Unique blood culture for diagnosis of bloodstream infections in emergency departments: a prospective multicentre study

S. Dargère1, J.-J. Parienti2-3, E. Roupie4, P.-E. Gancel5, E. Wiel5, N. Smaiti5, C. Loiez6, L.-M. Joly7, L. Lemée8, M. Pestel-Caron8, D. du Cheyron9, R. Verdon1, R. Leclercq3,10, V. Cattoir3,10 and UBC study groupa
1) Service de Maladies Infectieuses, 2) Unité de Recherche Clinique et Biostatistiques, Centre Hospitalier Universitaire, 3) Unité EA4655 U2RM, équipe Antibiorésistance, Université de Caen Basse-Normandie, 4) Département d’Accueil et de Traitement des Urgences, Centre Hospitalier Universitaire, Caen, 5) Pôle de l’Urgence, Centre Hospitalier Universitaire, 6) Pôle de Microbiologie, Centre Hospitalier Universitaire, Lille, 7) Département d’Anesthésie-Réanimation, Centre Hospitalier Universitaire, 8) Département de Microbiologie, Centre Hospitalier Universitaire, Rouen, 9) Service de Réanimation Médicale, Centre Hospitalier Universitaire and 10) Service de Microbiologie, Centre Hospitalier Universitaire, Caen, France

Abstract

Detection of microorganisms by blood cultures (BCs) is essential in managing patients with bacteraemia. Rather than the number of punctures, the volume of blood drawn is considered paramount in efficient and reliable detection of microorganisms. We performed a 1-year prospective multicentre study in adult emergency departments of three French university hospitals comparing two methods for BCs: a unique blood culture (UBC) collecting a large volume of blood (40 mL) and the standard method of multiple blood cultures (MBC). The performances of both methods for bacterial contamination and efficient microbial detection were compared, each patient serving as his own control. Amongst the 2314 patients included, three hundred were positive for pathogens (n = 245) or contaminants (n = 55). Out of the 245 patients, 11 were positive for pathogens by UBC but negative by MBC and seven negative by UBC but positive by MBC (p = 0.480). In the subgroup of 137 patients with only two BCs, UBC was superior to MBC (p = 0.044). Seven and 17 patients had contaminated BCs by UBC and MBC only, respectively (p = 0.062). Considering the sums of pathogens missed and contaminants, UBC significantly outperformed MBC (p = 0.045). Considering the complete picture of cost savings, efficient detection of microorganisms and decrease in contaminations, UBC offers an interesting alternative to MBC.

Keywords: Bacteraemia, blood contamination, blood cultures, bloodstream infection

Original Submission: 23 January 2014; Revised Submission: 29 March 2014; Accepted: 23 April 2014
Editor: D. Raoult
Article published online: 28 April 2014
Clin Microbiol Infect 2014; 20: O920–O927
10.1111/1469-0691.12656

Corresponding author: S. Dargère, Service de Maladies Infectieuses, Centre Hospitalier Universitaire de Caen, Avenue de la Côte de Nacre, 14033 Caen Cedex 9, France
E-mail: dargere-s@chu-caen.fr

*Members of the UBC study group are: Cédric Daubin, Géraldine Delente, Catherine Le Roux, Romain Masson, William Ochoa, Bertrand Sauneuf, Amélie Seguin, Nicolas Terzi, Xavier Valette (Caen, France); Claire Brunin-Lemanski, René Courcol, Grégoire Smith, Pierre Willatte (Lille, France); Maud Alfonsi, Virginie Lvovschi, Nicolas Peschanski (Rouen, France).

Introduction

Detection of bacteraemia and fungaemia by blood culture (BC) is essential in managing patients with bloodstream infection (BSI) [1]. Many studies have shown that increasing the number of BCs increases the likelihood of isolation of microorganisms [2–5]. It is a standard recommendation that two to four BCs should be obtained over a 24-h period for the optimal detection of BSIs in adults [6,7].

The volume of blood drawn is now considered paramount in efficient detection of microorganisms. This notion is based on many studies of patients with bacteraemia [4,8–12]. Li et al. demonstrated that increasing cultured volume from 20 to 40 mL increased yield by 19% [9]. Collecting only one BC should be discouraged because it results in an inadequate volume of cultured blood and therefore lacks sufficient sensitivity for detecting BSI [6]. Also, it is more challenging to distinguish between contamination and true bacteraemia.

Contaminated BCs may lead to longer hospital stays, unnecessary antibiotic therapy, redundant laboratory testing,
unnecessary removal of the catheter in patients with a central venous line and induce wasteful spending [13]. The multiple venipunctures required to obtain several sets of BCs are all opportunities for contamination.

To reconcile the need to collect large volumes of blood for efficient diagnosis of BSI and the need to minimize the contaminations by limiting the number of venipunctures, we have designed a prospective multicentre study comparing a unique BC (UBC) collecting a large volume of blood (40 mL) with the standard method of multiple BC (MBC) in patients presenting to the emergency department with a suspicion of BSI. We hypothesized that a UBC would decrease the number of contaminations and detect a similar number of pathogens, as compared with MBC.

Materials and Methods

Study design
This prospective, comparative, multicentre study involved emergency departments of three French university hospitals in Caen (1495 beds), Lille (2965 beds) and Rouen (2445 beds). The study included BCs obtained from consecutive patients aged ≥18 years from January to December 2012. However, the study had to be interrupted for holidays because of staff shortages.

BCs were collected from patients admitted with one of the following signs: fever (≥38.5°C), hypothermia (≤36°C), chills or shock.

For the first BC, 40 mL of blood was obtained aseptically by a single phlebotomy and equally distributed into two BacT/Alert FA aerobic bottles and two BacT/Alert FN anaerobic bottles (bioMérieux, La-Balme-les-Grottes, France). The four bottles were labelled prior to the venipuncture from one to four, in the following order, aerobic-anaerobic-aerobic-anaerobic, and filled in according to the numbering. Within the next 24 h, one to three other 20-mL BCs consisting of a single pair of aerobic and anaerobic bottles had to be performed, spaced by a minimum of 30 min. Bottles were incubated for 5 days or until positivity was reported by the BacT/Alert 3D instrument (bioMérieux).

The study was designed to compare the UBC and the MBC methods, with each patient being his own control: for MBC analysis, the first bottle pair was mimicked by taking into account the culture results of the first two bottles of the UBC set (see Supplementary Fig. S1). Hereafter, the mimicked MBC was called MBC.

The exclusion criteria were the following: patients <18 years, patients for whom direct venipuncture was impossible, patients who had an invasive procedure during the first 24 h of hospitalization, patients for whom the first four-bottle set was not labelled or labelled in incorrect order, and patients for whom subsequent two-bottle sets were not obtained.

Clinicians were free to prescribe two or more BCs. Skin disinfection was performed using similar protocols in the three centres based on alcoholic povidone-iodine as a disinfectant before each venipuncture.

This study was submitted to and approved by the local ethics committee. Given the observational nature of this study, in accordance with French legislation, written information was delivered to the patients or, if not possible, to their relatives.

Definitions of contaminants and pathogens
Microorganisms isolated from BCs were studied by standard microbiological techniques. A positive BC was defined as growing with one or several microorganisms, regardless of the number of bottles.

Contaminants. Cultures of coagulase-negative staphylococci (CoNS) (aside from Staphylococcus lugdunensis), coryneform bacteria, non-pneumococcal viridans streptococci, Propionibacterium, Bacillus and Micrococcus species, whatever the number of positive BCs, were considered as potential contaminations. The number of positive bottles and clinical data (including fever, chills, hypotension, neutropenia, antibiotic administration, catheter management and bacteriology of infected sites) were reviewed to evaluate the clinical significance of a potentially contaminated BC. Infectious diseases physicians conducted medical reviews (see Supplementary Appendix S1 for more details). In particular, the presence of CoNS in more than one set of BCs was considered as a contamination when the species identifications or antibiotic susceptibility profiles were different and when the physician review indicated no clinical evidence of infection.

Pathogens. Other organisms, such as E. coli or Staphylococcus aureus, not requiring several positive sets of BCs to be considered as pathogens, were classified as pathogens in the study [2]. When bacteraemia were polymicrobial, each microorganism was investigated independently.

Statistical analysis
Assuming that 2% of BCs (i.e. 20% of positive BCs) would be contaminated, including a level of contaminant of 8% or more in MBC only and 2.7% in UBC only (three times less because UBC gives rise to three less opportunities for contamination compared with MBC), we planned to include 200 positive BCs to be able to demonstrate a significant reduction of contaminant in UBCs as compared with MBCs. The culture results of UBCs were compared with those of MBCs. Analyses were carried out separately and then combined for pathogens and
contaminants. The number of patients with discordant results for contaminants and pathogens was compared by using the McNemar’s chi-square test. The \( \alpha \)-level was set at 0.05 for statistical significance.

**Results**

**Patients**

From January to December 2012, a first set of four bottles was obtained from 2314 unique patients (1551 in Caen, 461 in Lille and 302 in Rouen) (Fig. 1). At the end, a total of 300 patients had a first four-bottle set and subsequent two-bottle set drawn and were positive for pathogens or contaminants (13%) (Caen, \( n = 202 \), 13%; Lille, \( n = 76 \), 16.5%; Rouen, \( n = 22 \), 7.3%). Two BCs were performed for 170 positive patients and \( \geq 3 \) BCs were requested for 130 positive patients. The mean patient age was 67.3 ± 18 years (range, 18–92 years); 56.8% were male.

**Contaminant microorganisms**

Confirmed contaminants were detected in 55 patients (2.4% overall, 1.6% in Caen, 6.8% in Lille and 1.7% in Rouen). Pathogens also grew in BCs of four of these patients (three *E. coli* and one *S. aureus*). Data for these four patients were analysed independently for contaminants and pathogens.

Thirty-one patients had contaminated BCs by both UBC and MBC strategies. As expected, most contaminants (\( n = 25 \)) were detected in the first aerobic bottle that accounted for both the UBC and MBC groups. Seven patients had a contaminated UBC only and 17 had a contaminated MBC only (\( p = 0.062 \)). Contamination of the second set of BCs (\( n = 16 \)) accounted for the lower performance of MBCs. Bacterial species isolated as contaminants are shown in Table 1.
Pathogens
Pathogens grew in the BCs collected from 249 patients (10.8%). After review of medical records of discrepancies between the UBC and MBC groups, four patients with microorganisms detected by MBC but not by UBC were excluded from the study due to clinical invasive investigations performed after the collection of the first set of BCs. Indeed, two patients underwent urinary catheterization and endoscopic retrograde cholangiography, respectively, just before the second set of BCs positive for E. coli. The other two patients underwent abscess draining and ascites puncture just prior to the fourth BC positive for S. aureus and β-haemolytic streptococci, respectively.

Among the 245 remaining positive patients, 11 were positive for pathogens by UBC but negative by MBC, while seven were negative by UBC but positive by MBC (p 0.480) (Fig. 2). Discrepant microbial and clinical diagnoses are shown in Table 2. A sub-analysis was carried out according to the number of BCs performed in patients. In the group of 137 patients for whom only two BCs were performed, the difference between patients positive only with UBC and those positive only with MBC was statistically significant (10 vs. 2; p 0.044) (Fig. 2). Differences were not statistically significant for the 61 and 47 patients who underwent three and four sets of BCs, respectively (p 0.618 and p 0.480), as well as after combining patients with ≥3 BCs (p 0.221) (Fig. 2).

Overall, UBC allowed detection of pathogens in the blood of 97.4% of patients vs. 95.5% for MBC (89.8% with the first mimicked set of MBCs and 94.7% with the first two BCs) (Fig. 2). The difference between UBC and MBC was due to the lower performance of MBC in the two-BC subgroup (Fig. 3). The percentage of positive BCs was greater (99%) in the sub-group of 108 patients with ≥3 BCs. The rank order of pathogens isolated from BCs is shown in Table 3. E. coli accounted for nearly one-third of isolates, which is consistent with the community origin of BSIs.

Twenty-one patients (8.4%) had polymicrobial bacteraemia, including 17 and four with two and three microorganisms, respectively. As compared with UBC, MBC allowed isolation of additional pathogens in six of these BCs (Table 4). Conversely, UBC detected two additional pathogens as compared with MBC.

Global assessment of UBC and MBC
As the goal of this study was to compare UBC with MBC both for efficient isolation of blood pathogens and for minimization of BC contaminants, we have designed an additional statistical analysis accounting for both parameters. Considering the sums of patients with pathogens missed and contaminated BCs, the difference between performances of UBC and MBC was statistically significant (p 0.045) (Fig. 4).

Discussion
Adequate volume sampling appears to be the most important parameter for detecting bloodstream microorganisms because bacterial density in blood from bacteraemic patients is very low (median 1 CFU/mL). Sampling an adequate blood volume can be achieved either by increasing the number of venipunctures or by collecting more blood at each venipuncture. The

![FIG. 2. Discrepancies in detection of pathogens between the unique blood culture (UBC) and the multiple blood culture (MBC). Numbers of patients with bacteraemic episodes by UBC only or by MBC only are shown. Data are shown for all patients and for patients with two, three or four sets of blood cultures (SBC) by MBC.](image-url)
first strategy has been successful in several studies [5,9,14]. However, despite recommendations, a study by the American College of Pathologists showed that the incidence of solitary BCs leading to collect a maximum of 20 mL of blood, ranged from 1 to 99% (median 26%) at 38 surveyed institutions [15]. In a more recent study by the same College, single BCs were performed in 42.5% or more in the less performing 10% of 333 small US hospitals [16]. In a recent study from a large French hospital, only 45% of patients had ≥2 BCs [17]. The second strategy was used by Patel et al., who reported that collection of two sets of three bottles resulted in a 7.9% increased yield as compared with two bottles per set [12]. A single phlebotomy strategy collecting a large volume of blood provides several advantages. It does not delay antimicrobial therapy and increases the chance of isolating the causal microorganism in the case of severe sepsis where antimicrobial therapy has to be started after the first set of BCs. Furthermore, the risk of contamination mathematically increases with the number of venipunctures. In a recent study, when comparing the number of contaminated BCs with collection of two 30-mL BC sets with the number following the collection of one 20-mL BC set, the increased contaminant yield was 23.0% for the two 30-mL BC sets [12]. The theoretical possibility of intermittent bacteraemia that supports the concept of the MBC strategy has never been proved [9,18]. A presumed intermittent bacteraemia may turn to a continuous bacteraemia if the volume of sampled blood is increased.

Few studies have evaluated performances of a single collection of a large volume of blood. On the basis of a theoretical model and literature-based simulations, Lamy et al. proposed collection of a unique six-bottle BC set [19]. This

<table>
<thead>
<tr>
<th>Patient (hospital)</th>
<th>Bacterial species</th>
<th>Infection</th>
<th>Significant underlying disease</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBC positive and MBC negative</td>
<td>Enterobacter cloacae</td>
<td>EVD infection</td>
<td>Glioblastoma</td>
</tr>
<tr>
<td>1 (Caen)</td>
<td>Streptococcus agalactiae</td>
<td>Erysipelas</td>
<td></td>
</tr>
<tr>
<td>2 (Caen)</td>
<td>Streptococcus mitis</td>
<td>Pneumonia</td>
<td></td>
</tr>
<tr>
<td>3 (Caen)</td>
<td>Bacillus cereus sp.</td>
<td>Bacterial translocation</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>4 (Caen)</td>
<td>Escherichia coli</td>
<td>Pneumonia</td>
<td>Cirrhosis</td>
</tr>
<tr>
<td>5 (Caen)</td>
<td>Streptococcus agalactiae</td>
<td>Erysipelas</td>
<td></td>
</tr>
<tr>
<td>6 (Lille)</td>
<td>Escherichia coli</td>
<td>Pneumonia</td>
<td></td>
</tr>
<tr>
<td>7 (Lille)</td>
<td>Streptococcus pneumoniaiae</td>
<td>Pneumonia</td>
<td></td>
</tr>
<tr>
<td>8 (Lille)</td>
<td>Staphylococcus aureus</td>
<td>Bacteremia from skin lesion</td>
<td>IVUD</td>
</tr>
<tr>
<td>9 (Rouen)</td>
<td>Escherichia coli</td>
<td>Pyelonephritis</td>
<td>Diabetes mellitus</td>
</tr>
<tr>
<td>10 (Rouen)</td>
<td>Streptococcus pneumoniaiae</td>
<td>Pneumonia</td>
<td>Panhypopituitarism</td>
</tr>
<tr>
<td>11 (Rouen)</td>
<td>Staphylococcus aureus</td>
<td>Bacteremia</td>
<td></td>
</tr>
</tbody>
</table>

EVD, external ventricular drain; IVUD, intravenous drug use; IT, immunosuppressive therapy; PVT, portal vein thrombosis; HCC, hepatocellular carcinoma.

**Table 2.** Microbiological and clinical diagnosis of discrepancies between UBC and MBC strategies

**Table 3.** Rank order of pathogen microorganisms isolated from blood

<table>
<thead>
<tr>
<th>Bacterial species or group</th>
<th>Number of isolates (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>94 (35)</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>41 (15.2)</td>
</tr>
<tr>
<td>Other Enterobacteriaceae</td>
<td>24 (8.9)</td>
</tr>
<tr>
<td>β-haemolytic streptococci</td>
<td>21 (7.8)</td>
</tr>
<tr>
<td>Streptococcus pneumoniaiae</td>
<td>21 (7.8)</td>
</tr>
<tr>
<td>Anaerobes</td>
<td>20 (7.4)</td>
</tr>
<tr>
<td>Enterococcus spp.</td>
<td>13 (4.8)</td>
</tr>
<tr>
<td>Streptococcus viridans</td>
<td>10 (3.6)</td>
</tr>
<tr>
<td>Coagulase-negative staphylococci</td>
<td>8 (3)</td>
</tr>
<tr>
<td>Pseudomonas spp.</td>
<td>6 (2.2)</td>
</tr>
<tr>
<td>Streptococcus gallolyticus</td>
<td>6 (2.2)</td>
</tr>
<tr>
<td>Aeromonas sp.</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Cryptococcus neoformans</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Listeria monocytogenes</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Pasteurella multocida</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Total</td>
<td>269 (100)</td>
</tr>
</tbody>
</table>
strategy was shown to be superior to a multisampling strategy. However, getting enough blood for six bottles from a single puncture may be difficult, particularly in elderly patients. To the best of our knowledge, only one published study has used a single-sample strategy based on inoculating a 40-mL BC [20]. The increased yield of true bacteraemia using a 40-mL instead of 30-mL BC was estimated to be 4.2%. The authors, who used a before/after design, concluded that resources were optimally used and that this strategy had a positive impact on workload management and early antimicrobial therapy.

We used a study design in which the patient was his own control, allowing accurate comparisons between the UBC and MBC strategies. Surprisingly, 48% of the 2314 patients had a solitary BC. The increased yield of true bacteraemia using a 40-mL instead of 30-mL BC was estimated to be 4.2%. The authors, who used a before/after design, concluded that resources were optimally used and that this strategy had a positive impact on workload management and early antimicrobial therapy.

We used a study design in which the patient was his own control, allowing accurate comparisons between the UBC and MBC strategies. Surprisingly, 48% of the 2314 patients had a solitary BC. This percentage is similar to that reported previously [12–17]. We did not investigate the reasons for this, but it may be that unnecessary BCs are common in emergency departments [21,22].

Although statistical significance was not reached, the UBC strategy allowed detection of four more positive patients than the MBC strategy. Analysis of subgroups of patients revealed that statistical significance was reached when UBC was compared with the MBC subgroup with two BCs. In the subgroup of 108 patients with ≥3 BCs, four more pathogens were detected by the MBC strategy, although the difference with UBC was not significant. This could be related to the minimum of 60 mL of blood that was drawn, as opposed to 40 mL with the UBC strategy. However, this was paid by an increase in contaminants (five more) related to the multisampling strategy. By combining the efficiency in detection of microorganisms and the minimization of contaminants, the UBC strategy showed significant superiority over the standard MBC strategy (Fig. 4).

There is compelling evidence that contaminated BCs have a significant negative financial impact and deleterious effects on patient’s management [13,23–26]. False-positive BCs have been shown to increase patient charges by 47%, with an over-cost reaching $8720 per contamination [24]. Souvenir et al. reported that almost half of the patients with a false-positive result were treated with antibiotics, often with vancomycin, leading to additional costs of $1000 per patient [25]. BC contaminations have been shown to generate a 20% and 39% increase in laboratory and intravenous antibiotic charges, respectively [26].

Comparing UBC with the standard MBC with two, three and four sets of BCs, the cost savings related to less material and labour time should amount to 58 500 €, 159 000 € and 259 500 € for 10 000 BCs, respectively (see Supplementary Appendix S2).

An important point to consider is that our study was deliberately conducted without modifying routine prescriptions of clinicians. Therefore, global trends of the UBC strategy towards isolation of less contaminants and more pathogens as compared with the routine MBC reflects the daily practice in our three hospitals. Finally, a single 40-mL BC is likely to be more accepted by patients than several venipunctures and involves half the work or two-thirds less work for phlebotomists.

**TABLE 4. Discrepancies between UBC and MBC strategies for patients with polymicrobial bacteraemia**

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Isolated by UBC and MBC</th>
<th>Isolated only by MBC</th>
<th>Isolated only by MBC</th>
<th>Type of infection</th>
<th>Underlying condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Escherichia coli</td>
<td>Klebsiella pneumoniae</td>
<td>-</td>
<td>-</td>
<td>Acute cholangitis</td>
<td>Peritoneal carcinosis; obstruction of JJ stent</td>
</tr>
<tr>
<td>Enterococcus faecalis</td>
<td>Prevotella spp.</td>
<td>-</td>
<td>-</td>
<td>Cholecystitis</td>
<td>Cirrhosis, ascites</td>
</tr>
<tr>
<td>Proteus mirabilis</td>
<td>Pseudomonas aeruginosa</td>
<td>-</td>
<td>-</td>
<td>Urinary tract infection</td>
<td>Colorectal cancer with digestive occlusion</td>
</tr>
<tr>
<td>Escherichia coli, Enterococcus faecalis</td>
<td>Pseudomonas aeruginosa</td>
<td>-</td>
<td>-</td>
<td>Sigmoid diverticulitis</td>
<td>Peritonitis</td>
</tr>
<tr>
<td>Morganella morganii, Eubacterium spp.</td>
<td>Parabacteroides sp.</td>
<td>-</td>
<td>-</td>
<td>Colorectal cancer</td>
<td>Colorectal cancer</td>
</tr>
<tr>
<td>Bacteroides sp.</td>
<td>Anaerobic Gram-positive, Bacillus spp.</td>
<td>-</td>
<td>-</td>
<td>Eudiatal catheter with abdominal reservoir</td>
<td></td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>-</td>
<td>Bacteroides fragilis</td>
<td>-</td>
<td>Acute cholangitis</td>
<td>Peritonitis</td>
</tr>
<tr>
<td>Campylobacter freundii, Streptococcus milleri</td>
<td>-</td>
<td>-</td>
<td>Klebsiella pneumoniae</td>
<td>Acute cholangitis</td>
<td>Peritonitis</td>
</tr>
</tbody>
</table>

**FIG. 4.** Comparison of the technique of unique blood cultures (UBC) with that of multiple blood cultures (MBC) for patients with contaminations (white bars) and missed pathogens (black bars).
There are limitations to our study. The patients enrolled in the study presented to the emergency department mostly with community-acquired infections. We have not evaluated the UBC strategy for patients with hospital-acquired infections. Further studies are needed, in particular for candidemia, which have low organism density in blood [27]. Another point is that drawing of multiple sets helps to distinguish a contaminated BC related to skin contaminants from ‘true’ bacteraemia. In our study most of the contaminants were isolated in one or two bottles of the four of the UBC set, in accordance with a previous report [20]. Therefore, the clinical significance of putative contaminants should be evaluated according to the number of positive bottles in the UBC strategy instead of the number of BCs in the MBC strategy [28]. Further studies are needed to evaluate more precisely the number of positive bottles required for clinical significance.

The results of UBC for polymicrobial bacteraemia deserve some attention. Indeed, MBC allowed isolation of additional pathogens in six BCs vs. two with UBC. Although isolation of additional anaerobic bacteria had no significant therapeutic impact in our study, the MBC strategy might keep some interest in intra-abdominal infections.

In conclusion, it is crucial to consider the complete picture regarding both collecting BCs using best practice by taking the optimum volume of blood and decreasing costs induced by contaminations and multisampling. The UBC strategy offers an interesting alternative to MBC that should be considered for most patients, except for immunocompromised patients with suspicion of candidaemia.

Acknowledgements

We are grateful for the outstanding contribution of the emergency departments’ staff. These results were presented, in part, at the 24th European Congress of Clinical Microbiology and Infectious Diseases, Barcelona, Spain, 2014.

Funding

This work was supported by Programme Hospitalier Régional de Recherche Clinique of the French Ministry of Health (grant RCB 2010-A00720-39).

Transparency Declaration

The authors declare no conflicts of interest.

Supporting Information

Additional Supporting Information may be found in the online version of this article:

Figure S1. Collection of blood cultures (BCs).

Appendix S1. English translation of the document used for evaluation of clinical significance of a potential contaminant.

Appendix S2. Cost savings generated by the unique blood culture (UBC) method.

References


