NOTES

Latex Agglutination Testing Directly from Throat Swabs for Rapid Detection of Beta-Hemolytic Streptococci from Lancefield Serogroup C

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A latex agglutination method for the rapid detection of beta-hemolytic streptococci from Lancefield serogroup C in throat swabs from 403 university students with symptomatic pharyngitis was evaluated. Compared with culture, the rapid test was poorly sensitive (34.4%) but very specific (98.4%) in detecting group C beta-hemolytic streptococci. The sensitivity of the rapid test improved with an increasing quantity of growth on culture.

Outbreaks of pharyngitis have been attributed to beta-hemolytic streptococci (BHS) from Lancefield serogroup C (1, 5), and an important role for these organisms in causing endemic pharyngitis among adolescents and young adults has been suggested (3, 4, 10, 11, 15, 16). In one recent study, group C organisms were isolated more than twice as often from the throats of ill university students with pharyngitis than from those of age-matched, healthy controls (18). The issue of causality has remained controversial, however, because many of the earlier studies had not been thorough or properly controlled and because the serologic correlates of group C infection have not been well defined.

Latex agglutination methods for the rapid detection of group A BHS directly from throat-swab specimens are widely used in clinical practice (6, 8, 14). The negative-control latex reagent in one commercially available kit consists of latex particles coated with antibodies directed against the group C carbohydrate. This control reagent has been shown to be sensitive and specific in identifying group C BHS in veterinary specimens (7). The purpose of this study was to determine the accuracy of this reagent compared with that of culture in detecting group C BHS in throat-swab specimens from young adults with symptomatic pharyngitis.

Students presenting to the Student Health Centers at the University of Virginia and the University of South Carolina with a chief complaint of sore throat were studied from 1 October 1989 until 31 January 1990. Throat swab specimens were obtained simultaneously with two (University of Virginia) or three (University of South Carolina) rayon-tipped swabs. One swab was used to perform the latex agglutination testing (PathoDx Strep A Kit; Diagnostic Products Corp., Los Angeles, Calif.). The swab was immersed in an acidic solution for 1 min at room temperature. Any liberated antigen was then agglutinated by sensitized latex particles during a 4-min incubation on a clear glass plate on a mechanical rotator. Tests for group A and group C carbohydrate were performed in adjacent test circles. Agglutination was assessed by using indirect lighting against a black background. In accordance with the manufacturer's instructions, the test was considered positive when there was moderate or strong agglutination and negative when there was no agglutination and both circles remained milky white. The test was considered uninterpretable, and counted as negative, when there was a finely granular appearance (a slight roughening) in the test circles. The potencies of the test reagents were verified daily with positive control swabs impregnated with inactive group C BHS. The other swabs were used to inoculate two 5% sheep blood agar plates. At the University of Virginia, a single swab was used to inoculate both plates. The plate inoculated first was incubated at 35°C in a 5% CO2-enriched atmosphere. The second plate was incubated at 35°C in an anaerobic environment (Anaerobic GasPak System; Baltimore Biologic Laboratory, Cockeysville, Md.). At the University of South Carolina, a separate swab was obtained to inoculate each plate. The growth of typical beta-hemolytic colonies at 24 and 48 h was quantitated as follows: 1+, <10 colonies; 2+, 10 to 50 colonies; 3+, 51 to 100 colonies; and 4+, >100 colonies. Overall test sensitivity and specificity were calculated by considering a culture positive when either the anaerobic or the CO2-enriched culture contained group C BHS and negative when neither culture contained group C BHS. BHS were grouped by latex agglutination (PathoDx Strep Grouping Kit; Diagnostic Products Corp.). Isolates of group C BHS were frozen in sterile skim milk for later identification to the species level. The group C BHS include three species (Streptococcus equi, S. equisimilis, and S. zooepidemicus) which produce large colonies and a proportion of S. anginosus ("S. milleri") which produce small colonies and may also belong to other serogroups. The three large-colony species are common veterinary pathogens, but S. equisimilis
TABLE 1. Likelihood of a positive rapid test for group C BHS according to streptococcal species and quantity of growth on culture

<table>
<thead>
<tr>
<th>Species</th>
<th>No. of positive rapid tests/no. tested* with the following quantity of growth on culture</th>
<th>1+</th>
<th>2+</th>
<th>3+</th>
<th>4+</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. equisimilis</td>
<td>0/3</td>
<td>1/5</td>
<td>2/7</td>
<td>13/16</td>
<td></td>
</tr>
<tr>
<td>S. anginosus</td>
<td>2/12</td>
<td>1/20</td>
<td>4/10</td>
<td>4/8</td>
<td></td>
</tr>
<tr>
<td>Both</td>
<td>0/0</td>
<td>2/2</td>
<td>0/0</td>
<td>1/1</td>
<td></td>
</tr>
<tr>
<td>Not determined</td>
<td>1/4</td>
<td>0/1</td>
<td>0/2</td>
<td>1/2</td>
<td></td>
</tr>
</tbody>
</table>

* Categories for quantity of growth are as defined in the text.

The corresponding throat cultures may have been falsely negative. Swab-to-swab sampling error has been described for 5 to 10% of patients who have two cultures for group A BHS performed, and this error presumably can also occur in the detection of group C BHS. Furthermore, some group C organisms (S. dysgalactiae) may not be recognized upon culture because they appear alpha-hemolytic (3). Falsely negative cultures could also occur if the patients had used an antibacterial gargle or an unprescribed antibiotic. In such cases, nonviable group C BHS might be detected by the rapid test but not by culture.

In summary, this latex agglutination test was very specific but poorly sensitive compared with culture for the rapid detection of group C BHS directly from throat swab specimens. The sensitivity was higher for cultures with high colony counts of group C organisms. Many uncertainties remain concerning the role of group C BHS in causing endemic pharyngitis, including the frequency, seasonality, and duration of asymptomatic carriage of group C BHS; the relationship between colony count and the likelihood of carriage versus infection; the role of S. equisimilis versus S. anginosus in causing pharyngitis; the serologic correlates of group C infection; and the microbiologic and clinical effects of antibiotic therapy. Additional research to clarify these issues should help to define the potential usefulness of the rapid latex test in clinical practice. On the basis of current information, however, rapid antigen detection tests cannot be recommended as a substitute for culture and identification to the species level of group C isolates.

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REFERENCES

11. Mogabgab, W. J. 1970. Beta-hemolytic streptococcal and con-


