnosis. In our study, the ability of confirmatory procedures to identify *N. gonorrhoeae* (sensitivity) among presumptively positive specimens obtained from providers distant from the laboratory was consistently less than 100%. Most of these confirmation failures resulted from inability to grow the organism on subculture. It is likely that confirmation procedures are even less successful when cultures are mailed to laboratories.

Many laboratories should continue to confirm these presumptive isolates to detect trends in nongonococcal isolates and to assist in their own quality control. Since our data indicate that the vast majority of unconfirmed presumptive isolates are *N. gonorrhoeae*, even in low-prevalence populations, the message transmitted from the laboratory must be clear that "presumptive positive" or "unconfirmed" should not be interpreted by the clinician as "negative." Since gonorrhea is a highly communicable infection with common and permanently disabling complications, clinicians should treat and counsel women based upon the results of presumptive criteria for culture diagnosis. In our judgment, the benefits from such an approach far outweigh the risks occasioned by the rarely encountered nongonococcal isolate.

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