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Comparison of a Blood Culture System Containing Liquoid and Sucrose with Systems Containing Either Reagent Alone

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By utilizing parallel culture methods on multiple blood specimens, three blood culture systems were evaluated for their ability to allow rapid recovery of organisms. The same base medium was used for all three systems. System or flask 1 contained base medium with Liquoid added, flask 2 contained base medium with sucrose added, and flask 3 contained both Liquoid and sucrose. During the study period, there were 259 patients considered to have positive blood cultures. Organism recovery was accomplished from flask 1 in 214 of these patients, from flask 2 in 180 cases, and from flask 3 in 257 instances. The use of anticoagulants and osmotic stabilizers in blood culture systems is discussed in detail.

The use of Liquoid (sodium polyanetholsulfonate, Hoffmann-La Roche Laboratories, Inc., Nutley, N.J.) and its superiority over all other anticoagulants in blood culture systems have been demonstrated by many investigators (1, 4, 6, 7, 8). In addition to acting as an anticoagulant, Liquoid has been shown to be antiphagocytic (7), anticomplementary (2), and to neutralize the bactericidal action of fresh blood (2, 5).

Several investigators have reported on the use of sucrose as an osmotic stabilizer in media used to recover the so-called transitional forms (protoplasts, spheroplasts, L-forms, etc.). An excellent review of these various forms can be found in Guze (3). Although this report does not deal with transitional forms as described in the current literature, it does utilize several of the principles of osmotic stabilization in recovering organisms from clinical blood specimens. The purpose of this report is to evaluate three different blood culture systems: one system containing Liquoid, one containing sucrose, and one containing both reagents.

MATERIALS AND METHODS

The base medium used was Brucella Broth (Pfizer Diagnostics, New York, N.Y.). All flasks contained a final volume of 45 ml of the various media, and all flasks were sterilized by autoclaving. Flask 1 contained base medium to which 500 mg of Liquoid per liter was added. Flask 2 contained base medium to which 100 g of sucrose per liter was added. Flask 3 contained base medium plus both reagents. Each flask was color-coded for medium identification purposes.

Preparation of the patient for venipuncture was performed as described by Rosner (6). A total of 16 ml of blood was withdrawn in a glass syringe (20-ml capacity), and a 5-ml sample was inoculated into each of the three test flasks. The remaining 1 ml of blood was discarded. To be included in this study, each patient was required to have a minimum of two blood culture requests which were taken at 2-hr intervals. A positive patient was one from whom the same organism was recovered from at least one of the test flasks in each of the blood culture sets. Each set of flasks was labeled as to time of collection, date, and patient identification and was incubated in a carbon dioxide incubator for 24 hr. After this incubation period, material from each flask was subcultured onto two chocolate-sheep cell biplates. One plate was incubated under carbon dioxide, whereas the other was incubated anaerobically. This subculture procedure was repeated again after the flasks had been incubated for 72 hr and 7 days, respectively.

RESULTS

A total of 2,352 patients were included in this study. There were 259 (11%) patients with positive results as defined by this report. Table 1 indicates the types of organisms recovered and the frequency of recovery. With flask 1, containing Liquoid only, organism recovery was accomplished 214 times. With flask 2, containing

TABLE 1. *Types of organisms recovered and frequency of recovery from 259 patients*

Organism	No. of patients from whom isolated
Klebsiella-Enterobacter-Serratia group	56
Escherichia coli	54
Enterococcus species	47
Diplococcus pneumonia	43
Proteus species	16
Streptococcus mitis	15
Bacteriodes species	7
Pseudomonadaceae	6
Coagulase-producing staphylococci	4
Streptococcus pyogenes	3
Neisseria meningitidis	3
Salmonella species	2
Anaerobic streptococci	2
Haemophilus hemolyticus	1

sucrose only, organism recovery was accomplished 180 times. With flask 3, containing Liquoid and sucrose, organism recovery was accomplished 257 times. There were 20 patients from whom organism recovery was only accomplished in flask 3.

DISCUSSION

The higher recovery rate from medium containing Liquoid as compared to media containing just sucrose reemphasizes the importance of using Liquoid in any blood culture system. The significant increase in positive results obtained from media containing both Liquoid and sucrose indicates that osmotic pressure may play an important role in the survival rate of bacteria when taken from a clinical blood specimen.

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