TENNESSEE DEPARTMENT OF HEALTH
It's About Time!

Tennessee Department of Health Public Health Laboratories Newsletter

Susan R. Cooper, MSN, RN
Commissioner of Health

David L. Smalley, Ph.D., M.S.S., BCLD
Director, Division of Laboratory Services

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Inside this issue…

Summer in East Tennessee

Tennessee Public Health Laboratory Microbiologist Wins the National 2009 PulseStar Award

PulseNet, the National Molecular Subtyping Network for Foodborne Disease Surveillance has awarded state public health laboratory microbiologist **Jeannette Dill** with the 2009 PulseStar award for her outstanding achievement in 2008-2009. In 1988, Ms. Dill graduated from Austin Peay State University in Clarksville, Tennessee with a BS in Clinical Microbiology. She is a licensed Microbiologist and prior to starting at the State of Tennessee in 1995, worked in both a hospital clinical laboratory and a reference laboratory. While at the state laboratory, she has worked in the Bacteriology, Enterics and Molecular departments. Her primary responsibilities are PFGE related duties, but she also assists with PCR and nucleic acid sequencing and consults for enteric bacteriology when needed. She is the main contact to notify the Tennessee State Epidemiologist Office of increased levels of enteric disease (clusters) shown by PFGE to be from the same source. Recently, she has been a key person in novel influenza A/H1 PCR testing.

Ms. Dill has attended Food Emergency Response Network (FERN) training and participated in subsequent proficiency tests; attended training and participated in Phase I of a proposed molecular Salmonella serotyping validation; and has worked with Dr. Cooper at CDC PulseNet on the Listeria PFGE protocol validation. Her attendance at the last three annual PulseNet update meetings has been enhanced by also participating as a committee member for the past two years. She excels at teaching PFGE techniques during student rotations. Ms. Dill enjoys her profession, and her knowledge of enteric organisms is an asset in the PFGE laboratory. She is truly committed to PulseNet and foodborne disease surveillance in Tennessee.

Submitted by Amy Woron, Ph. D., Manager
Molecular Biology and Enteric Bacteriology

APHL Recognizes the Knoxville Regional Laboratory Director Dr. Robyn Atkinson, with the 2010 Emerging Leader Award

Each year the Association of Public Health Laboratory (APHL) presents the *Emerging Leader Award* to honor an individual whose leadership has been instrumental in one or more advances in laboratory science, practice, management, policy or education within his or her first five to ten years in the profession. This year's selection for the Emerging Leader Award is Robyn Atkinson, PhD. Dr. Atkinson began her career in public health in 2005 at the Wadsworth Center in New York, and currently serves as the Director of the Knoxville Regional Laboratory at the Tennessee Department of Health.

In addition to her daily leadership responsibilities, Dr. Atkinson has become a strong advocate for food safety. She serves on the APHL Food Safety Committee, chairs the Shiga Toxin-producing E. coli working group, serves as one of two APHL representatives on the Council to Improve Foodborne Outbreak Response (CIFOR), and serves as a member-at-large to the FDA Partnership for Food Protection Coordinating Council. Additionally, Dr. Atkinson is a laboratory instructor for the national Epi-Ready program.

Below Dr. Atkinson receives her Emerging Leader Award from Dr. David Smalley, Director of the Tennessee Public Health Laboratories

Division of Laboratory Services Adds Argininosuccinic Aciduria Screening by Tandem Mass Spectrometry

Submitted by Christine D. McKeever
Newborn Screening Section Manager MS/MS

Laboratory Services recently added the analyte Argininosuccinic Acid (ASA) to the newborn screening panel. ASA is the primary analyte used to screen for Argininosuccinic Aciduria also known as Argininosuccinate Lyase Deficiency. This disorder is autosomal recessive and is caused by defect of the enzyme, Argininosuccinate Lyase. Argininosuccinic Aciduria is characterized as a urea cycle disorder. The urea cycle operates to eliminate excess nitrogen when protein is used by the body.

On a protein diet, amino acids are oxidized for energy or stored as fat and glycogen, however nitrogen produced from this process must be excreted. So through a series of live cell reactions, nitrogen is processed to urea, a compound excreted by the kidneys. A deficiency of any urea cycle enzyme can result in elevated ammonia levels, hyperammonemia.

In the urea cycle, the enzyme Argininosuccinate Lyase cleaves Argininosuccinate to arginine and fumarate. Deficiency in this enzyme blocks urea synthesis leading to accumulation of the amino acids, Argininosuccinate and Citrulline, and this prevents synthesis of arginine, making arginine an essential amino acid. Affected infants exhibit progressively deteriorating symptoms due to the elevated ammonia levels. Excess ammonia is damaging to the central nervous system so Argininosuccinic Aciduria causes neurological problems as well as eventual liver damage. Neonatal onset is within the first two to three days of life. Infants present with vomiting, lethargy, poorly controlled breathing, hypothermia, brain degeneration due to ammonia, enlarged liver, coma, and death.

Late onset may present at a few months to years of age with non-specific mental retardation, episodic seizures and enlarged liver. Hair abnormalities and or skin lesions are also physical findings in late onset due to arginine deficiency. These patients will often self select a diet low in protein. Hyperammonemia in late onset is usually not severe and accumulation occurs only during times of illness or stress. Symptoms are non-specific in the milder form. Treatment usually consists of a diet low in protein, supplementation with arginine for completion of the urea cycle, drugs to scavenge ammonia and in some cases supplementation with carnitine, if the patient has a secondary deficiency. Liver transplant may improve the metabolic status of the patient and offers a partial correction of the enzyme deficiency. Fasting must be avoided and especially during illness the patient must supplement with high carbohydrates and non-protein calories to avoid catabolism. Metabolic emergencies may require acute hemodialysis to lower blood ammonia levels.

The incidence of this disorder is one in 70,000 (1:70,000) live births and has a high mortality rate. We have set our normal cutoff for ASA at <0.75 µmol/L. We have also instituted a ratio of Argininosuccinic Acid to Arginine (ASA/ARG) that can be elevated in true cases of Argininosuccinic Aciduria. The normal cutoff for this ratio ASA/ARG is <0.17. These cutoffs went into effect with specimens received on or after May 15, 2010. Laboratory Services has detected two diagnosed cases of Argininosuccinic Aciduria.

References:

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CAH (Congenital Adrenal Hyperplasia) Update

Perkin Elmer, the vendor for the reagent kits used in screening for Congenital Adrenal Hyperplasia has recently changed the antibody in the kit. This kit is now FDA approved and we have concluded our evaluation in comparison to the current kit.

We began use of this new kit with specimens received on November 4, 2009 (Julian date 308). New result cutoffs for the four different weight groups are shown in the chart. Any patient with results exceeding these cutoffs will be reported to follow-up as abnormal.

Weight group	Cutoff
<1250 grams	<97 ng/mL
1250 – 1749 grams	<62 ng/mL
1750 – 2249 grams	<42 ng/mL
≥ 2250 grams	<30 ng/mL

If you should have any questions, please call the Newborn Screening Laboratory at 615-262-6352 or the Women's Health and Genetics Follow-up Program at 615-262-6304.

Submitted by Christine McKeever, Manager
Newborn Screening Tandem Mass Spectrometry

Notable Changes in the Newborn Screening Form

The latest edition of the Newborn Screening forms are being sent out now, displaying the revision date REV. 03/10. There are a few changes with this form that should be noted.

Lot Number

The form continues to be WHATMAN 903, but is tan in color. It has an expiration date of March 2013. The expiration date is found at the bottom right corner of the form and is displayed as 2013-03. The new lot number is W092- 6863710.

Antibiotic Status

Since antibiotics can interfere with some of the Acylcarnitine results, we have added a place on the collection form to indicate if the infant had antibiotic therapy. Please indicate on the form by checking either YES or NO whether the infant is on antibiotics at the time of collection or has had antibiotics within 24 hours of collection.

Spanish

To aid in newborn screening follow-up, there is a place under Mother's Information to indicate if Spanish is the language spoken. Please collect this information.

Mother's Alternate Telephone Number

In addition there is now space to collect a second phone number under mother's information. The second phone number should be a phone that is always in service and answered. Occasionally there are critical or panic results that need immediate follow up. Recently we receive more and more numbers that are not in service when a call to a mother is made. Time can make a difference in the outcome. Encourage mothers to give accurate contact information.

Hearing Data

Under Hearing, there are now additional data items to indicate why a test was not performed -

"Unable to Test",
"Transferred",
"Still in Hospital" and
"Expired".

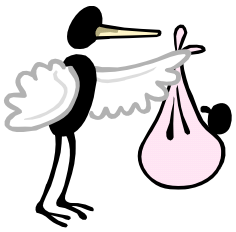
There are now six risk factor categories. ECMO and Chemo are now #6. See the back of the "Pink" hearing copy for the list of all definitions of risk factors.

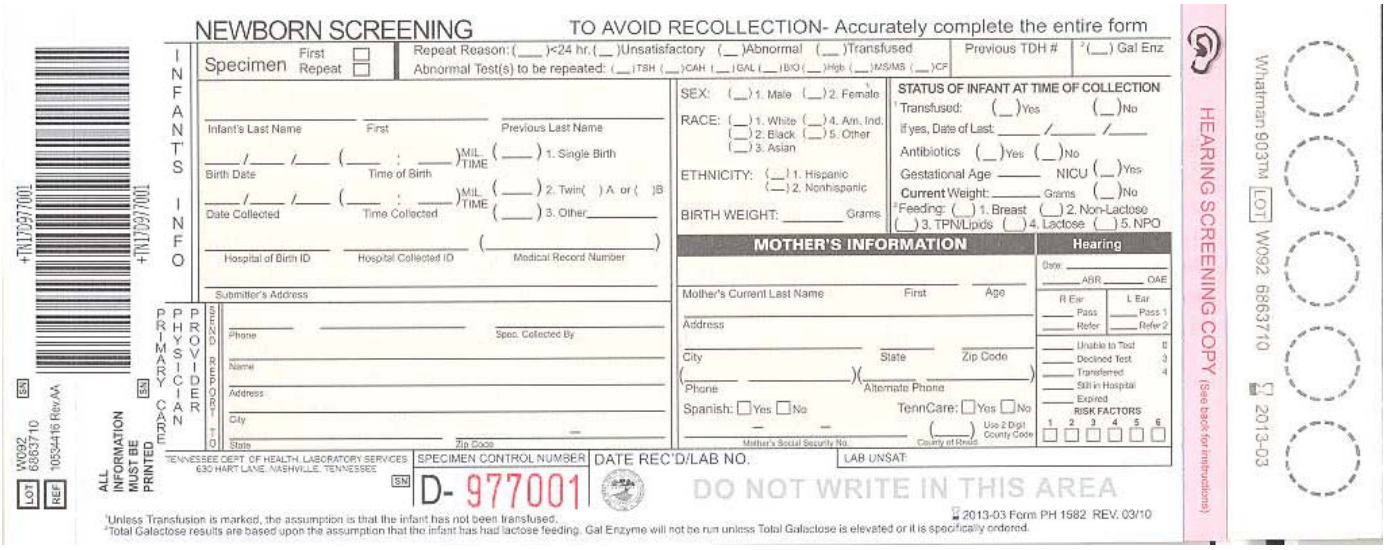
NICU Status

A space is now provided to document NICU status in the "Status Of Infant At Time Of Collection" box. Mark "Yes" if the infant is the NICU and mark "No" if the infant is in the well baby nursery.

If you have any questions, please contact:
Christine McKeever (615-262-6352,Chris.McKeever@tn.gov)
Thomas Childs (615-262-6446, Thomas.Childs@tn.gov) or
Mitzi Lamberth (615-262-6304, Mitzi.Lamberth@tn.gov).

Submitted by Christine McKeever, Manager
Newborn Screening Tandem Mass Spec





Traveling Workshop of Personal and Professional Interest - A Hitchhiker's Guide to Pathogens: Emerging Infections of Leisure that could Travel to Your Laboratory

Since the early 1990's, the clinical microbiology laboratory has seen an increase in emerging and "unusual" pathogens. Many new and increasingly resistant organisms are popping up as a consequence of increased travel, new leisure activities, trendy foods and as a product of a "world marketplace" brought to our local grocery stores. Travel, importation of food, and many leisure activities we engage in potentially expose us to new, formerly unrecognized, or undiagnosed disease pathogens. Whatever your chosen vacation destination, be aware of the uninvited guests.

Infections on cruise ships are traditionally associated with noroviruses (genus *Norovirus*, family *Caliciviridae*), a group of single-stranded RNA, non-enveloped viruses causing acute gastroenteritis in humans. With an average incubation time of 36 hours, vacationers run the risk of becoming ill at sea or bringing the illness home. Although Tennessee and Kentucky are both land-locked states, our residents do venture out to the open seas and sometimes return with uninvited guests. Norovirus is not the only cause of illness on cruise ships. There are documented cases of parasitic infections, respiratory infections, and bacterial skin and gastrointestinal illnesses. Let us not forget the dangers of entering ports of call where passengers may lack immunity to endemic pathogens.

For those now convinced to take a recently-popular "staycation" with your family pet, don't think that you are off the hook! Animal bites account for up to 1% of ER visits each year. Thankfully, dog bite wounds have a lower infection rate than cat bite wounds, since an estimated 5 million people/year are affected with a canine bite/scratch compared to an estimated 400,000 people/year either bitten or scratched from a feline companion.

Now that some of you are thinking, "Forget this, I will just stay at work!", let's turn our attention to laboratory acquired infections. The first documented laboratory acquired infection (LAI) was a case of brucellosis in 1899. Recent cases of LAI's include Meningitidis, Tularemia and Brucellosis. A 2007 study of personnel behaviors contributing to LAI's, identified that having a history of laboratory accidents and LAI's, and having a low opinion of laboratory safety programs were significant predictors of future LAI's.

These topics and more were discussed during the Tennessee Public Health Laboratories program, *2010 A Hitchhiker's Guide to Pathogens: Emerging Infections of Leisure that could Travel to Your Lab.* Want to hear more? Attend the KY/TN ASM branch meeting on November 12 and 13, 2010 and the Tennessee public health laboratory will present select summaries from this program.

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Submitted by Amy M. Woron M.S., Ph.D., Manager
Molecular Biology and Enteric
Bacteriology Laboratories

Shiga-toxin Producing E. coli (STEC): What is it? Where Does it Come From? How Does STEC Work in a Living System? How Can STEC Infections Be Prevented?

What is STEC?

Escherichia coli (abbreviated as *E.. coli*) are a large and diverse group of bacteria. Although most strains of *E.. coli* are harmless, others can make you sick. Some kinds of *E.. coli* can cause diarrhea, while others cause urinary tract infections, respiratory illness, pneumonia, and other illnesses. *E.. coli* 0157:H7 is the most noteworthy because much of its pathogenicity (ability to cause disease) comes from the production of Shiga toxins. These Shiga toxins can be produced by over 100 serotypes of *E.. coli* and collectively this group of bacteria are referred to as Shiga-toxin producing *E.. coli* or STEC. The Shiga toxins produced by the bacteria are responsible for the condition known as hemorrhagic colitis, the source of the bloody diarrhea associated with STEC infections. Shiga toxin production is also responsible for hemolytic uremic syndrome (HUS), a complication of infection that leads to kidney failure. Shiga toxins derive their name from the bacterial organism from which they were first identified, *Shigella dysenteriae*. *S. dysenteriae* causes Shigellosis (bacillary dysentery), which, like STEC infections, can cause severe, bloody diarrhea. There are two types of Shiga toxin, Stx1 and Stx2, which may be produced by STEC.

Who gets STEC infections?

People of any age can become infected. Very young children and the elderly are more likely to develop severe illness and hemolytic uremic syndrome (HUS) than others, but even healthy older children and young adults can become seriously ill.

What are the symptoms of STEC infections?

The symptoms of STEC infections vary for each person, but often include severe stomach cramps, diarrhea (often bloody) and vomiting. If there is fever, it usually is not very high (less than 101˚F/ less than 38.5˚C). Most people get better within 5–7 days. Some infections are very mild, but others are severe or even life-threatening.

How are these infections spread?

Infections start when you swallow STEC—in other words, when you get tiny (usually invisible) amounts of human or animal feces in your mouth. Unfortunately, this happens more often than we would like to think. Exposures that result in illness include consumption of contaminated food, consumption of unpasteurized (raw) milk, consumption of water that has not been disinfected, contact with cattle, or contact with the feces of infected people. Some foods are considered to carry such a high risk of infection with STEC, or another germ, that health officials recommend people avoid them completely. These foods include unpasteurized (raw) milk, unpasteurized apple cider and soft cheeses made from raw milk. Sometimes the contact is pretty obvious (working with cows at a dairy or changing diapers, for example), but sometimes it is not (like eating an undercooked hamburger or a contaminated piece of lettuce). People have become infected by swallowing lake water while swimming, touching animals and the environment in petting zoos and other animal exhibits and by eating food prepared by people who did not wash their hands well after using the toilet. Almost everyone has some risk of infection.

How Does STEC Work Inside a Living System?

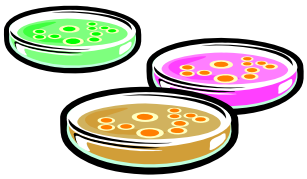
Much of the pathogenicity associated with STEC comes from the production of Shiga toxins. When Shiga toxin is released from a STEC bacterium, it is responsible for the bloody diarrhea associated with STEC infections because it kills cells of the intestine which causes bleeding and swelling. As a result, the body increases permeability of intestinal cell barriers so that important cells of the immune system (neutrophils/PMN's) can reach the *E.. coli* infection. Shiga toxin may also use this opportunity to break through the walls of the digestive tract, enter the blood stream and bind white blood cells for transport to locations such as the kidneys or the central nervous system (brain and spinal cord). Once Shiga toxin reaches a target organ such as the kidney, it binds to receptors on cell membranes. The toxin is then brought inside the cell and stops the cell from producing proteins it needs to function. Without the ability to sustain its function, the cell dies. This is the case with HUS which results from damage to the kidney cells. Shiga toxins are also responsible for the changes in the central nervous system that is associated with severe HUS. In coordination with pro-inflammatory factors Shiga toxins cause damage to the endothelial cells that make up the blood-brain barrier. This barrier is extremely important and normally prevents pathogens and toxins from causing damage to the brain itself.

How can STEC infections be prevented?

1. WASH YOUR HANDS thoroughly after using the bathroom, changing diapers, and before preparing or eating food.
2. WASH YOUR HANDS after contact with animals or their environments (at farms, petting zoos, fairs, even your own backyard).
3. COOK meats thoroughly. Ground beef and meat that has been needle-tenderized should be cooked to a temperature of at least 160°F/70˚C. It is best to use a thermometer, as color is not a very reliable indicator of "doneness."
4. AVOID raw milk, unpasteurized dairy products and unpasteurized juices (like fresh apple cider).
5. AVOID swallowing water when swimming or playing in lakes, ponds, streams, swimming pools, and backyard "kiddie" pools.
6. PREVENT cross contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat.

Information available from the National Center for Zoonotic , Vector-Borne and Enteric Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia
For more information on STEC visit: http://www.cdc.gov/nczved/divisions/dfbmd/diseases/ecoli_o157h7/

Only Outbreak Associated Stool Cultures Performed



During the past several months, we have been reviewing the services offered at the Central Laboratory in Nashville, the Jackson Regional Laboratory, and the Knoxville Regional Laboratory, which all operate under the Division of Laboratory Services. In order to pursue those areas of service that are directly related to Public Health, effective July 1, 2010, we will make the following change:

> **Stool cultures will only be performed on samples associated with an outbreak as determined by your local city or county health department. Routine screenings of stool samples will no longer be offered at any of the State Public Health Laboratories; referral to a commercial laboratory is an alternate option.**

All samples submitted for stool culture must be approved by the local health department before submission to Laboratory Services. Please contact your local health department epidemiologist to obtain approval.

Personnel News: Division of Laboratory Services Welcomes Newcomers to Public Health

Employee Name	Hire Date	Section	Job Title
Michelle Alexander	11/16/2009	Jackson Regional Laboratory	Microbiologist
Nathan Britt	7/14/2010	Special Microbiology	Microbiologist
Barbara Dewberry	8/01/2010	Knoxville Regional Laboratory	Microbiologist
Katie Farrell	7/12/2010	Knoxville Regional Laboratory	Microbiologist
Arlene Fuller	5/30/2010	Knoxville Regional Laboratory	Administrative Secretary
Janet Maddox	3/16/2010	Newborn Screening	Microbiologist
Bryan P. Mason	3/01/2010	Virology	Microbiologist
Randall Keith Morris	3/01/2010	Microbiology	Microbiologist
Shannon Spence	2/28/2010	Inorganic Chemistry	Chemist
Kristine Swart	3/16/2010	Serology	Microbiologist
Kathy Tseng	3/01/2010	Newborn Screening	Microbiologist