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Evaluation of the GO Slide (Roche) Growth Transport System for Isolation of *Neisseria gonorrhoeae* from Clinical Specimens

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A new growth transport system for the isolation of *Neisseria gonorrhoeae* from clinical specimens was evaluated. The system, GO Slide (Roche) of F. Hoffmann-La Roche & Co., Basel, Switzerland, showed 88% sensitivity for male urethral specimens and 59% sensitivity for endocervical specimens compared with transport in the Amies transport medium combined with culturing on modified Thayer-Martin medium. The media used appear not to support growth of certain strains of *N. gonorrhoeae*. Recovery and growth-supporting capabilities of this system need to be improved before the system can be used routinely.

A system that would detect close to 100% of patients having a *Neisseria gonorrhoeae* infection is desirable because of the clinical and epidemiological importance of the disease. *N. gonorrhoeae*, however, can suffer loss of viability during transportation of the swabs to the laboratory, and to overcome this drawback, several growth transport systems are currently in use (1). Recently, Roche Diagnostics, Div. F. Hoffman-La Roche & Co., Basel, Switzerland, has marketed GO Slide (Roche), an agar carrier, for the isolation of *N. gonorrhoeae* from clinical specimens. Visually resembling the dip-slide system for urine culture, the slide is covered on one side with chocolate agar with inhibitors (GO-ChA; antibiotic and antimycotic agents) and on the other side with chocolate agar without inhibitors (GO-Ch). Capnophilic conditions are provided by the addition of a tablet which generates CO_2 on coming in contact with the water of condensation. Detailed composition of the media used was not available. According to the manufacturer, GO Slide is intended to be used for growing and transporting urethral, cervical, rectal, or throat specimens. In this study we compared GO Slide with the transport and growth systems used in our laboratory, as described in Materials and Methods, the only difference being that routinely one swab is taken from the male urethra and two swabs are taken from the cervix for culture. Specimens in a charcoal transport medium are picked up twice a day on weekdays for a short-distance transport at ambient temperature to the laboratory. Gram-stained smears are not used as a part of our routine procedure in the diagnosis of female gonorrhea; hence they were not used here for evaluation of specimens from males or females.

MATERIALS AND METHODS

The study population comprised 157 males and 217 females attending the Sexually Transmitted Diseases Clinic, Calgary, Alberta, Canada, from whom specimens were taken for a bacteriological diagnosis of gonorrhea. All specimens were examined at the Provincial Laboratory of Public Health, Southern Branch, Calgary. Two sequential swabs were obtained from each site (urethra for males and endocervix for females). One swab was placed in a charcoal transport medium (Transport Medium Amies; Difco Laboratories, Detroit, Mich.), and the second swab was inoculated onto GO Slide as described below. The sequence of inoculation to the charcoal transport media and to the GO Slides was alternated.

Specimens in the transport medium were forwarded to the laboratory, where they were inoculated promptly onto modified Thayer-Martin medium (PL-mTM) consisting of (per liter) GC medium base (36 g; Difco), hemoglobin (10 g; Difco), and G.C. Medium Supplement (10 ml; Alpkem-Western Ltd., Calgary, Alberta, Canada) with (micrograms per milliliter) vancomycin hydrochloride (3.0), sodium colistimethate (7.5), trimethoprim lactate (3.0), and amphotericin B (5.0). Plates were incubated at 35.0°C in an incubator (Forma Scientific, Marietta, Ohio) in 5% CO_2 for up to 72 h and checked daily for growth, which, when present, was semiquantitated as heavy if more than 200 colonies with morphology typical of *N. gonorrhoeae* were present or as light if the count was below 200. *N. gonorrhoeae* was identified on the basis of colony morphology, gram stain of smear, oxidase reaction, direct fluorescent-antibody test (Difco), and carbohydrate degradation tests (2).

Inoculation of the GO Slides was according to the instructions of the manufacturer. Briefly, to inoculate the slides, the swab was rolled, with slight pressure, first over the agar side containing inhibitors and then over the side without inhibitors. The inoculated slides were replaced in plastic tubes after the insertion of CO_2-generating tablets, and the tubes were closed firmly and incubated at the clinic at 35°C for 24 h. The slides were then transferred to the laboratory, where they were checked for growth and, if necessary, incubated and checked for an additional 24 to 48 h. Growth of the typical oxidase-positive colonies was semiquantitated and identified as described above.

To determine if the media used in GO Slides inhibited the growth of some *N. gonorrhoeae* strains and to ascertain that increased CO_2 tension was adequately provided to the organisms, agar from the slides was removed aseptically, and freshly prepared PL-mTM and PL-mTM without inhibitors were poured into the empty sides of the GO Slides, which were cooled and replaced in the containers. Plates were also prepared from the same batches of PL-mTM media. Three isolates of *N. gonorrhoeae* that originally grew on PL-mTM but not on GO Slide were grown in Trypticase soy broth (BBL Microbiology Systems, Cockeysville, Md.) for 4 h at 35°C, the density of the growth was adjusted to an

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TABLE 1. Comparison of results of culturing specimens from 157 males and 217 females by using two culture transport systems

Method	Males (n = 157)			Females (n = 217)			% Sensitivity (total)
	No. positive		% Sensitivity	No. positive		% Sensitivity	
	Heavy[a]	Light[b]		Heavy	Light		
PL-mTM	23	2	100	15	2	100	100
GO Slide[c]			88			59	76
GO-ChA	11	8	76	0	9	53	67
GO-Ch	11	6	68	1	2	18	48

[a] More than 200 colonies on plate or slide.
[b] Fewer than 200 colonies on plate or slide.
[c] Combined results from both sides of GO Slide agar carrier system

0.5 McFarland standard, and the suspensions were further diluted to 10^{-2} and 10^{-4} in Trypticase soy broth. Inoculations of GO Slides with the original media and with our media and of petri plates with our media were made by delivering 0.05 ml of each dilution of the inoculum to each surface and spreading the inoculum by means of a glass rod. On petri plates, the inoculum was spread to an area approximately equal to that of the GO Slide surface. All inoculations were read after 48 and 72 h of incubation at 35°C.

To determine any lot-to-lot variation, suspensions of three isolates of *N. gonorrhoeae* which previously grew on GO Slide and three isolates of *N. gonorrhoeae* which previously did not grow on GO Slide were prepared and inoculated as described above to GO Slides lot no. 690, 719/1, and 737. The GO Slides were read after incubation at 35°C for 48 and 72 h.

Sensitivity of the GO Slide system was defined as a percentage of the PL-mTM culture-positive patients who were also GO Slide (any side) positive. Statistical significance was assessed by the χ^2 method with the Yates correction.

RESULTS

The results obtained by culturing specimens from 157 males and 217 females by using PL-mTM and the GO Slide system are shown in Table 1. Since there were no strains that grew on GO Slide and failed to grow on PL-mTM, sensitivity of the latter was assumed to be 100%. Thus, the overall sensitivity of the GO Slide system was 76%, i.e., 88% for males and 59% for females. Often the *N. gonorrhoeae* colonies on both surfaces of GO Slide were fine, pinpoint, and difficult to detect, especially on the side without inhibitors, and the growth was visible only after at least 48 h of incubation. On PL-mTM, a greater number of specimens, from both males and females, yielded heavy growth compared with the number yielding light growth ($P < 0.001$). On GO Slides, for specimens from males there was no statistical difference between the numbers of specimens showing heavy growth and those showing light growth on either medium ($P > 0.1$). None of the specimens from females showed heavy growth on GO-ChA, and only a few specimens from females showed growth of the organism on GO-Ch.

Of the 22 specimens from males from which *N. gonorrhoeae* was isolated on GO Slides, 3 specimens did not yield growth on GO-ChA, and 5 specimens did not yield growth on GO-Ch. Of 10 specimens from females from which *N. gonorrhoeae* was isolated on GO Slides, 1 specimen was not recovered on GO-ChA, and 7 specimens were not recovered on GO-Ch.

The three strains of *N. gonorrhoeae* that originally grew on PL-mTM but not on GO Slide grew at both dilutions on GO Slide with the original media replaced by our media, but they failed to grow on GO Slide with the original media. The size and numbers of colonies on each surface of GO Slide with substituted media corresponded to colony sizes and numbers in petri plates with the same media with the inoculum spread on an identical area of the medium. Inoculum spread on a whole plate yielded similar numbers of colonies, but larger sizes.

Growth on the three different lots of GO Slide of the three isolates of *N. gonorrhoeae* which previously were not inhibited on GO Slide was identical in numbers and sizes of colonies. None of the three isolates that previously were inhibited on GO Slide grew on any of the three different lots of GO Slide.

DISCUSSION

The inability to detect gonococcal infection in a high percentage of males and females could have serious epidemiological and clinical consequences. Our data imply that 12% of male and 41% of female patients with genital *N. gonorrhoeae* infection would have been missed if the GO Slide system was used as the only transport culture system. This technique would be unacceptable for routine use.

The inclusion of noninhibitory medium in the system did not much improve the isolation rate. In fact, the growth of contaminants from endocervical specimens resulted in overcrowding because of a surface area much smaller than that in a normal petri dish. As a consequence, colonies of *N. gonorrhoeae*, when present, tended to be smaller and difficult to detect, and very likely this occurrence contributed to the organism being isolated only rarely from such specimens.

The GO Slide system has an attractive design both for ease of transportation and for the examination of growth on agar surfaces. Being circular and sturdy, the system fits easily into an average laboratory mailing container compared with other growth transport media such as JEMBEC plates (5), Bio-Bag (Marion Scientific, Div. Marion Laboratories, Inc., Kansas City, Mo.), Gono-Pak (3), and Transgrow bottles (4). The paddle with agar can be removed from the container and examined and manipulated with ease compared with Transgrow bottles. These advantages, however, are nullified by the use by the manufacturer of media that appear to be either nutritionally insufficient or inhibitory to certain strains of *N. gonorrhoeae*. These strains grew well in the system when the original media were replaced by those routinely used by us, suggesting that most probably media, with no apparent lot-to-lot variations, were responsible for the failure of growth of these strains and that the CO_2 system performed adequately. There was no indication that the isolates that failed to grow on GO Slide grew less well on PL-mTM than did other *N. gonorrhoeae* isolates. We did not attempt to determine the nature of this deficiency, since there are numerous media available that support growth of *N. gonorrhoeae* well, and since substitution of the media in this system with PL-mTM improved the growth, other media may do likewise.

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