Saint Luke's Regional Laboratories
Clinical Laboratory Letter

May 2014

Lightning Fast Identification of Bacteria in Blood Cultures

Saint Luke's Microbiology has used PNA FISH for identification of select Gram-positive and Gram-negative blood culture isolates since 2009. This technology allowed for differentiation of staphylococci, common enteric organisms and Pseudomonas within a few hours of a positive blood culture. A drawback to this testing was the labor-intense procedure, which necessitated batch testing, therefore limiting availability on all shifts and during times of short-staffing. Additionally, many isolates that were not recognized by PNA FISH still required one to two days for conventional identification and susceptibility testing.

Effective this month, Microbiology will adopt a new multiplex PCR/array for blood cultures that will provide identification of most isolates about an hour after the culture becomes positive. Physicians will see PCR/array results on positive blood culture reports in addition to the Gram stain. The PCR/array technology greatly expands the database of immediately identifiable organisms. Gram positive organisms identified in addition to staphylococci will now include streptococci, Enterococcus, and Listeria. Gram-negative organisms identified in addition to E. coli, Klebsiella and Pseudomonas include Serratia, Proteus, Acinetobacter, Haemophilus, and *Neisseria meningitidis*. Five species of Candida are distinguished as well. Notably, although full susceptibility testing of blood isolates will still be necessary, key resistance genes including *mecA* (distinguishes MRSA vs. MSSA), *van A/B* (vancomycin-resistant enterococcus), and *blaKPC* (carbapenemase-resistant enterobacteriaceae) are detected, which will aid in targeting appropriate antimicrobial therapy and initiating isolation precautions sooner.

Microbiology processed 26,505 aerobic and anaerobic blood cultures in 2013. There were 2143 positive blood cultures, of which the majority (69%) were gram-positive aerobes. A breakdown of the most common isolates is as follows:

Organism	# Isolates (%)
Coagulase-negative staphylococci	529 (25%)
S. aureus, methicillin-resistant	186 (9%)
S. aureus, methicillin-sensitive	190 (9%)
E. coli	261 (12%)
Viridans streptococci	117
Streptococcus pneumoniae	88
Enterococcus species, non-VRE	72
Enterococcus VRE	20
Klebsiella species	70
Streptococcus agalactiae	40
Pseudomonas aeruginosa	49
Proteus, Enterobacter, & Serratia	64

The immediate availability of bacterial identification, combined with institutional antibiogram data, will allow physicians to practice more judicious antimicrobial therapy. Hospital specific antibiograms are readily available under the Clin Ref tab in the banner at the top of EPIC Hyperspace.

Urine Specimen Collection Devices

Improper transport of urine specimens impacts quality of results for both urinalysis and urine culture. Prolonged length of time between specimen collection and analysis can result in false-positive urine nitrites and false-negative glucoses. Likewise, bacterial overgrowth in non-preserved, non-refrigerated specimens leads to false-positive or contaminated urine culture results. Three years ago, Saint Luke's Regional Laboratories introduced a closed urine transport system with integrated transfer tubes containing preservative. This system decreases potential for bacterial contamination and allows for urine culture set-up up to 48 hours after collection and urinalysis up to 72 hours after collection. All urine specimens collected with this system include a preservative tube that can be used for add-on urine culture orders. The collection device should be used for both inpatients and outpatients. This

summer, the laboratory will begin rejecting urine specimens that are not submitted in the proper transport tubes.

Tick Time

Ticks are hematophagic ectoparasites that appear to serve no purpose on earth other than perpetuation of the infectious agents they carry. They are vectors for dissemination of several potentially debilitating or lethal infectious diseases afflicting both humans and canines. Although there are hundreds of tick species world-wide, only 3 are commonly known transmitters of human disease in Missouri & Kansas.

American dog ticks (*Dermacentor variabilis*), also known as wood ticks, are widely distributed east of the Rocky Mountains and are the most common species responsible for transmission of Rocky Mountain Spotted Fever (RMSF), caused by *Rickettsia rickettsii.* They are also a vector for tularemia, due to carriage of *Franscisella tularensis.* The diagnosis of RMSF is confirmed by antibody testing, detectable 7-10 days after onset of illness. Tularemia can be diagnosed serologically, or through isolation of the organism from blood or tissue, e.g. lymph node. Please note that if tularemia is suspected, Microbiology should be notified at the time cultures are submitted due to necessity of additional protective precautions for personnel.

The lone star tick (*Amblyomma americanum*), found in the southeast and eastern U.S., also transmits tularemia, as well as human Ehrlichiosis caused by *Ehrlichia chaffeensis* and *Ehrlichia ewingii.* Ehrlichiosis antibodies are usually detectable 7-10 days after onset of illness, and blood PCR is also available that detects organisms within the first week of infection.

The blacklegged tick (*Ixodes scapularis*), more commonly known as the deer tick, is found in the northeast and upper Midwestern U.S. and is the notorious vector of Lyme disease as well as babesiosis and anaplasmosis. A combination of IgM and IgG antibody, followed by Western blot confirmation is the suggested diagnostic procedure for Lyme, however serologic testing is insensitive during the first few weeks of infection. Anaplasmosis is diagnosed by antibody testing, usually done in combination with Ehrlichiosis serology, since the symptoms are similar. Babesiosis is best diagnosed by blood PCR, although organisms may be visible on a peripheral blood smear.

Finally, the brown dog tick, although widely distributed throughout the U.S. presently is only known to transmit RMSF to humans in the southwest United States. However, it is the vector of canine ehrlichiosis nationwide.

A wealth of information on diagnosis, treatment, and prevention of tick-borne diseases is available at the CDC's website (cdc.gov), including excellent photographs of various tick species. In general, submission of ticks to Microbiology for identification is non-productive, since carriage of a particular disease agent by the tick cannot be verified.

IgG4 Related Disease

Immunoglobulin G (IgG) is comprised of 4 subclasses designated IgG1 through IgG4. Approximately 65% of the total IgG is IgG1, 25% is IgG2, 6% is IgG3, and 4% is IgG4.

IgG4 related disease is a syndrome of unknown etiology most often occurring in middle-aged and older men. Two major presentations are type 1 autoimmune pancreatitis and sclerosing sialadenitis. Many other previously described diseases are now considered to be IgG4 related including inflammatory orbital psuedotumor, sclerosing cholangitis, chronic sclerosing aortitis, Riedel thyroiditis, IgG4 related interstitial pneumonitis, retroperitoneal fibrosis, IgG4 related hypophysitis, IgG4 related pachymeningitis and IgG4 related tubulointerstitial nephritis. Each of these entities is characterized by tumorlike swelling of the involved organs due to infiltration of IgG4 positive plasma cells and T lymphocytes with accompanying fibrosis. Serum concentrations of IgG4 are elevated in 60% to 70% of patients.

Elevated levels of IgG4 are consistent with, but not diagnostic of, IgG4-related disease. Definitive diagnosis of IgG4-related disease requires tissue biopsy of the affected organ. IgG4 quantitation should be ordered as IgG subclasses. Reference range is age dependent. Specimen is a red top tube of blood.