Your stamp

The information in this booklet is given as a guideline only and is not intended to be exhaustive.
It in no way binds bioMérieux S.A. to the diagnosis established or the treatment prescribed by the physician.

bioMérieux S.A.
69280 Marcy l'Etoile
France
Tel. : 33 (0)4 78 87 20 00
Fax : 33 (0)4 78 87 20 90

www.biomerieux.com
www.biomerieux-diagnostics.com

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EMPOWERING CLINICAL DECISIONS™

Blood Culture

A Key Investigation for Diagnosis of Bloodstream Infections

BIOMÉRIEUX

Introduction

Sepsis is a complex clinical syndrome that is defined as the systemic inflammatory response of the body to an infection. It is the most common underlying cause of death in non-coronary ICUs where the mortality rate can be as high as 32% or 54% in case of severe sepsis or septic shock, respectively.[1]

Blood cultures and early appropriate antimicrobial therapy count among the priority measures to be taken during the 6-hour resuscitation period of initial sepsis management.[2]

Rapid, accurate identification of the bacteria or fungi causing bloodstream infections may provide vital clinical information required to diagnose and treat sepsis.

Blood cultures - the laboratory detection of bacteremia and fungemia - are one of the most simple and commonly used investigations to establish the etiology of systemic bloodstream infections.

This booklet aims to:

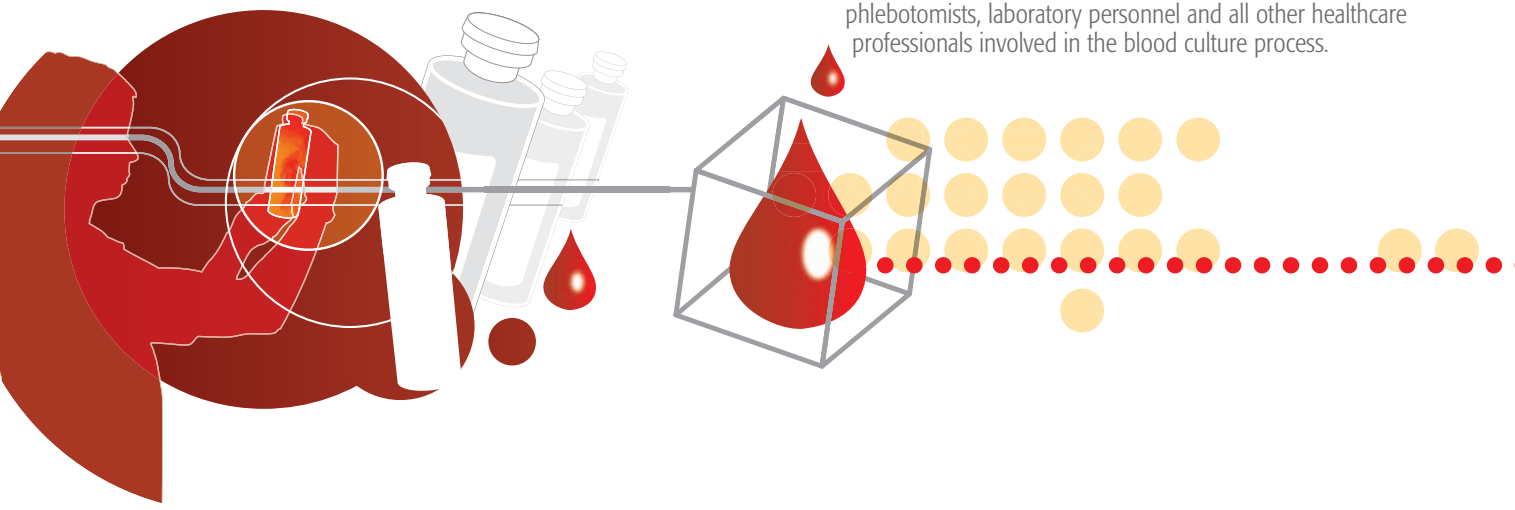
- **answer key questions** commonly asked in relation to blood culture
- **provide practical recommendations** for routine blood culture procedures
- offer an **illustrated step-by-step guide** to best blood collection practices.

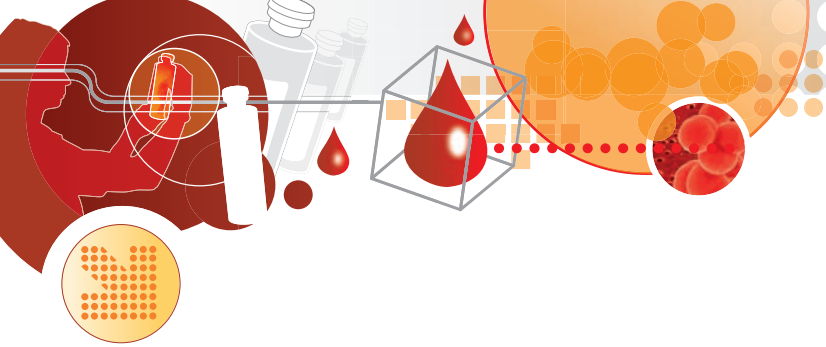
It is intended to be a useful reference tool for physicians, nurses, phlebotomists, laboratory personnel and all other healthcare professionals involved in the blood culture process.

Our special thanks go to

Professor Brian DUERDEN, Inspector of Microbiology and Infection Control, Department of Health, U.K.

for his helpful advice and comprehensive review of this booklet.





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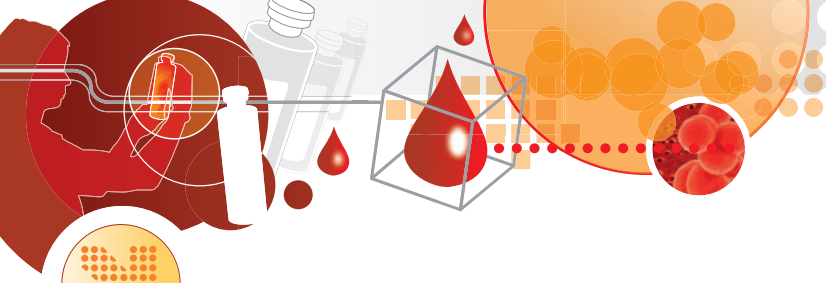


What is a blood culture?

A blood culture is a laboratory test in which blood, taken from the patient, is inoculated into bottles containing culture media to determine whether infection-causing microorganisms (bacteria or fungi) have invaded the patient's bloodstream.

The complete blood culture process consists of:

- collecting the sample correctly
- detecting, isolating and identifying microorganisms causing bloodstream infections
- providing an antibiotic susceptibility test result for the clinician

Why are blood cultures important?

Sepsis is one of the most significant challenges in critical care, and early diagnosis is one of the most decisive factors in determining patient outcome.

Blood culture is the most common diagnostic tool available for the detection of bacteremia and fungemia. It is an important investigation with major implications for the diagnosis and treatment of patients with bloodstream infections and possible sepsis.

A positive blood culture either establishes or confirms that there is an infectious etiology for the patient's illness.[3] It will also provide the etiologic agent for antimicrobial susceptibility testing, enabling optimization of antibiotic therapy.[3] Beginning effective antibiotic therapy as early as possible can have a significant impact on the outcome of the disease.[4,5]

Three main aims of blood culture

- confirm infectious etiology
- identify the etiological agent
- guide antibiotic therapy

For the blood culture process to be effective, however, it is absolutely imperative that samples are collected properly. Compliance with blood culture collection recommendations can significantly improve the quality and clinical value of blood culture investigations and reduce the incidence of sample contamination and "false-positive" readings.

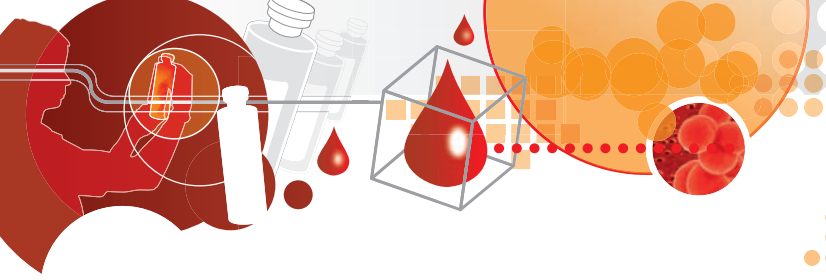
When performed correctly, blood cultures provide clinically relevant information that can help improve patient outcomes, reduce length of hospital stay and prevent overuse of antibiotics.

When to take blood cultures?

Blood cultures should always be requested when a bloodstream infection or sepsis is suspected.

Clinical symptoms in a patient which may lead to a suspicion of a bloodstream infection are:

- undetermined fever (> 36°C) or hypothermia (< 36°C)
- shock, chills, rigors
- severe local infections (meningitis, endocarditis, pneumonia, pyelonephritis, intra-abdominal suppuration, …).
- abnormally raised heart rate
- low or raised blood pressure
- raised respiratory rate



Timing of blood cultures

Blood cultures should be collected as soon as possible after the onset of clinical symptoms. Ideally, they should be obtained prior to the administration of antimicrobial therapy. If the patient is already on antimicrobial therapy, blood cultures should be taken immediately before administering the next dose.

It is generally recommended that 2-3 sets (2 bottles/set) of blood culture should be obtained over a brief time period (e.g. within 1 hour). Drawing blood at spaced intervals, such as 1 to 2 hours apart, is only recommended to monitor continuous bacteremia/fungemia in patients with suspected infective endocarditis or other endovascular (i.e. catheter-related) infections.

Table 1.

Recommendations for the timing of blood cultures in different clinical conditions and syndromes[6]

Baron, E.J., M.P. Weinstein, W.M. Dunne, Jr., P. Yagupsky, D.F. Welch, and D.M. Wilson. Cumitech 1C, Blood Cultures IV. Coordinating ed., E.J. Baron. ASM Press, Washington, D.C. 2005

Condition or syndrome	Recommendations
Suspected acute primary bacteremia or fungemia, meningitis, osteomyelitis, arthritis, or pneumonia.	Obtain two or three blood cultures, one right after the other, from different anatomical sites following the clinical events that precipitated the blood culture.
Fever of uncertain origin (e.g. occult abscess, typhoid fever, brucellosis or other undiagnosed febrile syndrome).	Obtain two or three blood cultures, one right after the other, from different anatomical sites initially. If these are negative after 24–48 h of incubation, obtain two more blood cultures, one right after the other, from different anatomical sites.
Suspected bacteremia or fungemia with persistently negative blood cultures.	Consider alternative blood culture methods designed to enhance recovery of mycobacteria, fungi, and rare or fastidious microorganisms.

How to take blood cultures?

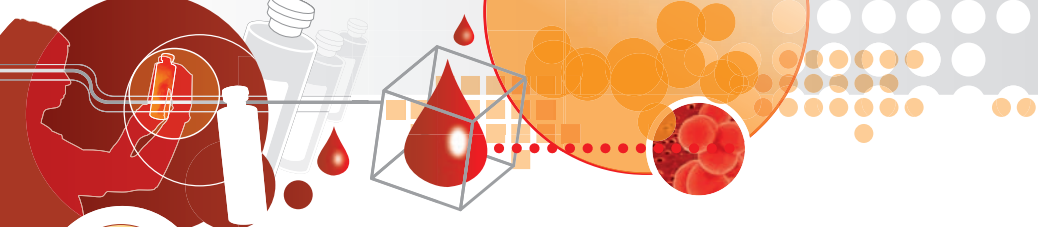
Sample collection is a crucial step in the blood culture process. Standard precautions must be taken, and strict aseptic conditions observed throughout the procedure. For an illustrated step-by-step guide to Good Blood Culture Practices, see page 26.

A properly collected sample, that is free of contaminants, is key to providing accurate and reliable blood culture results.

It is recommended that blood cultures should be collected only by members of staff (medical, nursing, phlebotomist or technician) who have been fully trained and whose competence in blood culture collection has been assessed.[7]

Key points to good sample collection:

- Prior to use, examine the bottles for evidence of damage or deterioration (discoloration). Do not use a bottle containing media which exhibits turbidity or excess gas pressure, as these are signs of possible contamination.
- Check the expiry date printed on each bottle. Discard bottles that have expired.
- Blood culture bottles should be clearly and correctly labelled.
- Each set of 2 bottles should be drawn from separate anatomical sites.
- Blood for culture should be drawn from veins, not arteries.[8]
- It is recommended to avoid drawing blood from a venous or arterial catheter, since these devices are often associated with higher contamination rates.[9]
- It is essential to disinfect the skin prior to collection of the sample.
- Transfer the inoculated bottles and the completed blood culture request to the clinical microbiology laboratory as quickly as possible, preferably within 2 hours.[3] Store bottles temporarily at room temperature, if there is any delay.[10]
- The use of vacuum tube transport systems can facilitate the rapid transmission of bottles to the microbiology laboratory.[11]
- All blood cultures should be documented in the patient's notes, including date, time, site and indications.



Which media to use?

Microorganisms causing bloodstream infections are highly varied (aerobes, anaerobes, fungi, fastidious microorganisms,…) and, in addition to nutrient elements, may require specific growth factors, and/or a special atmosphere.

It is recommended that each adult routine blood culture set should include paired aerobic and anaerobic blood culture bottles.[12]

The blood drawn should be divided equally between the aerobic and anaerobic bottles.

If an anaerobic bottle is not used, it should always be replaced by an additional aerobic bottle, to ensure that a sufficient volume of blood is cultured.[6]

A blood culture medium must be:

- **sensitive** enough to detect:
  - a broad range of clinically relevant microorganisms, even the most fastidious (*Neisseria*, *Haemophilus*,…)
  - microorganisms releasing small amounts of CO_2 (*Brucella*, *Acinetobacter*, …)
- **versatile:** able to provide a result for all types of sample collection (adults, infants, patients receiving antibiotic therapy, sterile body fluids…)

Which bottle should be inoculated first ?

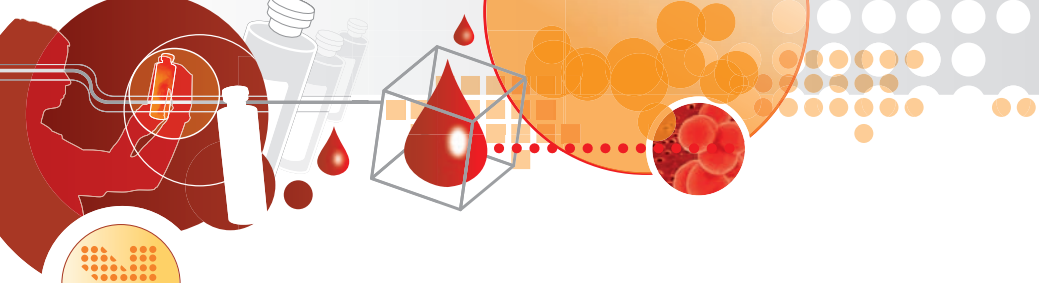
If using a **winged blood collection set**, then the aerobic bottle should be filled first to prevent transfer of air in the device into the anaerobic bottle. If using a **needle and syringe**, inoculate the anaerobic bottle first to avoid entry of air.

If the amount of blood drawn is less than the recommended volume*, the blood should be inoculated into the aerobic bottle first, since most bacteremias are caused by aerobic and facultative bacteria. In addition, pathogenic yeasts and strict aerobes (e.g. *Pseudomonas*) are recovered almost exclusively from aerobic bottles. Any remaining blood should then be inoculated into the anaerobic bottle.[6]

Blood cultures must be taken:

- in the right case
- at the right time
- in the right way

* For recommended volumes, see chapter "What volume of blood ?"



What volume of blood?

The optimal recovery of bacteria and fungi from blood depends on culturing an adequate volume of blood. The collection of a sufficient quantity of blood ensures the detection of pathogenic bacteria or fungi present in low quantities. This is essential when an endovascular infection (such as endocarditis) is suspected.

For each additional milliliter of blood cultured, the yield of microorganisms recovered from adult blood increases in direct proportion up to 30 ml.[13] This correlation is related to the low number of Colony Forming Units (CFU) in a milliliter of adult blood.[3]

The volume of blood that is obtained for each blood culture set is therefore the most significant variable in recovering microorganisms from patients with bloodstream infections.[14]

Adults

For an adult, the recommended volume of blood to be obtained per culture set is 20 to 30 ml.[6] Since each set includes an aerobic and an anaerobic bottle, each bottle should be inoculated with up to 10 ml of blood. If a third bottle is used, an aerobic bottle would be recommended. This volume is recommended to optimize pathogen recovery in the numerous cases of bacteremia/fungemia with less than 1 CFU per ml of blood.

Pediatric

The optimal volume of blood to be obtained from infants and children has not been defined with certainty, however, available data indicates that the yield of pathogens also increases in direct proportion to the volume of blood cultured.[15] The recommended volume of blood to collect should be based on the weight of the patient (see table 2 below), and an aerobic bottle should be used.

Table 2.

Blood volumes suggested for cultures from infants and children[15]

Adapted from Kellogg et al. Frequency of low-level bacteremia in children from birth to fifteen years of age. J Clin Microbiol. 2000; 38:2181-2185

Weight of patient		Patient's total blood volume (ml)	Recommended volume of blood for culture (ml)		Total volume for culture (ml)	% of patient's total blood volume
kg	lb		Culture no.1	Culture no.2		
≤ 1	≤ 2.2	50-99	2		2	4
1.1-2	2.2-4.4	100-200	2	2	4	4
2.1-12.7	4.5-27	> 200	4	2	6	3
12.8-36.3	28-80	> 800	10	10	20	2.5
> 36.3	> 80	> 2,200	20-30	20-30	40-60	1.8-2.7

How many blood culture sets?

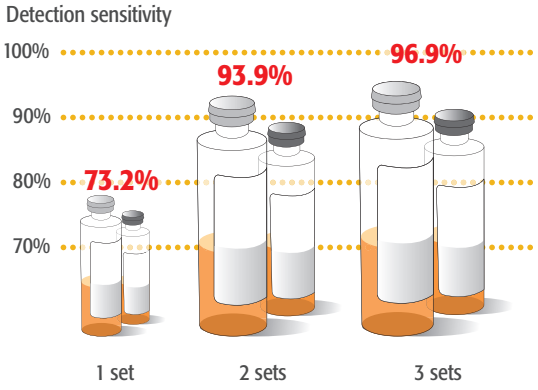
Since bacteria and fungi are not constantly present in the bloodstream, the sensitivity of a single blood culture set is limited.

A recent study, using continuous-monitoring blood culture systems, investigated the cumulative sensitivity of blood cultures obtained sequentially over a 24-hour time period. It was observed that the cumulative yield of pathogens from three blood culture sets (2 bottles per set) with a blood volume of 20 ml in each set (10 ml per bottle), was 73.2% with the first set, 93.9% with the first two sets and 96.9% with the first three sets. However, to achieve a detection rate of > 99% of bloodstream infections, as many as four blood culture sets may be needed.[16]

Figure 1.

Cumulative sensitivity of blood culture sets[16]

Weinstein et al. Detection of Bloodstream Infections in Adults: How Many Blood Cultures Are Needed J Clin Microbiol. 2007; 45:3546-3548



A single blood culture set should never be drawn from adult patients, since this practice will result in an inadequate volume of blood cultured and a substantial number of bacteremias may be missed.[3, 6]

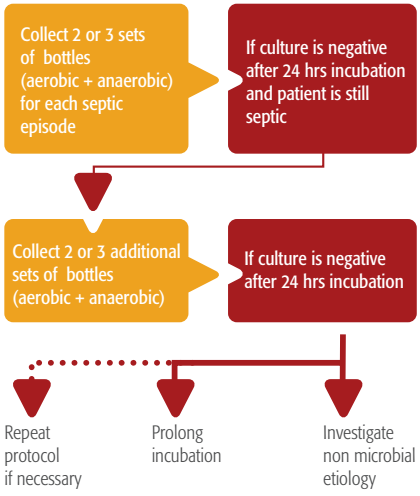
A contaminant will usually be present in only one bottle of a set of blood culture bottles, in contrast to a true bloodstream infection, in which multiple blood culture sets from separate anatomical sites will be positive. This further underlines the importance of taking more than one blood culture set, and taking each set from a separate anatomical site.[6]

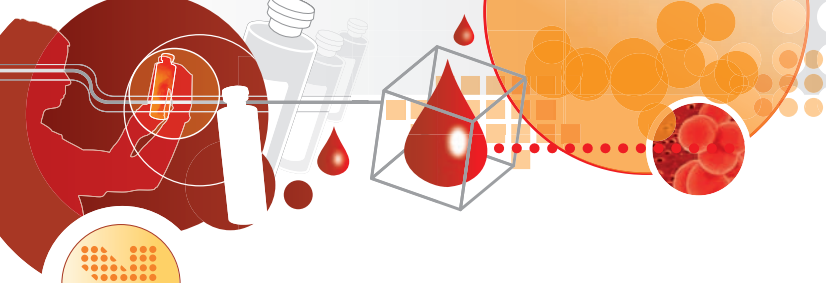
It is therefore generally recommended to collect 2, or preferably 3, blood culture sample sets from separate anatomical sites for each septic episode.[3]

If 2 to 3 sets are taken and cultures are still negative after 24 hours incubation, and the patient is still septic, 2 - 3 additional cultures may be collected, as indicated in the following diagram.

Figure 2.

Recommended number of blood culture sets





How many days incubation?

The current recommendation, and standard incubation period, for routine blood cultures performed by continuous-monitoring blood systems is five days.[17]

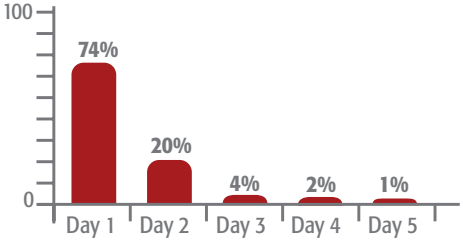
However, published data suggest that three days may be adequate to recover up to 95 to 97% of clinically significant microorganisms.

A recent study showed the number of significant microorganisms isolated per day for 35,500 consecutive blood cultures collected over 30 months, of which 2,609 were clinically significant isolates and 1,097 were contaminants.[18]

Figure 3.

Significant isolates per day[18]

Bourbeau PP et al. Routine incubation of BacT/ALERT FA and FN blood culture bottles for more than 3 days may not be necessary. J Clin Microbiol. 2005;43:2506-2509



These results demonstrate that 98% of clinically significant isolates were recovered with the first 3 days of incubation and 94% within 2 days of incubation.

Incubation of Fastidious Microorganisms

Another recent study demonstrated that, when using a continuous-monitoring blood culture system, 99.5% of non-endocarditis bloodstream infections and 100% of endocarditis episodes were detected within 5 days of incubation.[13]

This data suggests that extended incubation periods previously recommended for detection of the fastidious microorganisms* that sometimes cause endocarditis, are usually no longer necessary when using modern continuous-monitoring blood culture systems.[6]

*including *Brucella*, *Capnocytophaga* and *Campylobacter* spp., and the HACEK group (*Haemophilus*, *Actinobacillus*, *Cardiobacterium*, *Eikenella* and *Kingella* spp.)

Contaminant or true pathogen?

Contamination of blood samples during the collection process produces a significant level of false-positive results, and can have a serious negative impact on patient outcome.

A **false positive** is defined as growth of bacteria in the blood culture bottle that were not present in the patient's bloodstream, and were introduced during sample collection.

Contamination can come from a number of sources: the patient's skin, the equipment used to take the sample, the hands of the person taking the blood sample, or the environment.

Collecting a contaminant-free blood sample is critical to providing a blood culture result that has clinical value.

Certain microorganisms such as corynebacteria, *Propionibacterium* spp, coagulase-negative staphylococci, *Streptococcus viridans*, *Bacillus* spp. rarely cause severe bacterial infections or bloodstream infections. These are **common skin contaminants**, and although they are capable of causing serious infection in the appropriate setting, their detection in a single blood culture set can reasonably be treated as contamination without clinical significance. However, it is important to consider that coagulase-negative staphylococci

are the primary cause of both catheter-associated infections and false positive blood cultures, and may be clinically significant in up to 20% of cases.[19]

The most difficult interpretation problem for the physician is to determine whether the bacteria growing in the blood culture is a **true pathogen causing bloodstream infection**, or a **contaminant**. If it is a contaminant, then the patient may be treated unnecessarily with antibiotics, leading to overuse of existing medications, and the development of resistant strains.

In contrast to patients with infective endocarditis or other true positive bloodstream infections, patients whose blood cultures grow contaminants usually have only a single blood culture that is positive. This information is of great practical value for physicians, and underlines the importance of taking two to three blood culture sets from different anatomical sites.[6]

Contamination rates can be most effectively reduced by strict compliance with hand hygiene rules and best practices for blood collection, particularly during the stages of skin antisepsis, venipuncture and sample transfer to blood culture bottles.

However, even when the best blood collection protocols are used, it may not be possible to reduce the contamination rate below 2%.[20]

Impact of contamination rates

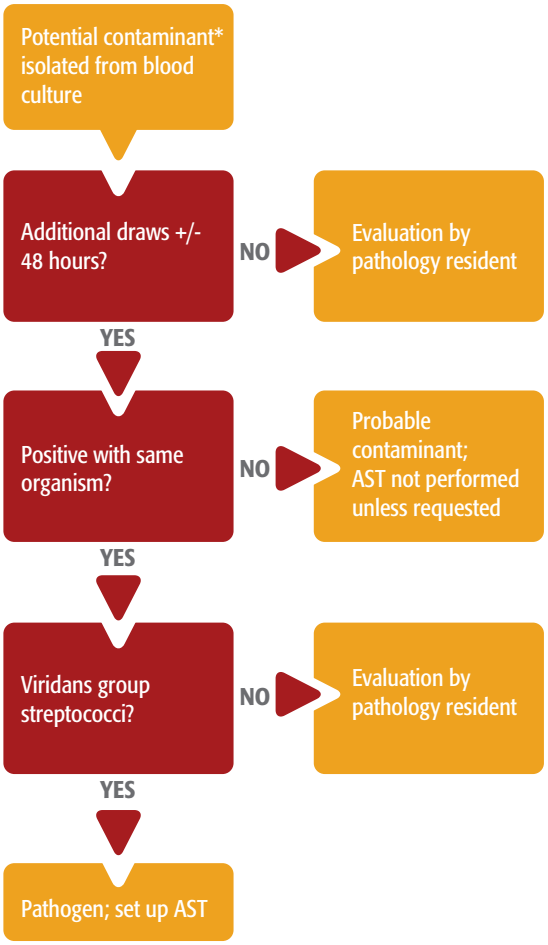
A contaminated blood culture can result in unnecessary antibiotic therapy, increased length of hospitalization and higher costs.
It has been found that each false positive result can lead to an increase in :

- patient stay - by 4.5 days on average
- intravenous antibiotic charges - by 39%
- an additional US$ 4,400 in subsequent total charges.[21]

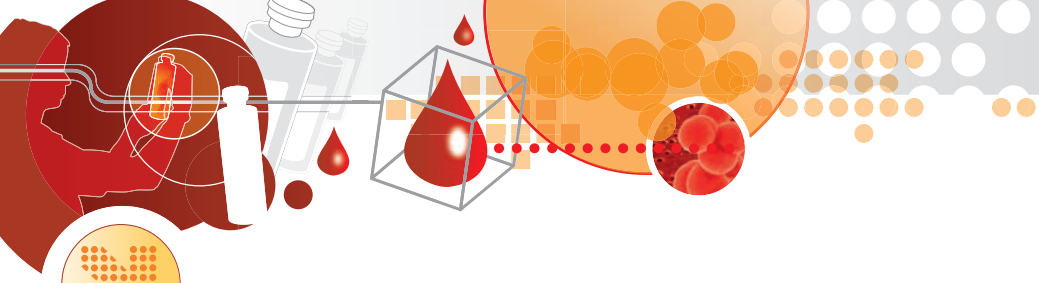
Figure 4.

Laboratory-based algorithm to determine blood culture contamination.[19]

Adapted from Richter et al. Minimizing the workup of blood culture contaminants: implementation and evaluation of a laboratory-based algorithm. J Clin Microbiol. 2002;40:2437-2444



* Microorganisms such as coagulase-negative staphylococci, *Streptococcus viridans*, *Bacillus* spp., *Propionibacterium* spp., diphtheroids, *Micrococcus* spp.



Special topic: Infective Endocarditis

Blood culture is essential in the diagnosis of infective endocarditis (infection of the heart valves). In this elusive disease, blood cultures may need to be taken repeatedly during febrile episodes, when bacteria/fungi are shed from the heart valves into the bloodstream. For patients with infective endocarditis, positive blood cultures will be obtained in over 90% of cases, if optimal culture conditions are respected.[22]

Acute Infective Endocarditis

Fulminant illness progressing rapidly over days to weeks, which may be caused by highly virulent pathogens, such as *Staphylococcus aureus*. When suspected, the severity of this disease requires blood cultures to be drawn immediately to avoid unnecessary delays in treatment.

- Multiple blood culture sets should be drawn during a 30-minute period prior to administration of empiric antimicrobial therapy.[2]

Sub-acute Infective Endocarditis

If sub-acute infection is suspected, there is usually not an urgent need to initiate empiric therapy.
It is more important to attempt to establish the microbiological diagnosis.

- Multiple blood culture sets should be obtained prior to initation of antimicrobial therapy, with sets spaced 30 minutes to one hour apart. This may help document a continuous bacteremia, and could be of additional clinical value.[3]

Fungal Infective Endocarditis

Once a rare occurrence, the incidence of fungal endocarditis is currently increasing considerably.[23] *Candida* is the most common fungal pathogen involved in infective endocarditis.[24]

If optimum collection conditions are observed, the yield for positive blood cultures in fungal endocarditis for *Candida* spp. is 83 to 95%.[25]

How many cultures?

In order to distinguish between contamination and true bacteremia, a total of three to five blood culture sets should be sufficient.

- Initially, three blood culture sets should be obtained from patients with suspected infective endocarditis. If the first three sets are negative at 24 hours, collect two more sets of cultures, for a total of five sets overall.[3]

Often patients with suspected infective endocarditis have been put on antibiotics prior to blood collection. This is the most common reason for **"culture-negative" infective endocarditis**. It is therefore important to use a blood culture medium that has the capacity to sustain microbial growth in the presence of antibiotics (see chapter "Which media to use?").[26, 27]

However, "culture-negative" endocarditis may also be due to fastidious microorganisms, such as *Aspergillus* spp., *Brucella* spp., *Coxiella burnetii*, *Chlamydia* spp. and HACEK microorganisms.

- Since current continuous-monitoring blood culture systems can recover all HACEK and other fastidious organisms within a 5-day period, extending incubation beyond this period is no longer considered to be necessary. However, if all blood culture bottles are negative after 5 days, and infectious endocarditis is still suspected, all bottles should be subcultured to chocolate agar.[28]

Processing blood cultures

Today, continuously-monitored blood culture systems provide the optimum solution for blood sample processing. Generally accepted incubation periods vary from 5-7 days, with 5 days being most popular. Determination of 98% of all positive specimens occurs within the first 3 days (see Figure 3).

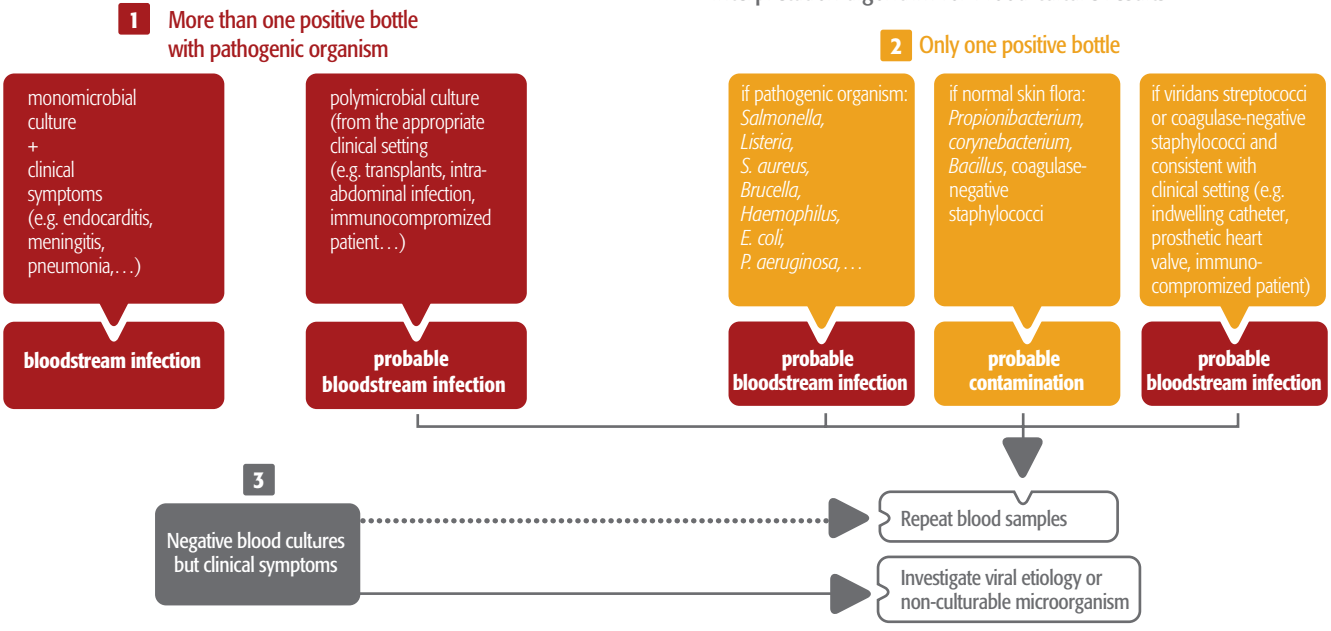
Following an instrument flagged positive event, a bottle is removed from the system and a Gram stain and subculturing is then performed. If **the Gram stain confirms the blood culture to be positive**, the morphology of the result should be reported immediately and subcultures performed for further organism identification and antibiotic susceptibility testing.
If a sample is Gram stain negative, no report is made to the clinician unless there is growth on subculture. Clinically relevant results must be reported as soon as available, due to the immediate impact on patient care decisions. When **reports are delivered rapidly**, studies have shown broadly improved outcomes and efficiencies in patient management.[29,30]
Rapid identification and antibiotic susceptibility testing techniques should be performed on positive blood cultures to provide the clinician with a complete result. **Antibiotic stewardship** (rational use of antibiotics) is crucial in cases of bloodstream infections and sepsis. Accurately determining the antimicrobial resistance profile of the causative pathogen in order to adopt the most effective antibiotic therapy can have a significant impact on patient outcome.

Interpretation of results

The microbiology laboratory can provide useful information to clinicians to help them determine whether a blood culture sample is a true positive or a false positive (contaminant). For example, the identity of the microorganism isolated can help determine if the culture is contaminated, and the number of cultures positive with the same organism can help predict true infections.[31]

Since no official guidelines exist, predictive models, such as the algorithm below, can give guidance only on the interpretation of blood culture results.[19, 31, 32] These guidelines should be used in conjunction with clinical guidelines, e.g. patient's full blood count, presence of catheters, radiological findings…
Further testing must be performed if the clinician suspects a clinically significant infection.

Figure 5.
Interpretation algorithm for blood culture results



bioMérieux Solutions for diagnosing bloodstream infections and sepsis

bioMérieux, a world leader in the field of *in vitro* diagnostics for over 40 years, has extensive experience in microbial detection and the rapid diagnosis of bacterial infection. Our products include manual and automated blood culture systems, culture media, automated immunoassays, manual and automated systems for identification and antimicrobial susceptibility testing.

By providing timely, relevant information, these products **help clinicians in their daily decision-making** and the prescription of relevant antibiotic therapy, and ultimately contribute to improved patient care.

Manual blood culture

> Hemoline™:

Diphasic culture media for fastidious microorganisms

Automated blood culture

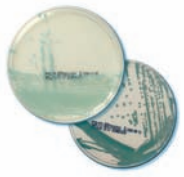
> BacT/ALERT® 3D:

Microbial detection system for blood, body fluids and mycobacteria testing

Culture media

> Conventional and chromogenic pre-plated media:

chromID™ MRSA, chromID S. aureus



Bacterial infection marker / Procalcitonin

> VIDAS® B·R·A·H·M·S PCT:

Innovative procalcitonin assay for early detection of severe bacterial infections. The VIDAS® platform is fully adapted to Emergency settings.

Automated identification and antibiotic susceptibility testing

> VITEK® 2 and VITEK® 2 Compact:

Following a positive blood culture, rapid identification of pathogens and interpretation of resistance profiles provides clinicians with a complete result and contributes to antibiotic stewardship.

The BacT/ALERT® 3D Microbial Detection System

bioMérieux has been committed to the development of automated blood culture solutions since 1990. The BacT/ALERT 3D - **a continuous-monitoring blood culture system** - offers minimal operator intervention and maximum performance in terms of reporting bloodstream infections to the clinician.

The BacT/ALERT 3D system provides an **optimal environment** for the recovery of a wide range of pathological organisms, including bacteria, fungi and mycobacteria. It is also the most **compact, modular and flexible** blood culture system available, providing a single platform for the recovery of microorganisms from **blood, sterile body fluids and mycobacterial specimens**, both respiratory and non-respiratory.

BacT/ALERT 3D

BacT/ALERT 3D 240

BacT/ALERT 3D 120

BacT/ALERT 3D 60

BacT/ALERT culture media

A wide variety of culture media to meet your specific needs, including **pediatric** and **mycobacteria** specific bottles.

Reinforced safety features

To comply with regulations designed to protect healthcare workers from blood-borne pathogens, bioMérieux upgraded its BacT/ALERT blood culture bottle from glass to **plastic**. This shatter-resistant material provides **greater user protection** against accidental blood exposure.

In addition, bioMérieux recently introduced the SampLOK® Adapter Cap for BacT/ALERT bottles and inserts. This accessory has the added feature of a safety lid to help protect the user from the risk of a needle-stick injury from the rear of the needle.

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Recommendations for blood culture collection

a summary of good practice

A - Using winged blood collection set

1> Prepare blood collection kit

Gather all materials before beginning the procedure. **Ensure the blood culture bottles are within date. Do not use bottles which show any signs of damage, deterioration or contamination.**



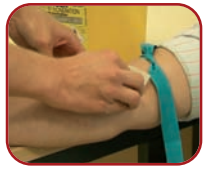
2> Prepare bottles for inoculation

Wash hands with soap and water then dry, or apply an alcohol hand rub. Remove the plastic "flip-cap" from the blood culture bottles and disinfect the septum using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. Use a fresh swab/applicator for each bottle. **Allow bottle tops to dry in order to fully disinfect.**


3> Prepare venipuncture site

Confirm the patient's identity. If skin is visibly soiled, clean with soap and water. Apply a disposable tourniquet. Palpate to identify the vein and cleanse using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. **The venipuncture site is not fully clean until the disinfectant and has fully evaporated.**





4> Wash hands. Wear gloves.

Wash hands again or use an alcohol hand-rub and apply clean examination gloves. Sterile gloves are not necessary.


5> Venipuncture

Attach a winged blood collection set to a collection adapter cap. **To prevent contaminating the puncture site, do not re-palpate the prepared vein before inserting the needle.** Insert the needle into the prepared site.


6> Culture bottle inoculation

Place the adapter cap over the aerobic bottle and press down to pierce the septum. Hold the bottle upright and use the graduation lines to accurately gauge sample volume. Add up to 10 ml of blood per adult bottle and up to 4 ml per pediatric bottle. Once the aerobic bottle has been inoculated, remove the adapter cap and repeat the procedure for the anaerobic bottle.
The use of blood collection adapters without blood collection sets is not recommended.


7> Other blood tests

If blood is being collected for other tests, place an insert into the adapter cap. The insert is used to guide blood collection tubes onto the needle. **If other blood tests are required, always collect the blood culture first.**

8> Finish the procedure

Discard the winged collection set into a sharps container and cover the puncture site with an appropriate dressing. Remove gloves and wash hands before recording the procedure, including indication for culture, time, site of venipuncture, and any complications. **Ensure additional labels do not cover the bottle barcodes and that the tear-off barcode labels are not removed.**


B - Using needle and syringe

1> Prepare blood collection kit

Gather all materials before beginning the procedure. **Ensure the blood culture bottles are within date. Do not use bottles which show any signs of damage, deterioration or contamination**.



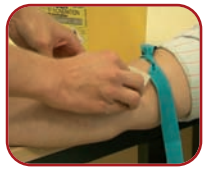
2> Prepare bottles for inoculation

Wash hands with soap and water then dry, or apply an alcohol hand rub. Remove the plastic "flip-cap" from the blood culture bottles and disinfect the septum using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. Use a fresh swab/applicator for each bottle. **Allow bottle tops to dry in order to fully disinfect**.


3> Prepare venipuncture site

Confirm the patient's identity. If skin is visibly soiled, clean with soap and water. Apply a disposable tourniquet. Palpate to identify the vein and cleanse using an appropriate disinfectant, such as 2% chlorhexidine in 70% isopropyl alcohol, 70% isopropyl alcohol, or iodine in swab or applicator form. **The venipuncture site is not fully clean until the disinfectant and has fully evaporated**.



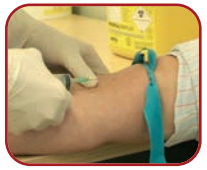


4> Wash hands. Wear gloves.

Wash hands again or use an alcohol hand-rub and apply clean examination gloves. Sterile gloves are not necessary.


5> Venipuncture

Attach the needle to a syringe. T**o prevent contaminating the puncture site, do not re-palpate the prepared vein before inserting the needle**. Carefully insert the needle into the vein.

6> Culture bottle inoculation

Collect the sample. Transfer the blood into the culture bottles, starting with the anaerobic bottle. Hold the bottle upright and use the graduation lines to accurately gauge sample volume. Add up to 10 ml of blood per adult bottle and up to 4 ml per pediatric bottle.

7> Finish the procedure

Discard the needle and syringe into a sharps container and cover the puncture site with an appropriate dressing. Remove gloves and wash hands before recording the procedure, including indication for culture, time, site of venipuncture, and any complications. **Ensure additional labels do not cover the bottle barcodes and that the tear-off barcode labels are not removed**.