Blood Cultures

Why?
- Bacteria or other microorganism overcome the normal host’s defense system and cause infection
- Microorganisms can enter the blood stream
  - Via lymphatics or from extravascular sites
  - Quickly disseminate throughout the body
  - Cause severe and life threatening disease
    - Rapid diagnosis key to survival

Blood Cultures

- Bacteremia
  - Presence of viable bacteria in the blood
    - Can be transient but is more frequently associated with serious infections
  - Growth in blood culture bottles may or may not represent infection
    - False positive due to contamination of blood samples during collection procedure (normal skin flora)
    - No antimicrobial therapy needed in those cases

Blood Cultures

- Purpose of Blood Cultures is the diagnosis of:
  - Bacteremia/Fungemia
  - Fever of Unknown Origin (FUO)
  - Acute sepsis
  - Subacute bacterial endocarditis
  - Osteomyelitis, meningitis, pneumonia, or pyelonephritis
  - Other infections

Blood Cultures

- Definitions
  - Systemic inflammatory response syndrome (SIRS)
    - Inflammatory state affecting the whole body
    - Can be caused by infectious or non-infectious state
    - When infectious, it can be a severe condition ranging from sepsis to severe sepsis to septic shock

Blood Cultures

- Definitions
  - Bacteremia
    - Presence of viable bacteria in the blood
  - Septicemia
    - Bacteremia with clinical presentation of physical signs and symptoms of bacterial invasion and toxin production
  - Sepsis
    - Infection with systemic inflammatory response
  - Severe Sepsis
    - Sepsis with organ dysfunction, hypotension
  - Septic Shock
    - Sepsis accompanied by refractory hypotension
Blood Cultures

- Definitions
  - Blood culture set
    - One aerobic and one anaerobic bottle collected from the same venipuncture site at the same time and date

Blood Cultures

Blood cultures are one of the most important specimens submitted to the Microbiology Laboratory for examination!

- Severe and life threatening disease may occur
  - Meningitis, sepsis, septic shock

Blood Cultures

- Indications for drawing blood cultures include:
  - Abrupt onset of chills, fever or hypothermia
  - Hypotension
  - Profuse sweating
  - Abnormal rapid breathing
  - Delirium, stupor or agitation
  - Nausea and vomiting
  - Acute renal failure

Blood Cultures

- Laboratory indications for drawing blood cultures include:
  - Leukocytosis - especially with a left shift
  - Leukopenia or Thrombocytopenia
  - Lactic acidosis
  - Hypoglycemia or hyperglycemia
  - Abnormal liver functions
  - Coagulopathy/DIC
  - Elevations in C-reactive protein, haptoglobin or fibrinogen

Blood Cultures

- Indications for drawing blood cultures include:
  - Suspected meningitis
  - Suspected pneumonia
  - Fever associated with a heart murmur (suspected endocarditis)
  - Typhoid fever
  - Brucellosis

Biomarkers for Diagnosis of Sepsis

- Biomarker: measured characteristic that indicates a normal biologic or pathogenic process, or pharmacologic response to therapy.
- Goal: differentiate sepsis from any other SIRS
- Commonly used biomarkers:
  - Lactate
  - Procalcitonin
  - C-reactive protein
  - D-dimer
- Biomarkers are often used in conjunction with each other to predict sepsis
**Procalcitonin**
- Procalcitonin: a peptide released in response to proinflammatory stimuli
- Goal: help diagnose those with systemic bacterial infection
  - Currently used for sepsis and pneumonia
- Interpretation of results/levels of procalcitonin:
  - Low: low probability of bacterial sepsis
  - Moderate: possible early infection or non-infectious condition
  - High: high probability of bacterial sepsis (and patient may progress to severe sepsis or septic shock)
  - Decreasing: response to therapy
- May also be used for antimicrobial management (when levels decrease to specific levels can discontinue antimicrobial therapy)

**Blood Cultures**
- Normal Flora
  - There is no normal flora in the blood
  - Sterile body site
  - If bacteria is in the blood there must be a source/body site of infection
  - Treatment of bacteremia/fungemia/sepsis must include discovery of the source of infection

**References:**