Preliminary Identification of Beta-Hemolytic Streptococci in Throat Swab Cultures with a Commercial Blood Agar Slide (Streptocult)

POUL CHRISTENSEN,1,4 DAN DANIELSSON,2 BIRGITTA HOVELIUS,3 AND JAN KJELLANDER2

Department of Medical Microbiology1 and Community Care Center at Dalby,3 University of Lund, Lund, and Department of Clinical Bacteriology and Immunology, Central County Hospital, Örebro,2 Sweden

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A commercial blood agar slide (Streptocult, Orion Diagnostica) was used for preliminary identification of beta-hemolytic streptococci of groups A, C, and G in throat swab specimens. The sensitivity of the test was 93.6% and the specificity was 94.7%, as judged from 580 specimens. A model is suggested for routine processing of throat swab specimens, involving inoculation and reading of the slide in general practice and transport of positive or inconclusive slides to a bacteriology laboratory for isolation and serological grouping of beta-hemolytic streptococci. The model combines preliminary detection of beta-hemolytic streptococci within 24 h with the reliability of serological grouping, and should reduce the volume of specimens sent to the laboratory considerably.

The diagnosis of streptococcal infections is difficult in the absence of adequate assistance from the bacteriological laboratory (9). In Sweden, for example, one third of general practice consultations are attributable to upper respiratory tract infections (7). In consequence, cultures for beta-hemolytic streptococci constitute a quantitatively important part of clinical bacteriology. The modern kits for serological grouping (4, 6) are time-saving, and the prospects of further rationalization seem to be few. In fact, most of the time in the laboratory is spent on simple procedures, such as labeling, mailing, unpacking, etc.

Several authors have devised "office" bacteriological techniques to achieve a rational and rapid detection of beta-hemolytic streptococci, such as the use of blood agar plates at the clinical department (8). These methods have not gained general acceptance, however, since numerous investigations have demonstrated the importance of serological grouping for correct identification of beta-hemolytic streptococci (9).

The present paper concerns a new, commercially available blood agar slide which is also suitable for the transport of beta-hemolytic streptococci. The routine here suggested involves preliminary reading of the slides at the clinical department, but combines the immediacy thus achieved with the reliability ensured by sending tentatively positive slides to the laboratory. Since the negative slides are discarded at the clinical department, the volume of specimens to be dealt with at the laboratory would thus drastically be reduced.

MATERIALS AND METHODS

Blood agar slide (Streptocult; Orion Diagnostica). The slide is shown in Fig. 1. The agar contains ox blood, antibiotics to inhibit irrelevant bacteria, and a streptolysin S carrier to strengthen hemolysis. The cost is at present $1.00.

Design of the study. Two throat specimens were taken from each patient with pharyngitis or tonsillitis at four community care centers. One of each pair of specimens was transported to our laboratory in hematin agar for conventional culture (see below). The other was streaked on a Streptocult slide and read the next day by the local staff. Slides judged to contain beta-hemolytic streptococci or giving inconclusive results were sent to the laboratory for subculture.

The staff who read the slides at the health care centers were laboratory technicians trained in clinical chemistry. They were given 2 to 3 h of training in recognition of alpha- and beta-hemolytic streptococci, inoculation of the slides, interpretation of the cultures, and disposal of waste products from the tests.

Inoculation, incubation, and reading of the slide. The surface of the slide was vigorously inoculated with the cotton swab, leaving about 1 cm of the distal part untouched for comparison at the time of reading. The slides were then incubated aerobically overnight at 37°C. A dense hemolytic growth of bacteria was judged as positive, and isolated colonies surrounded by hemolytic zones, among a dense growth of alpha-hemolytic bacteria, were judged as "inconclusive" (Fig. 2A and B, respectively).

Isolation and identification of beta-hemolytic streptococci. The swab specimens transported directly to the laboratory were streaked on blood agar plates and the plates were incubated anaerobically (GasPak; BBL Microbiology Systems) overnight at 37°C. Beta-hemolytic streptococci were grouped serologically, using coagglutination (3).
RESULTS

Throat specimens from 580 patients were investigated for beta-hemolytic streptococci groups A, C, and G. Whereas conventional culture revealed 112 positive specimens (19.3%) (Table 1), subculture from the Streptocult slides added 13 patients more. Thus, a total of 125 patients (21.6%) harbored streptococci belonging to one of the three groups; 108 (86.4%) were of group A, 9 (7.2%) were group C, and 8 (6.4%) were group G.

A comparison between the "conventional" cultures and the results obtained with the slides at the clinical departments is shown in Table 1. Of the 125 specimens containing group A, C, or G beta-hemolytic streptococci, 98 (78.4%) were judged positive with Streptocult and 19 (15.2%) were inconclusive. Taken together, the slide detected 93.6% of the patients harboring beta-hemolytic streptococci, whereas 24 (5.3%) of the 455 patients without groups A, C, or G were incorrectly diagnosed as positive for the presence of these bacteria. Hence, the sensitivity of the test was 93.6% and the specificity (number of negative results by Streptocult in relation to the true negative) was 94.7%. The false-positive Streptocult slides grew hemolytic variants of Escherichia coli or Staphylococcus aureus.

The conventional culture detected 89.6% of the beta-hemolytic streptococci. The difference in this respect between conventional cultures and the results obtained with the slides at the clinical departments was not significant.

DISCUSSION

The fact that none of the methods detected all beta-hemolytic streptococci was expected; Breese and Disney (2) reported that duplicate cultures from the same patient revealed 8% more positive throat swab specimens than single cultures. The sensitivity of the Streptocult slides was found to be 93.6%, and the specificity was 94.7%. The number of false-positive slides, 5.3%, should be compared to the diagnosis of streptococcal infection based on clinical evaluation, which results in more than 50% false-positive cases. The number of inconclusive slides was 15.2%.

TABLE 1. Comparison of conventional culture and Streptocult slides in 580 patients

<table>
<thead>
<tr>
<th>True group A, C, or G streptococci</th>
<th>Results of Streptocult testa (no. of isolates)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
</tr>
<tr>
<td>Positive</td>
<td>98</td>
</tr>
<tr>
<td>Negative</td>
<td>5</td>
</tr>
</tbody>
</table>

a Results at the local clinical laboratories.
slides (which were taken as tentatively positive) was only 38 (6.6%) from all specimens. These results taken together make the slide suitable for preliminary identification of beta-hemolytic streptococci groups A, C, and G. We advocate the use of the slides, but not without close cooperation with a clinical bacteriological laboratory. All available data indicate that the diagnosis of beta-hemolytic streptococci should always conclude with a serological grouping (9).

It might be a matter of discussion whether the detection of group C or G streptococci in the throat of a patient with an upper respiratory tract infection should be regarded as clinically important. In Sweden, most doctors are prone to treat such patients with penicillin, on the basis of epidemics of pharyngitis caused by these groups (1, 5).

About 5% of the group A isolates in our laboratory are microaerophilic. Although the Streptocult slides were incubated aerobically these strains were detected, probably because of (i) the heavy inoculation procedure used and (ii) the presence of a streptolysin carrier in the agar.

We suggest the following model for handling throat swab specimens: (i) the swabs are inoculated onto Streptocult slides, incubated overnight, and read at the local clinical department; (ii) the patients should be treated according to the preliminary results; (iii) positive or inconclusive slides are sent to the bacteriology laboratory for serological grouping; (iv) a minor proportion of the negative slides are also sent for control of the reading.

This model has several advantages (provided the clinical departments are not situated at the same hospital as the bacteriological laboratory): (i) a reliable preliminary detection of beta-hemolytic streptococci groups A, C, or G can be obtained within 24 h; this will probably save some patients unnecessary penicillin therapy and lead to earlier treatment of others who need the drug; (ii) the ultimate identification of beta-hemolytic streptococci is performed by serological grouping; (iii) the number of specimens sent to the laboratory is considerably reduced (at our department, to 25% of the volume now received); (iv) the preliminary identification of beta-hemolytic streptococci is continuously controlled.

LITERATURE CITED