Division of LGM Laboratory & Genomic Medicine

BARNES-JEWISH Hospital BJC HealthCare
Washington University in St. Louis Physicians
NATIONAL LEADERS IN MEDICINE

Newsletter

January, 2015 • Volume 1, Issue 3

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New Laboratory Established for Laboratory Monitoring of Patients with Emerging Infectious Diseases

The Ebola outbreak in West Africa this past year brought infected individuals to the United States for treatment. This, combined with stories in the popular press of healthcare workers returning from endemic areas, lead to the need for many U.S. medical centers to assess their ability to deal with emerging infectious diseases. In response to this need, BJH has created a "Restricted Access Lab" to perform point-of care laboratory testing on patients with potentially highly infectious diseases. Laboratory workers trained to perform this testing use the appropriate personal protective equipment to complete this work. This laboratory provides a limited menu of tests including complete metabolic panel (CMP), complete blood count (CBC) with 5 part differential, activated Partial Thromboplastin Time (aPTT), and International Normalized Ratio (PT/INR), blood cultures, and blood parasite analysis (i.e. malaria testing). The laboratory is a joint effort between BJH and SLCH medical directors, managers, and technologists with on call volunteer staffing from both hospitals.

A team from the Missouri Department of Health and Senior Services inspected the Restricted Access Lab on January 7, 2015. The inspectors were impressed by the laboratory's high security, appropriate test menu, and policies and procedures.

The Laboratory and Genomic Medicine faculty are also laboratory directors for healthcare facilities on other campuses?

Since April 2013, LGM faculty has directed the clinical laboratory at St. Louis Shriner's Hospital, currently located on Lindbergh Blvd in Town and Country. In April 2015, Shriner's will move to a new hospital located on Clayton Avenue, east of the medical center. South Siteman Cancer center began providing outpatient chemotherapy and radiation therapy care to patients two years ago, with a BJH clinical laboratory directed by LGM faculty. Rapid growth in patient visits and treatment plans combined with plans to build a second building for outpatient surgeries and subspecialty clinics supported an enlargement of the onsite laboratory to accommodate an automated chemistry analyzer and a more advanced hematology analyzer which were installed and verified in December 2014, and ready for patient testing in January 2015.

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Rapid Identification of Gram-Positive Pathogens and Antimicrobial Resistance Determinants in Blood Cultures

Detection of blood stream infections is an important function of the clinical microbiology laboratory. Administration of optimal anti-infective therapy as quickly as possible is essential for patients with bacteremia and/or sepsis, and it has been demonstrated that in critically ill patients, there is a 7.6% mean decrease in survival for every hour that effective antimicrobial therapy is delayed (Kumar et al. Crit Care Med. 2006. 34: 1589-1596).

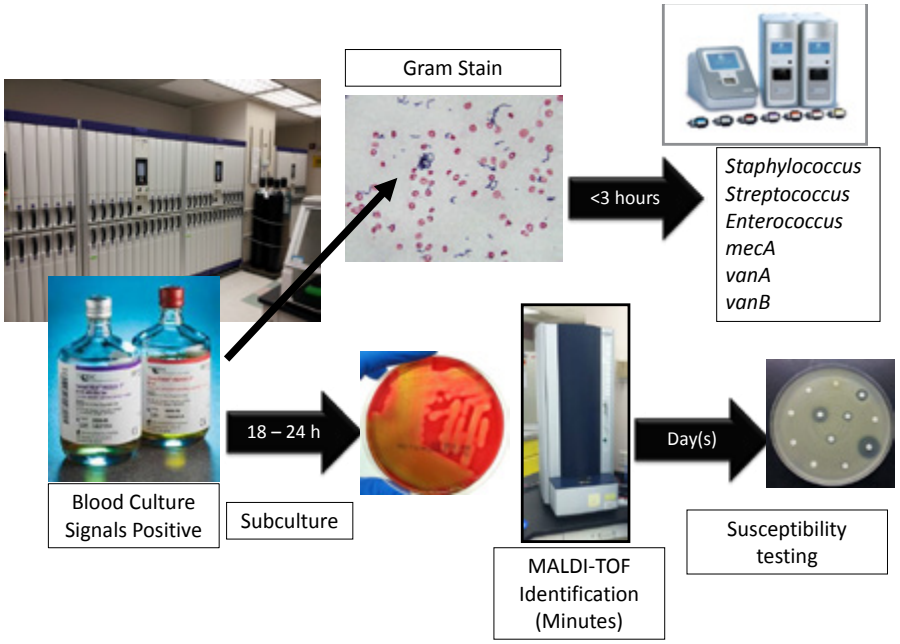
Blood cultures are used to detect pathogens in the blood. Blood is placed into blood culture broth (at BJH, using the VersaTREK system), which is then placed in an automated incubator. The incubator queries the bottles at regular intervals for evidence of bacterial growth. Once the instrument signals positive, the laboratory will Gram-stain the broth and subculture it. Gram-stain results are rapid and the result is called to the provider within 1 hour. Subculture for traditional identification and susceptibility testing is then performed, which takes days to complete.

The Clinical Microbiology laboratory is now performing a method (the Nanosphere Gram Positive Blood Culture assay) to expedite the identification of Gram positive pathogens such as Staphylococci and Enterococci, as well as detect specific mechanisms of resistance, such as mecA (the gene conferring methicillin-resistance in Staphylococci). This is a microarray that detects nucleic acids extracted from the blood culture broth. This assay demonstrates excellent sensitivity and specificity in large clinical trials and in our own experience with this test.

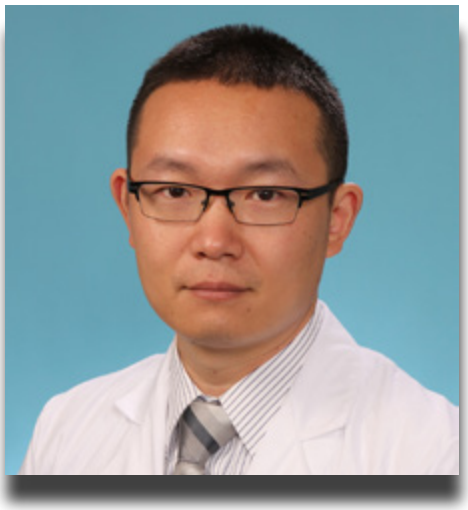
The Nanosphere blood culture assay is performed on blood cultures with Gram-positive cocci, and takes less than 3 hours. The results of this test are conveyed by telephone as soon as they are complete.

Species Level Identifications	Genus Level Identifications	Resistance Markers
Staphylococcus aureus *Staphylococcus epidermidis* *Staphylococcus lugdunensis* *Streptococcus anginosus group* *Streptococcus agalactiae* *Streptococcus pneumoniae* *Streptococcus pyogenes* *Enterococcus faecalis* *Enterococcus faecium*	*Staphylococcus* spp. *Streptococcus* spp. *Listeria* spp.	*mecA* (For methicillin resistance in *Staphylcoccus aureus* and *Staphylcoccus epidermidis*) *vanA and vanB* (For vancomycin resistance in Enterococci)

Table. Pathogens and resistence determinants detected by the Nanosphere Assay



Featured Colleague



Chang Liu, M.D., Ph.D.

Dr. Liu joined the Faculty July 2014 as Assistant Medical Director of the Blood Bank. He completed his residency and fellowship at Washington University/Barnes-Jewish Hospital, and is board certified in Clinical Pathology and Blood Banking and Transfusion Medicine. During his training, he performed clinical studies in several areas of Transfusion Medicine, including the platelet recovery rate as a prognostic factor for TTP patients receiving therapeutic plasma exchange, the laboratory features and natural history of antibody of undetermined specificity, the utility of peripheral lymphocyte count as a surrogate to track the cellular dose of photopheresis, and the sterility testing of stem cell products by the VersaTREK system. In the area of histocompatibility and immunogenetics, Dr. Liu evaluated the cutoff values for the single-antigen assay for antibodies to HLA, and established a bioinformatics program to perform high-resolution HLA typing using next-generation exome-sequencing data. Dr. Liu will focus his effort in the immunohematology area of the Blood Bank, to improve the automation and standardization of pretransfusion testing. He is also working on high-throughput HLA typing using next-generation sequencing to benefit the transplant patients. We welcome Dr. Liu to the Division of LGM!

BJH Laboratories are Moving!

The BJH Chemistry, Hematology, Flow cytometry, and Serology/Immunology laboratories are going to be combined into a single state-of-the art central laboratory. The new laboratory will be centrally located on the medical center campus, occupying the north half of the 4th floor of the BJC Institute of Health (IOH) building. Currently the space is under construction (see photo). The blood bank will move to the west end of the 4th floor, and laboratory medicine administrative, resident, and faculty offices will move to the east area. Moving is slated to start in the fall of 2015. The Microbiology laboratory will move to the north end of the 5th floor of the IOH in early 2016. The Central laboratory will receive all clinical samples, primarily via an upgraded pneumatic tube system connected to south campus Emergency Department and ICUs, St. Louis Children's Hospital, and North Campus patient areas, currently under construction.

Installation of advanced automated lines and instruments for chemistry, hematology, and microbiology will enhance processing and performance of many tests while also providing space and resources to handle small volume and other unique specimens. Future Laboratory Newsletter issues will highlight specific features of the new laboratories and will address questions solicited from clinical services.

Why Add-On Test Requests for HIV Are a Problem

In the last issue we announced the implementation of the 4th generation HIV I/II Combo test which tests for the HIV antibodies and the p24 antigen. BJH now follows the current CDC HIV testing guidelines with an initial screen using an HIV Antigen/Antibody test, and positive samples are confirmed with an assay to differentiate HIV I/II and a viral load assay for HIV-1 RNA. This new testing algorithm requires one 7 or 10 mL purple top (EDTA) tube which is sufficient to perform all three assays.

The HIV-1 viral load assay requires a minimum 1.2 mL of EDTA plasma that has been separated from the cells within 6 hours of collection. Separating plasma from cellular blood components is critical for accurate HIV-1 RNA testing since the concentration of virus is higher in the cells than in the plasma. Over time the virus can leak out of the cells and will falsely increase the viral load.

For this reason, adding on HIV testing to a specimen already in the lab is not appropriate and a new specimen should always be obtained.

If you are a physician, we are interested in how many of your medical decisions are based on laboratory testing. If you did not previously respond to this survey, please go to
https://www.surveymonkey.com/s/NHPVHLD
and answer two short questions.
We will share our data in a future newsletter. Thank you!