Evaluation of Two Transport Systems for Gonorrhea Cultures

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The ability of the Transgrow and JEMBEC systems to yield positive cultures when transported to a central laboratory was compared. There were no significant differences in the recovery rates of the two systems. Statistically significant decreases in recovery rate were noted when each system was compared with the traditional plate-candle jar technique.

The transport of specimens for gonorrhea culture is among the more vexing problems encountered by public health laboratories, both from a logistic and a microbiological point of view. Significant numbers of positive specimens may not be detected when cultures are mailed to a central laboratory. A number of factors, such as delays in the mail (4) and delays in placing the cultures into a CO₂-enriched environment with appropriate incubation (3), have been suggested as reasons for lack of recovery of *Neisseria gonorrhoeae*. Delays in the mail generally cannot be controlled, and incubation before mailing is often not possible due to lack of equipment at the collecting facility. However, several systems have been developed for transport of cultures for gonorrhea which permit shipment on appropriate media in a CO₂-enriched environment. Two of the most commonly used are the CO₂-containing bottle system, commonly referred to as the Transgrow (TG) system, and the bag-plate method in which a self-contained CO₂-generating system (JEMBEC [John E. Martin Biological Environmental Chamber]) is used. Both of these systems have been individually described and evaluated (5-9, 12, 13). It was the purpose of this study to evaluate the ability of these two systems to yield positive cultures from clinical material after shipment under identical conditions and to compare these results with the traditional candle jar technique, performed at the site of specimen collection.

The TG system, JEMBEC plates, and petri dishes all contained modified Thayer-Martin medium (MTM) (10) which was purchased from Granite Diagnostics, Burlington, N.C. Mueller-Hinton broth (Difco Laboratories, Detroit, Mich.) was prepared in the laboratory of the authors. All lots, including commercially prepared media, were subjected to quality control procedures (2) before use in the study.

Specimens were obtained from volunteers and

referrals to a metropolitan venereal disease clinic. The study included 159 males and 263 females. Cultures were collected by clinic personnel from females by inserting a cotton swab into the cervical os and from males by inserting a cotton swab into the anterior urethra. The swab was immediately placed into 1 ml of Mueller-Hinton broth, and the specimen was eluted by twirling the swab in broth for approximately 15 s. Material suspended in Mueller-Hinton broth was inoculated by swab onto the various systems by using standard techniques. Excess moisture was expressed from the swab before inoculation of culture systems by pressing the swab on the side of the tube. The inoculation order of the various systems was randomized so that each system was in each position of the inoculation order essentially the same number of times.

After inoculation the MTM plates were immediately incubated in a candle jar for 48 h at 35°C. After this incubation, cultures on MTM plates were evaluated at the collection site. The CO₂-generating system in the JEMBEC was activated as soon as the specimen was inoculated. The TG and JEMBEC systems were incubated at 35°C until shipped to a central laboratory 110 miles (177 km) away. Transport was by a commercial courier, with cultures being picked up each day in the late afternoon with arrival in the central laboratory early the following morning. Transport was at ambient temperature. On arrival, the TG and JEMBEC systems were incubated for 40 to 48 h.

Presumptive identification of *N. gonorrhoeae* was made based on growth on modified MTM, positive oxidase test, and a Gram stain revealing typical gram-negative diplococci. Final identification of isolates was made by using a direct fluorescent antibody technique (11). The significance of the differences observed between various culture systems was statistically determined

by using a 2×2 contingency table and the chi-square technique (1).

Of the 422 patients examined, 252 (59.7%) were culture positive for *N. gonorrhoeae* by one of the systems. Table 1 illustrates the distribution of positives among the various systems. Of the 252 cultures positive by one of the methods, 163 (64.7%) were detected by all three systems, 201 (79.8%) were detected by the JEMBEC, 210 (83.3%) were detected by TG, and 240 (95.2%) were detected by MTM plates. The JEMBEC and TG each detected 3 positives not detected on any other system, and 10 isolates were recovered only on MTM. There was no significant difference between the results obtained when the JEMBEC and TG were compared ($\chi^2 = 1.07$; $P = 0.30$). When MTM and TG were compared, significantly more positive cultures were obtained with MTM plates incubated in a candle jar at the site of collection than with the TG system transported to a central laboratory ($\chi^2 = 18.7$; $P < 0.001$). When JEMBEC and the MTM plate-candle jar technique were compared, MTM yielded significantly more positive cultures than did JEMBEC ($\chi^2 = 27.5$; $P < 0.001$).

Ninety percent of the cultures on TG or JEMBEC were received within 24 h of collection, and the balance were received within 48 h. There was no significant difference in the rate of recovery with either system when groups of cultures received within 24 or 48 h of collection were compared. Additionally, there was no significant difference in the rate of recovery when order of system inoculation was considered. Four cultures on the JEMBEC system and one on TG were overgrown to the point that they could not be evaluated.

Previous studies (4) have suggested that a delay of 1 or 2 days should not significantly affect results, whereas other studies (3, 5) suggest that there are significant losses of positive cultures when incubation in a CO₂-enriched environment is delayed. The present study sug-

gests that statistically significant losses are encountered when cultures for gonorrhea are shipped with resulting delays of less than 24 h, but there was no significant difference in the recovery rates of two commonly used systems for the transport of gonorrhea cultures, the JEMBEC system and the TG system. However, losses of 12.5% (TG) and 16.2% (JEMBEC) were detected when compared with a modified MTM plate immediately incubated in a CO₂-enriched environment with no interruption of the incubation period.

A study by Faur et al. (5) found that the JEMBEC system was equivalent to the plate technique and superior to the TG system when New York City medium was used. In that study cultures were incubated for 18 to 24 h before shipment and on arrival were placed in a CO₂ incubator. In the present study cultures were shipped to a central laboratory within 12 h and incubated in a room air incubator. The latter point may explain the difference between the studies since work by Symington (12) found that for optimal results cultures in the JEMBEC system had to be incubated in a CO₂ incubator if delayed in transport. Since both the TG and JEMBEC systems were designed to be self sufficient for the isolation of *N. gonorrhoeae*, it was felt that added ambient CO₂ during incubation would undermine comparison with the plate-candle jar technique.

This study suggests that either of the described systems may be equally useful in situations where there is minimum delay and reliable delivery to a central laboratory, but workers should be aware that there can be significant losses with these systems due to transport.

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TABLE 1. Recovery of 252 cultures positive for *N. gonorrhoeae* by the MTM, TG, and JEMBEC systems

Isolates recovered on:	No. of isolates
MTM only	10 (4.0) ^a
TG only	3 (1.2)
JEMBEC only	3 (1.2)
MTM, TG, JEMBEC	163 (64.7)
MTM, TG	38 (15.1)
MTM, JEMBEC	29 (11.5)
TG, JEMBEC	6 (2.4)

^a Figures in parentheses indicate percentage of total positive cultures.

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