

## INTRODUCTION

Blood cultures enable the detection of bacteria and/or fungus in the blood and guide the appropriate selection of antimicrobials<sup>1,2</sup>. Accuracy of test results rely on correct blood volume to improve confirmation of bacteraemia or fungaemia and minimise the risk of contamination.

This guidance is written in line with the NSW Health Policy Directive *Intravascular Access Devices (IVAD) - Infection Prevention and Control (PD2019\_040)*. It is intended for **adult patients only** (16 years and older). For paediatric and neonatal blood culture sampling guidance refer to the Clinical Excellence Commission (CEC) [sepsis website](#).

## WHEN TO TAKE BLOOD CULTURES IN ADULTS

Blood cultures are recommended for adults with any of the following:

- suspected sepsis as per the CEC [Adult or Maternal Sepsis Pathway](#)
- severe pneumonia as scored by CORB/SMARTCOP
- new confusion/change in behaviour or delirium
- fever (or history of fever) and immunocompromised, including neutropenia
- fever or evidence of infection with a vascular access device or recent surgery
- fever and recent overseas travel

In addition, selected patients with fever of unknown origin **who appear unwell or are at risk of sudden deterioration** such as the elderly (age ≥ 65 years) or those who are chronically ill, may need blood cultures. It is recommended in these instances that advice is sought from a senior clinician.

## IMPORTANT POINTS TO REMEMBER

- Blood cultures are the 'gold standard' for the detection of microbial pathogens related to bacteraemia and sepsis<sup>3</sup>
- Adequate volume of blood is needed to be able to culture bacteria and fungi<sup>1,5</sup>
- Always use aseptic technique - correct technique may help reduce the risk of cross contamination and a false positive test result<sup>3,5</sup>
- Ensure hand hygiene is performed as per the [5 Moments for Hand Hygiene](#)<sup>5</sup>
- In patients with a central venous access device (CVAD) and suspected sepsis, one set of blood cultures should be taken from the CVAD as well as one set from a peripheral site.<sup>6</sup>

## BLOOD CULTURE PROCEDURE

1. Inform patient of the procedure, explain the purpose, and obtain verbal consent.
2. Perform hand hygiene.
3. Check pathology request form, patient identification and chlorhexidine allergy history.
4. Perform hand hygiene, assemble and prepare the following equipment on a procedure trolley:
  - Alcohol-based hand rub
  - Two blood culture sets, each set comprising one aerobic and one anaerobic bottle (4 bottles in total); check expiry date of each bottle
  - Mark 10mL above the existing fluid for fill level; label each bottle with patient's name, Medical Record Number (MRN), date/time for collection of blood and location of site used for each set; do not cover bar codes or the bottom of the bottle
  - Gloves or sterile gloves, small dressing pack, tape, tourniquet(s), eye protection
  - Alcohol (ethanol or isopropyl alcohol), or alcohol with chlorhexidine, according to local procedure
  - Winged infusion set with leash and Vacutainer® sleeve designed to fit over the neck of the blood culture bottle; if unavailable use a winged infusion set with luer adapter and syringe
  - Sharps container
5. Put on protective eyewear and perform hand hygiene.
6. Remove the cap of each blood culture bottle and scrub the vial stoppers using alcohol, or alcohol with chlorhexidine, and allow to dry completely.
7. Position patient appropriately, apply tourniquet to palpate and identify appropriate vein.
8. Using alcohol, or alcohol with chlorhexidine<sup>5</sup> disinfect the venepuncture site using a circular scrubbing motion, spiralling out from the planned venepuncture site. Use a fresh swab for each scrub. Use 2-3 scrubs and do this for a total of 1-2 minutes, then allowing the site to dry. After cleaning if re-palpation of the site is expected, use of sterile gloves and sterile procedure is recommended.
9. Perform hand hygiene.
10. Put on gloves and use aseptic non-touch technique. If re-palpation of the venepuncture site occurs, it must be re-cleansed (return to step 8)<sup>4,6</sup>.
11. Perform venepuncture using winged infusion set with luer adapter and Vacutainer® sleeve
12. Fill each bottle only to the pre-marked 10mL line<sup>3, 4</sup> keeping the blood culture bottle upright and below the level of the venepuncture. Invert bottles gently several times to prevent clotting.
  - Always collect the blood culture bottles FIRST (inoculating the aerobic bottle first) then collect additional blood pathology tubes if required.
  - Release tourniquet, remove needle (with safety sheath applied), tape cotton ball across the skin site and apply pressure (where possible request patient to take over application of pressure).
13. Repeat steps 8-13 to collect the second set of blood cultures from a different peripheral site.
14. Discard sharps, collect all rubbish/dirty items and dispose of appropriately.
15. Remove gloves and perform hand hygiene; remove eye protection and perform hand hygiene.
16. Place bottles into the biohazard bag and arrange to send to the laboratory with the request form. Transport bottles at room temperature.
17. Document in the health record the number of sets of blood cultures that have been taken, the sites and reason for site choice if this differs from a peripheral site.
18. Perform hand hygiene.
19. Explain to patient that results may not be available for 48 hours.

## FREQUENTLY ASKED QUESTIONS

### Why bother taking blood cultures when most results come back negative?

Studies show that insufficient blood sample volume increases the risk of a false negative result<sup>1,3,4</sup>. The optimal recovery of bacteria and fungi from blood depends on culturing an adequate volume of blood. It is therefore important to follow the procedure to collect a sufficient blood sample volume. The direct correlation between the volume of blood cultured and yield relates to the low number of colony forming units in a millilitre of adult blood. For each additional millilitre of blood cultured, the yield of microorganisms recovered from adult blood increases<sup>4</sup>.

A positive result provides direct evidence of infection, enabling the antibiotic treatment to be directed against the demonstrated pathogen(s). Furthermore, cumulative antibiograms can be constructed by summarising antibiotic susceptibility of blood isolates which then supports development of reliable empiric antibiotic treatment guidelines. Click [here](#) for the National Healthcare Safety Network (NHSN) Centers for Disease Control and Prevention Organism list.

### What should I do if less than 10mLs of blood is collected?

If you collect less than 10mLs of blood you should inoculate the entire sample into the aerobic bottle<sup>6</sup>. The rationale for this is that most bacteraemia is caused by aerobic and facultative bacteria, which will be recovered better from aerobic bottles. In addition, pathogenic yeasts are recovered almost exclusively from aerobic bottles, as are strict aerobes, such as *Pseudomonas* and *Stenotrophomonas*.

The volume of blood drawn for culture is the most important determinant of the sensitivity of detection of bacteraemia or fungaemia. The more blood collected the easier it is to detect bloodstream infections. Where possible, seek expert help in obtaining a larger blood sample.

### Why collect two sets (4 bottles) of blood cultures from different sites?

A single set (2 bottles) provides an inadequate sample volume for adults and significantly reduces the sensitivity of the culture process. Collection of two sets (4 bottles) is the standard of care in adults<sup>2,4</sup>. Potential contaminant organisms may also cause infection and isolation of the same organism from more than one blood culture set provides good evidence that the positive blood culture is not caused by contamination. The two sets should always be collected from separate venepunctures<sup>4</sup>. If a CVAD is present, then one sample should be collected from the CVAD and the other from a peripheral venepuncture<sup>7</sup> and the site of collection should be indicated on each sample.

### Can I collect blood cultures from an intravenous cannula?

Collection of blood cultures via an intravenous cannula is NOT the recommended method<sup>1</sup>. However, if this method is used it should only be from a cannula that has been freshly inserted and a second specimen should be obtained from a peripheral site<sup>1,7</sup>.

### How are blood cultures stored prior to transport to the laboratory?

Storage should be at room temperature and never refrigerated<sup>4</sup>. Where transport is delayed, the facility should liaise with the receiving laboratory to establish guidance on sample storage.

## REFERENCES

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