

Comparison of Directigen Group A Strep Test with a Traditional Culture Technique for Detection of Group A Beta-Hemolytic Streptococci

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The Directigen Group A Strep Test (DGAST), a new rapid method of detecting group A beta-hemolytic streptococci directly from throat swabs, was compared with a traditional culture technique for the detection of group A beta-hemolytic streptococci. Five hundred oropharyngeal swabs from pediatric and adult patients were cultured and then processed by using the DGAST. Of the 144 specimens positive by culture, 131 were DGAST positive (sensitivity, 90.9%). Of the 356 specimens negative by culture, 353 were DGAST negative (specificity, 99.2%). Twelve of the 13 false-negative DGAST results were from pediatric patients. One hundred isolates of non-group A beta-hemolytic streptococci were recovered, primarily groups C, F, and G. The DGAST is easy to perform, rapid, sensitive, and very specific for detection of group A beta-hemolytic streptococci directly from swabs. Supplementing the DGAST with a culture on a 5% sheep blood agar plate would enhance detection of group A beta-hemolytic streptococci, especially in pediatric patients.

Rapid diagnostic methodologies are changing traditional approaches to clinical microbiology (3, 5). The Directigen Group A Strep Test (DGAST; Hynson, Wescott & Dunning, Baltimore, Md.), a new test using antigen extraction and latex agglutination, enables clinical laboratories to detect group A beta-hemolytic streptococci directly from throat swabs within 1 h of receipt of a specimen as compared with 24 to 48 h by routine culture techniques. With this new technique available, clinical laboratories must consider new approaches to process throat specimens to detect pharyngitis caused by group A beta-hemolytic streptococci.

To determine whether the DGAST is as sensitive and specific as traditional techniques, we processed 500 consecutive oropharyngeal swabs by a standard culture technique and then by the DGAST. The results of both pediatric and adult specimens were tabulated separately as were the incidences of group A and non-group A beta-hemolytic streptococci.

Patient sampling and specimen collection. Five hundred consecutive oropharyngeal specimens from outpatients were submitted to the laboratory for study from 21 November 1983 to 3 February 1984. The patients were identified as pediatric if they were 18 years old or younger or as adult if they were 19 years or older. The specimens were collected on a rayon swab (Culturette; Marion Scientific Corp., Rockford, Ill.) and transported to the laboratory within 4 h to be processed.

Specimen processing. Each swab was inoculated onto one plate of Trypticase soy agar (BBL Microbiology Systems, Cockeysville, Md.) containing 5% sheep blood prepared in our laboratory. Each plate was streaked by a semiquantitative method to allow estimate of relative growth expressed as 4+, 3+, 2+, and 1+ (1). Each plate was stabbed in the area of initial inoculation and in the area of isolation. The plate was incubated anaerobically for 14 to 16 h in a GasPak jar (BBL) at 35°C and then examined for the presence of beta-hemolytic streptococci. The plate was reexamined after

another 24 h of incubation in 5% CO₂ at 35°C for additional growth of beta-hemolytic streptococci.

Cultural identification. All beta-hemolytic streptococcal isolates were tested by the 0.04 Unit Taxo A bacitracin disk (BBL) sensitivity method. Any zone of inhibition after overnight incubation at 35°C in 5% CO₂ was considered positive for group A beta-hemolytic streptococci. Each beta-hemolytic streptococcal isolates was also grouped as A, B, C, D, F, G, or non-group A-G by the Streptex Rapid Latex Test Kit (Wellcome Research Laboratories, Beckenham, England). The instructions of the manufacturer were followed.

DGAST. After each appropriately labeled swab was inoculated onto a 5% sheep blood plate, a DGAST was performed. The swab was placed into a numbered glass test tube (12 by 75 mm) containing 0.5 ml of extraction reagent, which was vortexed for 5 s and then incubated in a 35°C heat block for 1 h. After incubation, as much extract as possible was expelled from the swab before testing. Fifty microliters of extract was mixed with anti-group A reagent (antibody-coated latex particles specific for group A beta-hemolytic streptococci) on a glass slide. After 4 min of rotation at 100 rpm, the agglutination of latex particles in the mixture was determined by using a direct light.

Of the 500 samples, 366 (73.6%) were DGAST negative and 134 (26.8%) were DGAST positive. No beta-hemolytic streptococci were recovered from 256 (51.2%) of the cultures. Beta-hemolytic streptococci were found in the remaining 244 (48.8%) cultures. Of these, 144 (59%) were group A beta-hemolytic streptococci and 100 (41%) were non-group A beta-hemolytic streptococci. Of the non-group A beta-hemolytic streptococci grown, 45 (45%) were group C, 22 (22%) were group F, 18 (18%) were group G, 9 (9%) were group B, and 6 (6%) were non-group A-G. As has been noted in previous studies, we found the predominant non-group A beta-hemolytic streptococci to be groups C, F, and G, in that order (4, 6).

Of the 144 specimens positive for group A beta-hemolytic streptococci by culture, 131 were positive by DGAST (sensi-

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TABLE 1. Comparison of DGAST and culture

Culture result	No. of cultures	DGAST positive	DGAST negative
Positive for group A streptococci	144	131	13
Negative for group A streptococci	356	3	353

tivity, 90.9%). Of the 356 specimens negative by culture, 353 were negative by DGAST (specificity, 99.2%). The predictive values are 97.7% (131/134) for a positive DGAST result and 96.4% (353/366) for a negative DGAST result (Table 1).

We divided the samples in our study into pediatric and adult specimens to determine whether the DGAST might be more effective with one population than with the other. Approximately half of the patients in the study were pediatric (258), and the other half were adult (242). Approximately three times as many group A beta-hemolytic streptococci were isolated from the pediatric specimens (111) as from the adult specimens (33). The distribution of non-group A beta-hemolytic streptococci between the two population groups was the same.

The predictive value of a positive DGAST for the pediatric population was 98.1% (99/101). The predictive value of a positive DGAST for the adult population was 96.9% (32/33). The predictive value for a negative DGAST for the adult population was 99.5% (208/209). The predictive value for a negative DGAST in the pediatric population was 92.3% (145/157) (Table 2).

There were three specimens which were positive for group A beta-hemolytic streptococci by the DGAST but negative by culture. One possible explanation for this phenomenon is the use of over-the-counter cold remedies which render the bacteria nonviable but antigenically reactive (K. P. Aspden, *Abstr. Annu. Meet. Am. Soc. Microbiol.* 1984, C210, p. 270).

Of the 13 culture-positive, DGAST-negative specimens, 9 contained 1+ to 2+ growth patterns of beta-hemolytic

TABLE 2. Comparison of DGAST and culture in two population groups

Culture result	No. of cultures		DGAST positive		DGAST negative	
	Pediatric	Adult	Pediatric	Adult	Pediatric	Adult
Positive for group A streptococci	111	33	99	32	12	1
Negative for group A streptococci	147	209	2	1	145	208

streptococci. Possibly the low numbers of group A beta-hemolytic streptococci in the specimens account for the negative DGAST results.

We found that the Taxo A bacitracin disk was 100% accurate in identifying group A beta-hemolytic streptococci as group A but less accurate in detecting non-group A beta-hemolytic streptococci. Our results concur with other studies in demonstrating that 13% of group C beta-hemolytic streptococci and 11% of group G beta-hemolytic streptococci are sensitive to the Bacitracin disk (6).

Many laboratories are considering whether to perform the DGAST alone or to supplement it with a culture. Our study suggests that a supplemental culture would be of value. Although the predictive value of a positive DGAST is quite high, the predictive value of a negative DGAST for the pediatric population indicates that ca. 8% of group A beta-hemolytic streptococci would be missed by DGAST alone. A backup culture would also aid in detection of other possible agents of pharyngitis (2).

The cost of performing the DGAST is greater than that of culture alone. The benefits of DGAST warrant the additional expenditure. The rapid results allow the physician to treat promptly and appropriately, thereby preventing any sequelae due to group A beta-hemolytic streptococcal infection, and also aid in preventing the overuse of antimicrobial agents. The DGAST is easy to perform and suitable for use in clinical laboratories.

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LITERATURE CITED

1. Bartlett, J. G., N. S. Brewer, and K. J. Ryan. 1978. Cumitech 7, Laboratory diagnosis of lower respiratory tract infections. Coordinating ed., J. A. Washington II. American Society for Microbiology, Washington, D.C.
2. Benjamin, J. T., and V. A. Perriello, Jr. 1976. Pharyngitis due to group C hemolytic streptococci in children. *J. Pediatr.* **89**:254-256.
3. Edwards, E. A., I. A. Phillips, and W. C. Suiter. 1982. Diagnosis of group A streptococcal infections directly from throat secretions. *J. Clin. Microbiol.* **15**:481-483.
4. Forrer, C. B., and P. D. Ellner. 1979. Distribution of hemolytic streptococci in respiratory specimens. *J. Clin. Microbiol.* **10**:69-71.
5. Petts, D. N. 1984. Early detection of streptococci in swabs by latex agglutination before culture. *J. Clin. Microbiol.* **19**:432-433.
6. Pollock, H. M., and B. J. Dahlgren. 1974. Distribution of streptococcal groups in clinical specimens with evaluation of bacitracin screening. *Appl. Microbiol.* **27**:141-143.