Nebraska Public Health Laboratory Newsletter

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NPHL Updates

By Peter C. Iwen, PhD, D(ABMM), Associate Director, NPHL

With summer coming to a close, the NPHL is working with both the CDC and the Office of Epidemiology at the NE DHHS to assemble a plan for administration of the Influenza Surveillance Program. Details of this will become available as the influenza season approaches.

Highlighted in this newsletter are two articles condensed from recent recommendations for the clinical laboratory. Dr. Jerry Capraro provides an update on the CDC recommendations for the laboratories role in the prevention of perinatal group B streptococcal disease. Additionally, Karen Stiles, the State Training Coordinator for the NPHL provides guidance on the new DOT regulations to ship both Category A and Category B isolates to the NPHL. Karen will be sponsoring a statewide Telehealth broadcast this fall to discuss this topic further.

The unprecedented flooding of the Missouri River has impacted all of us. Since disease outbreaks have historically been associated with widespread flooding, Tony Sambol provides insight on what requests laboratorians might expect during this time. Fortunately, no major disease outbreaks have been identified in testing at the NPHL but we continue to stay vigilant.

Dana El-Hajjar, clinical chemist, presents an article to highlight activities associated with the Chemistry Section of the NPHL. Our state is fortunate to have the equipment and knowledgeable personnel to perform the high-level of chemical testing as described. Individuals in the Chemistry Section are always interested to expand testing and welcome the opportunity to discuss this further.

Finally, please welcome Dr. Amity Roberts as the newest member of our team. Amity recently graduated from Wake Forest University in Winston-Salem, NC and is participating in the UNMC post-doctoral clinical microbiology fellowship training program. For additional information about this program refer to the UNMC Department of Pathology and Microbiology Fellowship Program website at http://www.unmc.edu/pathology/fellowship_programs.htm.

INSIDE THIS ISSUE:

Updated Recommendations for the Prevention of Perinatal Group B Streptococcal Disease

By Gerald A. Capraro, PhD, Clinical Microbiology Fellow

Since the early 1990's, group B streptococcal disease has been the leading cause of early-onset neonatal sepsis in the United States. In November 2010, the CDC, in collaboration with the American College of Obstetricians and Gynecologists, the American Academy of Pediatrics, the American College of Nurse-Midwives, the American Academy of Family Physicians, and the American Society for Microbiology, published updated guidelines for the prevention of perinatal infection (1). This article summarizes those recommendations.

Microbiology and Clinical Significance

Group B *Streptococcus* (GBS), or *Streptococcus agalactiae*, is a Gram-positive coccus that contains cell wall antigens that react with the Lancefield agglutination group B reagent. *S. agalactiae* can cause a number of severe infections, including invasive disease particularly in infants, pregnant/postpartum women, and the elderly (2). Early-onset disease occurs following infection of a newborn during the first week of life. Late-onset disease occurs in infants following the first week of life and up to approximately three months of age. Early-onset disease is characterized by respiratory distress, apnea, sepsis and pneumonia within the first 24 – 48 h, and can frequently lead to meningitis. The mortality rate is 2 – 3% for full-term infants and 20 – 30% for preterm infants (< 33 weeks gestation). Transmission of the organism to the newborn from a colonized mother can occur either by ascension of the organism from the vagina to the amniotic fluid following membrane rupture or via direct infection of the newborn during passage through the birth canal (3). In the case of the former, the organism can be aspirated into the fetal lung, which leads to bacteremia and the development of early-onset disease.

As the primary risk factor for invasive early-onset GBS disease is maternal colonization during pregnancy, universal screening of pregnant women at 35 – 37 weeks gestation is recommended with antibiotic prophylaxis initiated when indicated. Screening involves collection of a swab from the lower vagina and the rectum, and inoculation into an enrichment broth and onto blood agar media. *S. agalactiae* generally grows as a large gray colony with a narrow zone of beta-hemolysis (although nonhemolytic isolates have been reported). Identification is achieved via routine latex agglutination or molecular-based testing. GBS is predictably susceptible to penicillin and other beta-lactam antibiotics; however, antibiotic susceptibility testing is warranted for isolates derived from patients with a penicillin allergy.

Specific 2010 Updates to the Recommendations

Laboratory methods for the identification of GBS

Properly collected and transported specimens should be inoculated into an enrichment broth to enhance recovery of GBS. Examples of this media include Todd Hewitt broth supplemented with gentamicin and nalidixic acid (TransVag broth) or with colistin and nalidixic acid (Lim broth). Enrichment broth that utilizes a chromogenic pigment for the detection of beta-hemolytic GBS (e.g., StrepB Carrot broth and Granada Biphasic broth) can also be inoculated. Following 18 – 24 h incubation, the broth is subcultured onto blood agar medium to detect beta-hemolytic colonies characteristic of GBS. Alternatively, GBS can be detected directly from the enrichment broth using molecular tests such as PCR.

GBS detected in the urine of pregnant women

Routine screening for asymptomatic bacteriuria is recommended for pregnant women. Laboratories should screen urine culture specimens for GBS at concentrations of $\geq 10^4$ colony forming units per milliliter and identify GBS when present at this concentration in pure culture or when mixed with a second organism.

Algorithm for GBS screening and intrapartum chemoprophylaxis for women with preterm labor or with preterm premature rupture of membranes

Women presenting with signs and symptoms of preterm labor or with rupture of amniotic membranes at < 37 weeks gestation should be screened for GBS colonization on admission unless a screen was performed within the preceding 5 weeks. If the GBS colonization status of the woman is positive or unknown on admission, intrapartum antibiotic prophylaxis should be initiated. For women without premature rupture of the membranes, prophylaxis should be discontinued if it is determined that true labor has not begun or if the GBS screen is negative. This is a key change from the 2002 guidelines. For women with premature membrane rupture, prophylaxis should be continued per standard of care. At any point prior to 37 weeks gestation, if the GBS status of the woman is positive or unknown, prophylaxis should be initiated or continued (for preterm membrane rupture) at the onset of true labor. If the woman reaches 35 weeks gestation and has not yet delivered, the vaginal-rectal screen culture should be performed, and intrapartum antibiotic prophylaxis initiated as indicated (**Table 1**).

Change in the recommended dose of penicillin-G for chemoprophylaxis

Penicillin remains the drug of choice for intrapartum antibiotic prophylaxis, with ampicillin an acceptable alternative (4). The new recommended dose of penicillin-G is 5 million units IV initially, followed by 2.5 – 3 million units every 4 h until delivery. For ampicillin, 2 g IV initial dose followed by 1 g IV every 4 h until delivery is the recommended dosing regimen.

Updated prophylaxis regimens for women with penicillin allergy

Penicillin-allergic women with no history of anaphylaxis following penicillin administration should be given cefazolin (2 g IV initial dose, with 1 g IV every 8 h until delivery). Antibiotic susceptibility testing should be performed on all GBS isolates derived from penicillin-allergic women who have a history of anaphylaxis following penicillin administration. To ensure appropriate testing of the isolate, clinicians must communicate the penicillin allergy of their patient to the laboratory. Clindamycin (900 mg IV every 8 h until delivery) is the recommended regimen for treatment of GBS found to be susceptible to clindamycin and erythromycin (including a test for inducible resistance to clindamycin). If the isolate is resistant to clindamycin, or if the susceptibility results are not available, vancomycin (1 g IV every 12 h until delivery) should be used for treatment.

Algorithm for management of newborns at risk for early-onset GBS disease

The algorithm for detection of sepsis now applies to all newborns. At any point in the algorithm if signs of sepsis develop, a full diagnostic evaluation (including complete blood count with white blood cell differential and platelet count, chest radiograph, and lumbar puncture) should be performed on the newborn. Appropriate antibiotic therapy should be initiated, which should cover the most common causes of neonatal sepsis (including GBS, *E. coli*, and other Gram negative pathogens). If there are no signs of neonatal sepsis but there is evidence of maternal choriamnionitis, a limited evaluation (including blood culture and complete blood count with differential and platelet count) should be performed on the newborn at birth and at 6 – 12 hours of life and antibiotic therapy should be initiated. Well appearing newborns of any age whose mothers had no indication for GBS prophylaxis or whose mothers received appropriate intrapartum antibiotic prophylaxis should simply be observed with no routine diagnostic testing recommended. Well appearing newborns of < 37 weeks gestational age or those for whom the duration of membrane rupture prior to delivery was ≥ 18 hours should undergo a limited evaluation with observation for 48 hours.

Conclusion

Universal screening for maternal GBS colonization has significantly decreased the rate of early-onset invasive GBS disease in the United States. However, over the past 40 years, the rate of maternal colonization with GBS has remained relatively unchanged. Therefore, clinicians and laboratorians must continue their efforts to prevent GBS disease in newborns. This is especially important given that there is currently no FDA approved vaccine for GBS at this time. Diligent screening for GBS and the appropriate use of intrapartum antibiotic prophylaxis regimens are the guardians of early-onset GBS disease prevention.

References

1. Centers for Disease Control and Prevention. Prevention of perinatal group B streptococcal disease – revised guidelines from CDC, 2010. MMWR 2010: 59 (No. RR-10).
2. Phares, CR. *et al*. 2008. Epidemiology of invasive group B streptococcal disease in the United States, 1999 – 2005. JAMA 299: 2056 – 2065.
3. Desa, DJ. *et al*. 1984. Intrauterine infections with group B beta-hemolytic streptococci. Br J Obstet Gynaecol 91: 237 – 239.
4. Chen, KT. *et al*. 2005. No increase in rates of early-onset neonatal sepsis by antibiotic-resistant group B *Streptococcus* in the era of intrapartum antibiotic prophylaxis. Am J Obstet Gynecol 192: 1167 – 1171.

Table 1: The need for intrapartum antibiotic prophylaxis to prevent early-onset GBS disease (adapted from reference 1).

Intrapartum GBS prophylaxis indicated	Intrapartum GBS prophylaxis not indicated
Previous infant with invasive GBS disease	Colonization with GBS during a previous pregnancy (unless an indication for GBS prophylaxis is present for current pregnancy)
GBS bacteriuria during any trimester of the current pregnancy*	GBS bacteriuria during previous pregnancy (unless an indication for GBS prophylaxis is present for current pregnancy)
Positive GBS vaginal-rectal screening culture in late gestation+ during current pregnancy*	Negative vaginal-rectal GBS screening culture in late gestation during the current pregnancy, regardless of intrapartum risk factors
Unknown GBS status at the onset of labor (culture not done, incomplete, or results unknown) and any of the following: Delivery at < 37 weeks gestation Amniotic membrane rupture ≥ 18 hours Intrapartum temperature ≥ 38.0°C¶ Intrapartum NAAT± positive for GBS	Cesarean delivery performed before onset of labor on a woman with intact amniotic membranes, regardless of GBS colonization status or gestational age

*Intrapartum antibiotic prophylaxis is not indicated in this circumstance if a Cesarean delivery is performed before onset of labor on a woman with intact amniotic membranes.

+ Optimal timing for prenantal GBS screening is at 35 – 37 weeks gestation.

¶If amnionitis is suspected, broad-spectrum antibiotic therapy that includes an agent known to be active against GBS should replace GBS prophylaxis.

± Nucelic acid amplifaction test (NAAT) for GBS is optional and might not be available in all settings. If intrapartum NAAT is negative for GBS but any other intrapartum risk factor (delivery at < 37 weeks gestation, amniotic membrane rupture at ≥ 18 h, or temperature ≥ 38.0°C is present, then intrapartum antibiotic prophylaxis is indicated.

What's in the Water?

By Tony Sambol, MA SM(NRM), Assistant Director, NPHL

For the past several weeks the record flooding that has been occurring along the Missouri river has impacted on all of us. As public health personnel, we are certainly aware of the more common gastro-intestinal diseases that can occur when food comes into contact with contaminated water or if contaminated water is accidently swallowed. Avoidance of contaminated water is common knowledge to international vacationers especially when traveling in a third world country where sanitary conditions are questionable. Travelers are always advised, "Don't drink the water".

In the Midwest, flood waters may contain fecal waste from commercial operations (cattle, goat, chicken, turkey, or pig), wild animals, or sewage waste from municipal treatment plants. Waters could contain disease-causing viruses, parasites, fungi, or bacteria. Some bacterial diseases that might be seen are salmonellosis (*Salmonella* spp.), campylobacter enteritis (*Campylobacter* spp.), shigellosis (*Shigella dysenteriae*), and a variety of diseases caused by strains of *Escherichia coli*. Besides the bacterial diseases, the CDC and other sources list parasitic diseases including giardiasis (*Giardia lambia*) and cryptosporidiosis (*Cryptosporidium* spp.); fungal diseases such as histoplasmosis (*Histoplasma capsulatum*); and less-common bacterial diseases such anthrax (*Bacillus anthracis*), leptospirosis (*Leptospira* spp), tetanus (*Clostridium tetani*), and botulinum (*Clostridium botulinum*).

The CDC website (www.bt.cdc.gov/disasters/alldisasters.asp) provides a wealth of information about disease prevention during and after flooding has occurred. Individuals are encouraged to visit this website and update themselves on the diseases that may affect individuals working in contaminated waters in your area.

Nebraska Department of Health and Human Services (DHHS) has also posted a press release related to well water testing. "Even wells that don't appear to be flooded but are near flooded regions may need to be tested" according to Jack Daniel, administrator of the Office of Drinking Water and Environmental Health at DHHS. The link of this press release can be found at http://www.nema.ne.gov/pdf/jic-daily/june-21-2011-well.pdf.

Our NPHL Newsletter is going Electronic! If you would like to receive our e-newsletter, please e-mail Karen Stiles at kstiles@unmc.edu to subscribe.

Activities in the Chemistry Section of the NPHL

By Dana El-Hajjar, MBA, BS, Chemistry Technical Supervisor

This year celebrates the International Year of Chemistry and the many ways that chemistry is contributing to the welfare of humanity. This issue of the newsletter sheds light on how the NPHL Chemistry Section is contributing, albeit in a small way. This section has four core activities to include responding to an unknown terrorist or exposure incident, human lead testing, basic research, and coordination of Fourier Transform Infrared Spectroscopy (FTIR) and Raman Proficiency programs.

Since our inception in 2004, the Chemistry Section has expanded the testing for agents of chemical terrorism. The lab has received training from the CDC to test for the following agents in human samples by Mass Spectrometry : cyanide and volatile organic compounds, lead, cadmium and mercury in blood; abrine and ricinine toxins, tetramine (rat poison), organophosphate nerve agent metabolites, and a heavy metals panel (arsenic, selenium, barium, beryllium, antimony, cesium, tungsten, platinum, lead, uranium, thallium, molybdenum, cadmium, and cobalt) in urine. In the event of an exposure incident, laboratory personnel are on-call and available to test 24/7.

One public health activity that is of utmost importance to the residents of the State of Nebraska is lead testing. The eastern portion of the Omaha Metropolitan area was deemed a Lead Superfund Site by the EPA in 2003. Lead is still a major concern in children < 6 years old and has been linked to behavioral problems and learning disabilities. The NPHL tests approximately 10,000 children annually for lead using both the whole blood and blood spot methods. In addition, the Chemistry Section participates in several research projects as requested by clinicians and researchers at the University of Nebraska Medical Center.

The FTIR and Raman Proficiency programs were developed at NPHL in 2007 and have national and international participants. These devices are used to test for chemicals in unknown powder and liquid samples.

The Chemistry Section at NPHL strives to be on the forefront to protect the health and well being of the citizens of Nebraska.

For additional information about this section of the laboratory, contact Dana El-hajjar at delhajja@unmc.edu.

2011 NPHL Upcoming events:

Bioterrorism Preparedness Recognize, Rule out and Refer Workshop
Omaha, Sept 30
Scottsbluff, October 4
North Platte, October 7
Hastings, TBA
Norfolk, December 19

Nebraska Biological Challenge Set Exercise
October 31, 2011

Reportable Disease Requirements

By Karen Stiles MT(ASCP)SM

The updated State of Nebraska law on Reporting of Communicable Diseases, Title 173, requires all laboratories to submit specific organisms to the NPHL for possible future testing (see **Table 1**). The responsibility for the safe transport of these hazardous materials starts with the laboratory (the shipper) and compliance with hazardous materials regulations is mandatory. The shipper must be trained and certified to transport Division 6.2 Hazardous Materials. The send-out staff must be advised on what is offered for shipment for them to know how to package and ship appropriately. The proper classification of organisms required for transport is also important.

Table 1. Organisms submitted to NPHL

Category A	Category B
M. tuberculosis complex	*Bordetella pertussis*
Shiga-toxin producing *E. coli*	*Haemophilus influenza*
(both O157 and Non-O157)	*Listeria monocytogenes*
Shigella dysenteriae	
Isolate reasonably expected to be:	Neisseria *menigitidis*
Coccidioides immitis/posadasii	*Salmonella* spp.
Bacillus anthracis	*Shigella* spp.
Brucella spp.	(not *S. dysenteriae)*
Francisella tularensis	*Vibrio cholerae*
Yersinia pestis	
Burkholderia mallei/pseudomallei	

The Category A organisms pertain only to material that is intentionally propagated such as a culture or broth and does NOT include the original patient specimen. Please notify NPHL at (402) 888-5588 prior to sending suspected BT Agents.

Category A organisms require packaging labeled as "UN2814 Infectious substances, affecting humans" with a "Shipping Document" and "Emergency Response Information" attached to the outside of the box. These boxes must be segregated from courier coolers that contain all other patient specimens. Category B organisms require packaging labeled as "UN3373 Biological substances, Category B" and should NOT be labeled as "Diagnostic Specimens". Both category A and B must be triple packaged with the primary container supplied by your laboratory. This can include a culture plate or broth tube and must be sealed with parafilm or other sealing product and placed into a biohazard bag with sufficient absorbent material to absorb the contents if leaking or broken.

Secondary packaging will include either a hard shelled plastic canister with an orange screwtop lid for Category A or a white Tyvek Envelope for Category B. Each system is drop ship tested and conforms to UN certification requirements. The secondary and prelabeled outer packaging for Category A and Category B will be provided by NPHL. These can be ordered from the NPHL website at www.nphl.org.

To assist in the shipping changes scheduled to occur this fall, NPHL will provide a state wide Telehealth broadcast (TBA). For more information please contact NPHL at 402.559.3590 or email kstiles@unmc.edu.

Meet the Laboratorian – Rex F. Famitangco

Compiled by Karen Stiles MT(ASCP)SM, State Training Coordinator

Rex Famitangco is the Laboratory Administrative Director at the Morrill County Community Hospital (MCCH) in Bridgeport, NE. Under his leadership, the hospital laboratory has been awarded the COLA Laboratory Excellence Award twice for achieving perfect scores in two rigorous on-site laboratory surveys. Rex also is the Program Director of the Phlebotomy Technician and Medical Laboratory Assistant Program at the Western Nebraska Community College where he develops curriculum and teaches core courses. He is also a Local Representative of the American Society for Clinical Pathology for the North Central Region.

What interested you in pursuing a career in laboratory science?

I was first attracted to the career in high school where I excelled at science. A lot of people, including me, start out in this profession thinking they want to be medical doctors because most of the courses in third-year med studies are basically about laboratory medicine and pathology. The field appealed to me because of the detective work.

Where did you attend med tech school and where did you receive your formal training?

I began my laboratory career following completion of a Bachelor of Science in Medical Technology degree from Trinity University of Asia. I furthered my education and continued with a Master of Science in Clinical Laboratory Science with honors from Michigan State University. Other graduate certificates obtained were in the Executive Management Program, Molecular Laboratory Diagnostics and Clinical Flow Cytometry. I am a Certified Medical Laboratory Scientist and with a Qualification in Laboratory Compliance thru the American Society for Clinical Pathology, a Certified Medical Technologist through American Medical Technologist, a Registered Medical Technologist through the Republic of the Philippines' Professional Regulation Commission, and a Licensed Limited Radiographer through the State of Nebraska's Department of Health and Human Services.

How long have you worked in your present location?

My employment with MCCH began in January 2003. Prior to MCCH, I worked at Security Forces Hospital, Riyadh, Kingdom of Saudi Arabia for 4 years and the University of Santo Tomas Hospital, Manila, Philippines for 2 years.

What is unique about your facility?

Work activities are wide range at MCCH, from drawing blood, to results analysis and reporting. I enjoy working at MCCH where most of our patients are farmers, ranchers and railroad workers'. My passion is being a 'man for others,' always being of service to people, adding that the best part of our hospital is the people whom I work with, especially my colleagues at the laboratory.

What do you think are the biggest changes in the laboratory since you started?

Point-of-care testing, noninvasive testing, automation, genetic and molecular-based testing and telepathology are a few of the many innovations that have changed the practice of laboratory medicine. One of the biggest changes which fascinates me the most, is pharmacogenomics where patient care is individualized and adopted to an individual's genetic make-up.

What are the biggest challenges you face in your job today?

The biggest challenges of a critical access hospital laboratory are the following: increasing costs for instruments and reagents, decreasing reimbursements, a shrinking pool of educated and trained laboratory professionals, the technological advancements in laboratory science, and the need to train existing laboratory professionals on these advancements for their professional growth. Concerning education, student recruitment is a challenge since we work behind the scenes and a majority of the general public does not understand the laboratories contribution to saving lives. I feel it is important for us to provide a face to our beloved profession.

What advice would you give to a first year clinical scientist?

Students need to be reminded that there are patients behind what we do and that they depend on us to treat them like they are close relatives or acquaintances. We should treat each day as a learning experience and learn from mistakes, learn from your colleagues and listen to their words of wisdom. If you don't understand why something is done the way it is, then ask about it. Be open to contributing something new to will help you grow professionally and give you confidence. A positive outlook, open mind and cooperative spirit will take you far in this field.

What do you see as future challenges for the field of medical technology?

I believe the top three future challenges for laboratory medicine are the implementation of the healthcare reform law (more scrutiny over paying for testing and supporting diagnoses may be more limited for testing), staffing (laboratory workforce shortage) and the implementation of electronic health records.

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IN THIS ISSUE

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