IV Catheter-Drawn Blood Cultures:

Discarding the Initial Aliquot of Blood Does Not Reduce Contamination Rates

Sukrut Dwivedi¹, Rohit Bhalla¹, Donald R. Hoover¹,², Melvin P. Weinstein¹,²

Division of Infectious Diseases, Allergy & Immunology, Departments of Medicine¹ and Pathology², UMDNJ-Robert Wood Johnson Medical School, New Brunswick, NJ, and Department of Statistics and Biostatistics³, Rutgers University, New Brunswick, NJ

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Corresponding Author:
Melvin P. Weinstein
Division of Infectious Diseases, Allergy & Immunology
Robert Wood Johnson Medical School
New Brunswick, NJ 08901-0019
Ph: 732-235-7713
Email: weinstei@umdnj.edu
Abstract

Although venipuncture is the preferred method for obtaining blood cultures, specimens often are obtained from intravenous catheters (IVC). For IVC-drawn blood cultures, some authorities recommend discarding the initial 5-10 ml of blood to reduce contamination and remove potential inhibitory substances. To determine whether this practice reduced contamination rates (CR), we assessed the results of IVC-drawn blood cultures in adults. Thirty ml of blood was obtained aseptically. The first 10 ml, rather than being discarded, was inoculated to an aerobic culture vial. Using a second sterile syringe, 20 ml of blood was obtained and inoculated in 10 ml aliquots to aerobic and anaerobic culture vials. Positive cultures were evaluated to assess clinical significance (true vs. contaminant).

From 653 IVC-drawn blood culture pairs, both vials were contaminated in 38 (5.8%); only the “discard” vial was contaminated in 33 (5.1%); and only the “standard” vial was contaminated in 31 (4.7%). Overall CR were 10.9% for the discard vial versus 10.5% for the standard vial (P=0.90). We conclude that discarding an initial aliquot of blood when obtaining blood cultures from IVCs does not reduce CR.
Background

The standard method for obtaining blood for culture is venipuncture using aseptic technique. With greater utilization of intravenous access catheters (e.g., PICC, Hickman, etc.), blood cultures often are obtained from these devices. Yet there is no standardized method for obtaining blood for culture by this technique. Several reports have demonstrated increased blood culture contamination rates (i.e. false positive results) when blood cultures are obtained from catheters (4,8,10,15) which, in turn, can lead to inappropriate antibiotic administration as well as additional unnecessary diagnostic testing. Some authorities recommend discarding the first 5-10 ml of blood when obtaining blood from intravenous catheters (IVCs) prior to inoculating the blood culture vials (17), whereas others do not (1,9,16). The purpose of discarding these aliquots of blood is to remove any substances that could potentially inhibit microbial growth (e.g., heparin) (6,19) and to reduce blood culture contamination rates. However, there are few published systematic assessments of this issue, no consensus recommendations on how to draw blood cultures from an IVC, and no controlled comparative evaluations of different techniques to obtaining blood culture samples from an IVC.

It has been standard practice at our institution to discard the first 10 ml of blood prior to obtaining blood for culture from IVCs. If patients have repeated blood cultures, in which 10 ml of blood is discarded with each culture, nosocomial anemia may occur or worsen and result in added morbidity (1,11,18,21). To
determine whether discarding the initial aliquot of blood from IVC-drawn blood cultures reduces contamination, we inoculated the initial 10 ml sample of blood that would have been discarded to an aerobic blood culture vial and compared contamination rates in these vials with contamination rates in the “standard” blood sample obtained for culture from the same patient.

MATERIALS AND METHODS

Adult inpatients (≥18 years old) on three oncology nursing units for whom the attending physician ordered a catheter drawn blood culture from March 29 to October 9, 2007, at Robert Wood Johnson University Hospital, New Brunswick, NJ, were included. The study was approved by the Robert Wood Johnson Medical School Institutional Review Board.

For this study, a "set" was defined as three culture bottles, 2 aerobic and 1 anaerobic, obtained from an indwelling catheter. The catheter hub was initially cleansed with 70% isopropyl alcohol, then allowed to dry. The hub was then disinfected with 2% iodine tincture and allowed to dry for 30 seconds. Using a sterile syringe, the IVC was flushed with 10 ml of normal saline solution. Using a sterile syringe, 10 ml of blood, the “discard” aliquot, was drawn from the IVC and inoculated to a Bactec Plus Aerobic/F culture vial. The IVC hub was then re-cleansed with isopropyl alcohol and iodine tincture in the same fashion. Using a
sterile syringe, 20 ml of blood was obtained and inoculated in 10 ml aliquots to a Bactec Plus Aerobic/F vial, the “standard” vial, and a Bactec Plus Anaerobic/F vial.

Positive blood culture sets were analyzed to determine whether the isolates represented true infection or contamination, and contamination rates were compared in the discard versus the standard aerobic vial. Factors used to differentiate contaminants from clinically important pathogens included the identity of organism, number of positive blood culture sets versus the number of culture sets obtained and, when appropriate, review of the medical record of the patient with the positive culture to compare the results to those of any peripheral blood cultures obtained during the same time frame (20). Data were entered and saved on Excel spreadsheets. Overall proportions of contamination in the discard and standard vials were then compared using McNemar's Discordant Pairs Test of matched results for the same subject.

RESULTS

During the study period, there were a total of 653 blood culture sets collected from IVCs with matched discard and standard vial pairs (Table). In 33 instances (5.1%) only the discard vial was contaminated, and in 31 instances (4.7%) only the standard vial was contaminated. In 38 instances both the standard and discard vials were contaminated (5.8%). Thus, overall contamination rates for
the “discard” and “standard” vials were 10.9% and 10.5%, respectively (P=.90; 1 95% CI for difference in CRs from the normal approximation fo the multinomial, -1.9% to +2.7%). In 4 instances only the discard bottle grew a true pathogen, and in 6 instances only the “standard” bottle grew a true pathogen. In each of these cases, other blood cultures taken in the same time frame or previously also grew the same pathogen.

DISCUSSION

IVCs frequently are used to administer chemotherapy, blood products, total parenteral nutrition, antibiotics, and many other medications. In addition to the administration of therapeutic agents, IVCs also are used to obtain blood samples to reduce the trauma associated with venipuncture. Although the preferred method for obtaining blood cultures is peripheral venipuncture (3,8), blood for culture increasingly is obtained from IVCs.

Several methods of obtaining blood for culture via IVCs have been described. In the “discard” method, blood is aspirated into a syringe to clear the catheter of any residual intravenous solutions and medications, and is then discarded. A second sterile syringe is then used to obtain blood for culture. Blood immediately beyond the hub of an IV catheter is thought to be diluted by the IV or flush solution. The blood that is removed allows the vein to refill from the capillary bed,
thereby allowing the lumen of the catheter to fill with blood more representative of
the total venous circulation (14). In some cases, the discard aliquot is described
as removal of the first aspirate without flushing the catheter. In others, the
discard aliquot is described as including an initial flush of the device and then
withdrawal of a discard specimen. In our institution, the discard technique
involved an initial flush.

The “discard” method is used commonly. Seventy-five percent of pediatric bone
marrow transplant units reported using the this method (12). According to the
Oncology Nursing Society’s Access Device Guidelines (5), the discard method is
most commonly used in adults as well. An informal online survey recently
confirmed that institutions using this method usually discard 5-10 ml of blood
before inoculating culture bottles (Baron EJ, personal communication).

MacGeorte et al reported that adult bone marrow transplant patients lost an
average of 95.7 ml of blood per week not including the blood volume for
diagnostic testing, assuming that 6 ml of blood were discarded for each lab draw
(13). In severely ill, febrile patients blood cultures are done frequently, and
discarding of 5-10 ml of blood at the time of each culture can result in significant
blood loss and potential iatrogenic anemia which, in turn, can lead to transfusion-
associated risks.

Although Everts and Harding (9) reported no significant difference in
contamination rates between first drawn and second drawn samples (17.1% vs. 15.8%), only 152 blood cultures were evaluated. Our study, which has a substantially larger sample size, confirms the observation that discarding the initial aliquot of blood from an IVC-drawn blood culture does not reduce contamination rates. Despite recommendations to use peripheral venipuncture as the preferred method of obtaining blood for culture, sometimes for ease or for other reasons, blood is drawn through an IVC. Whereas we do not advocate IVC-drawn blood cultures, we recognize the reality that some will be obtained in this fashion. Since discarding the initial aliquot of blood may contribute to nosocomial anemia and does not reduce contamination rates, we believe this practice should be abandoned.
REFERENCES


Table. Frequency of contamination in blood inoculated into “discard” and “standard” culture vials

<table>
<thead>
<tr>
<th>Contamination in Discard Sample</th>
<th>Contamination in Standard Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>38 (5.8)^a</td>
<td>33 (5.1)</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>31 (4.7)</td>
<td>551 (84.4%)</td>
</tr>
</tbody>
</table>

^a Numerical data presented as No. (%)