Simple measures to reduce the rate of contamination of blood cultures in Accident and Emergency

M Madeo, T Jackson, C Williams

**Objectives:** To reduce the contamination rate of blood cultures taken in the Accident and Emergency (A&E) department.

**Methods:** The standard blood culture sampling kit was supplemented with an instruction sheet on the optimal method for drawing blood cultures and a large 62% ethyl alcohol impregnated wipe.

**Results:** There was a statistically significant reduction in the number of contaminants (p = 0.039), use of tincture of iodine for skin disinfection associated the use of a dedicated phlebotomy service and good venepuncture technique are important factors in reducing the rate of contamination. The most common bacterial contaminant identified was coagulase negative staphylococci (CNS); 12 CNS were identified in the month prior to the intervention but only three in the subsequent month.

**DISCUSSION**

The role of blood cultures in A&E remains open to question. However a reduction in the number of contaminants will optimise any relevance that a positive blood culture has to patient management. Most false positive blood cultures are caused by endogenous microbial skin flora so strict skin preparation and good venepuncture technique are important factors in reducing the rate of contamination. The most common bacterial contaminant identified was coagulase negative staphylococci (CNS); 12 CNS were identified in the month prior to the intervention but only three in the subsequent month.

**RESULTS**

In the month before the intervention 50 sets of blood cultures were taken, 35 (70%) had no bacterial growth, three (6%) were judged to have significant growth, and 12 (24%) were judged to contain contaminants. In the month following the intervention 50 sets of blood cultures were also taken; 37 (74%) had no bacterial growth, nine (18%) were judged to have significant growth, and four (8%) were judged to contain contaminants. There was no statistically significant difference in overall bacterial growth following intervention, $\chi^2 (df = 1) = 2.31$, p = 0.13. There was however a statistically significant reduction in the number of contaminants, $\chi^2 (df = 2) = 7.06$, p = 0.03.

The results are summarised in table 1 and bacterial isolates listed in table 2.

**DIAGNOSIS**

The role of blood cultures in A&E remains open to question. An increase in the number of contaminants may lead to errors both in clinical interpretation and administration of inappropriate treatment. There are several problems in A&E which may contribute to high contamination rates of blood cultures—these include a rapid turnover of staff, lack of ongoing training, workload, and the nature of the presenting patients. Our study shows the effect that the provision of information on skin decontamination has on the contamination rates in A&E.

**METHODS**

The infection control team, in partnership with the A&E consultant staff, introduced a blood culture sampling kit. This contained BacT/ALERT (Biomerieux, Basingstoke, Hants, UK) sampling bottles but the bottles were placed in a polythene sleeve with enclosed pocket size instructions on how to take blood cultures (fig 1) and a large 62% ethyl alcohol impregnated wipe (Purell, Gojo Industries, Arkon, OH, USA) for cleaning the patient’s skin before venepuncture.

The medical and nursing staff in A&E were instructed on how to use the blood culture kits but no additional formal training was given on venepuncture. The interventions were timed to occur in the middle of the junior doctors’ rotation period to minimise the effect that staff changes may have had on the study.

The request form was marked in order to allow the laboratory to identify which blood culture samples had been collected using the kit method. Bacteria were identified using standard microbiological techniques. A blood culture contaminant was defined as a usual skin organism that was isolated from only one set of blood cultures in a patient with no evidence of an infection with that organism.

**Abbreviations:** CNS, coagulase negative staphylococci.
Reducing contamination of blood cultures in A&E

PATIENTS CURRENTLY RECEIVING ANTIBIOTICS ONLY 5 ML OF BLOOD SHOULD BE INOCULATED PER BOTTLE

- Withdraw 20 ml blood (5 ml from pre-teen children, 1–2 ml in neonates) and inoculate 10 ml into anaerobic bottle first then the remainder into the aerobic bottle.
- Do not change needles between venepuncture and inoculation of the bottles — reduces the risk of contamination and injury.
- Dispose of needle and syringe as a single unit in a sharps container
- Send the samples to the laboratory for incubation ASAP.

**Preparation for Taking Blood-Cultures**

**Equipment**
- 20 ml sterile syringe with 21 gauge needle
- Blood-culture bottles (purple top = anaerobic and blue top = aerobic)
- For babies a single paediatric bottle with a yellow top should be used.
- Skin disinfectant
- Sharps container
- Sterile/Non-sterile gloves

**Procedure**
- Select two BactAlert bottles (one purple and one blue)
- Label each bottle with patient’s name, DOB, unit number, date and time of collection — both on the specimen and on the laboratory request form.
- DO NOT PLACE LABELS ON BOTTLE
- Clean the skin by swabbing concentrically using enclosed alcohol wipe from the venepuncture site outwards for a minimum of 30 seconds — allow the site to dry completely before performing venepuncture (1–2 minutes)
- Do not touch prepared skin with unglove finger
- Disinfect the tops of BactAlert bottles using 70% alcohol (do not use iodine)

**Table 1** Results of blood cultures taken before and after the intervention

<table>
<thead>
<tr>
<th>Total blood culture sets (%)</th>
<th>No bacterial growth (%)</th>
<th>Significant bacterial growth (%)</th>
<th>Contaminated (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre 50 (100)</td>
<td>35 (70)</td>
<td>3 (6)</td>
<td>12 (24)</td>
</tr>
<tr>
<td>Post 50 (100)</td>
<td>37 (74)</td>
<td>9 (18)</td>
<td>4 (8)</td>
</tr>
</tbody>
</table>

**Table 2** Microorganisms recovered from the blood cultures

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Significant growth</th>
<th>Contaminants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre Post</td>
<td>Pre Post</td>
</tr>
<tr>
<td>Staphylococcus epidermidis</td>
<td>0 0</td>
<td>12 3</td>
</tr>
<tr>
<td>Diphtheroids</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>0 3</td>
<td>0 0</td>
</tr>
<tr>
<td>Escherichia coli</td>
<td>1 5</td>
<td>0 0</td>
</tr>
<tr>
<td>Streptococcus spp</td>
<td>1 1</td>
<td>0 0</td>
</tr>
<tr>
<td>Klebsiella spp</td>
<td>1 0</td>
<td>0 0</td>
</tr>
<tr>
<td><em>Total</em></td>
<td>3 9</td>
<td>12 4</td>
</tr>
</tbody>
</table>

**References**

3. Trautner WB, Claridge EJ, Darouiche RO. Skin antisepsis kits containing alcohol and chlorhexidine gluconate or tincture of iodine are associated with low rates of blood culture contamination. Infect Control Hosp Epidemiol 2002;23:397–401.

**Authors’ affiliations**

M Madeo, C Williams, Department of Infection Control, Hull and East Yorkshire Hospitals, Hull, UK
T Jackson, Department of Accident and Emergency, Hull and East Yorkshire Hospitals, Hull, UK

Correspondence to: Dr C Williams, Department of Microbiology, Yorkhill Hospital, Dalnair Street, Glasgow G3 8SJ, UK; craig.williams@yorkhill.scot.nhs.uk

**Figure 1** Leaflet enclosed with each set of blood culture bottles.