BACTEC blood culture collection for medical staff overview

Key messages: <u>Safety</u> <u>Asepsis</u> (reduce contam'n) <u>Sensitivity</u> (correct volume)

1. Background

Provide information about the new system (take two BACTEC bottles for demonstration and hand them around the room):

- BACTEC bottle contains a very sensitive culture media that can provide rapid indication of growth (< 12 hrs for GNR, 10-18hrs for GPC and 2-3 days for yeast (candida)
- More rapid and sensitive than existing in-house media- we expect at least 10% of well collected cultures to grow a significant pathogen (depends on what sort of patient is being sampled)
- Each bottle accommodates up to 10mLs of blood ; small volumes also work well (although eventually special pediatric bottles will be available for infants)
- The advantage is lost if cultures are not collected with aseptic care as contamination rates will be too high. Aim is to keep contamination to be < 3 %.
- Sensitivity of bloodstream infection detection in adults is highly volume dependent – 10mL minimum sample; 20mL better (i.e. two venepunctures of 10mL), 40mL optimal. Less of an issue with children – in general they have a higher concentration of bacteria during sepsis.
- Aerobic and anaerobic bottles will isolate most GNR and *staphylococci* and either can be used for a single bottle adult collection. Aerobic bottle is preferred for children. Eventually with the availability of 20mL syringes, the standard adult collection will change to 20mL.

2. Laboratory process

Once the sample is collected, the bottle(s) should be taken to the lab. without delay so that they can be placed in the BACTEC machine for incubation, agitation and automatic monitoring. CO2 production in the broth due to bacterial or fungal growth leads to a colour change in the disc on the bottom of the bottom which then triggers a signal to the lab. staff.

The bottle is removed and a Gram stain microscopy slide is prepared. The broth is subcultured on to agar media for further incubation. The following day, colonies are subcultured again onto the antibiotic susceptibility testing agar together with antibiotic containing discs. On day 3, the zone sizes around the discs are measured. A measured zone size that is greater than the breakpoint value indicates susceptibility. The lab. has in place a rigorous quality control system to make sure that the testing is reliable.

The Gram stain (see below) gives an initial indication of the type of growth (Gram positive coccus (GPC), Gram positive rod (GPR), Gram negative rod (GNR), Gram negative coccus, Yeast). GPC resembling staphylococci have a coagulase test done which determines whether *Staphylococcus aureus* is present (coag positive). GPC resembling *streptococcus* have a rapid direct test for the pneumococcal antigen – a positive result indicates pneumococcal (*Strep. pneumoniae*) infection; a negative result indicates some other species of *streptococcus* or *enterococcus*. GPR generally indicates contamination (a *Bacillus* or *Corynebacterium* species usually). GNR indicates Gram negative sepsis- contamination is unusual. GNC may either be significant (e.g. *Neisseria meningitidis)* or contaminant (e.g. *Moraxella* species).

3. Clinician notification

For initial results such as GNR, GNC, GPC (Strep)- pneumococcus or not, GPC (Staph) with *S. aureus* confirmed by coagulase and yeast are notified directly to the ward or clinician by the pathology registrar (working days) or by the duty scientific officer (after hours). Clinician notification can only occur if a legible name and number of the person are provided on the request form! The path registrar is to

receive continuous microbiology and infectious diseases backup from Australian experts via a WHATSAPP group. New isolates are also notified to the PMGH infection control service.

The pathology registrar in microbiology will be providing regular feedback to each clinical handover meeting concerning recent blood culture usage, contamination rates and significant isolate types.

Timely availability of robust data on the incidence of bloodstream infection and the susceptibility of pathogens that are isolated, separated by community versus hospital onset events, will enable:

- Adjustment of therapy in the individual patient – change to an antibiotic that is demonstrated to cover the pathogen that has been detected
- Re-design of local empirical treatment guidelines for sepsis so that the agents used provide action against the expected range of pathogen
- A starting point for antimicrobial stewardship (AMS) efforts – AMS is a process which aims to promote optimal treatment of patients with infection and avoidance of antibiotic use in patients who are unlikely to have significant bacterial infection. Reducing unnecessary use can lead to very significant reduction in patients who acquire multi-resistant infections in hospital.

The lab. produces an annual cumulative antibiogram- a document that analyses collective antimicrobial susceptibility results for major pathogens. The 2018 document will be tabled soon at the Infection Control committee and shared with clinicians.

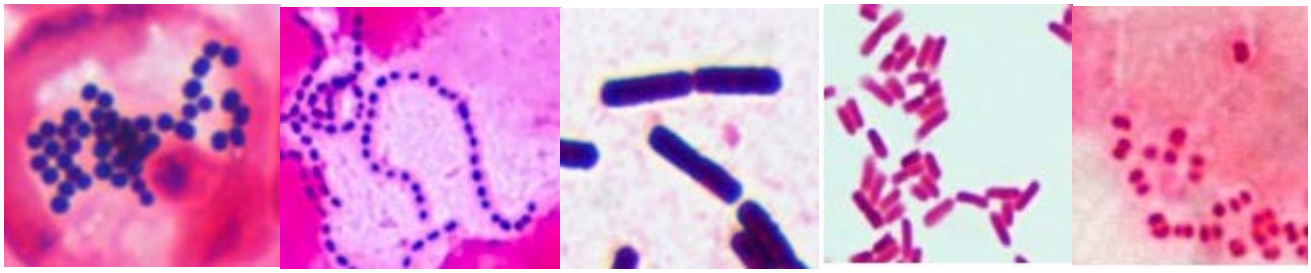
4. Indications for blood culture

Each unit needs to consider and document what are its accepted indications for blood culture- the PMGH pathologists can assist with this determination. A correctly timed and collected blood culture will often provide more valuable information that culture of wounds, sputum or urine.

Patients who require admission for syndromes where severe sepsis is part of the differential should be cultured on admission. Admitted patients who develop hospital onset sepsis are another group to consider- in that case, early removal / replacement of IV lines and other devices is critical.

Indicative Gram stain appearances of bacteria

GBC (Staph.) **GPC (Strep)** **GPR** **GNR** **GNC**



5. Blood culture collection training

- Handout the collection instruction sheet
- Sequentially go through the process, demonstrating as you go; keep to the sequence; stress these key messages – correct patient ID process, request form completeness and sample labeling, asepsis, volume of collection, safety measures and timely transport (< 2 hours delay)
- Repeatedly invite questions or clarifications along the way
- Provide a copy of this handout at the end
- Arrange for follow-up visit back to this clinical group to further discuss implementation issues and results to date (usage, contamination and significance)