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TN Department of Health

Public Health Laboratory Newsletter

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Commissioner of Health

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Director, Laboratory Services

Inside This Issue:

2019 Novel Coronavirus—COVID-19

Coronavirus is a family name for a group of viruses that may infect both humans and animals. Those that infect humans may cause a mild infection like a cold or more serious infection. Examples are Middle East Respiratory Syndrome and Severe Acute Respiratory Syndrome.

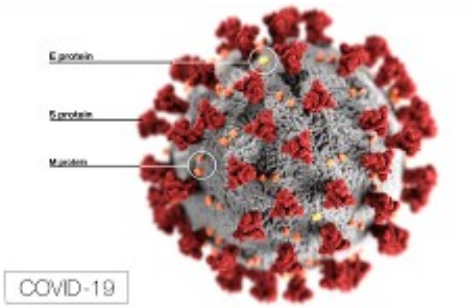

Photo credit: Alissa Eckert, MS; Dan Higgins, MAMS

SARS-CoV-2 is a new viral strain that was not identified in humans prior to December 2019. This virus may cause illnesses that range from cold symptoms to pneumonia. The disease is known as COVID-19. The virus is spread through direct contact with an infected person or contaminated surfaces. Respiratory droplets are sprayed through the air when an infected person coughs or sneezes.

The virus can be fatal in those who are more vulnerable, such as older people and/or those with pre-existing medical conditions. In order to avoid COVID-19 or any other respiratory virus:

- Wash hands frequently with soap and water or use alcohol-based hand sanitizer.
- Distance yourself from others—maintain your "personal space" of three feet or more.
- Keep your hands away from your face.
- Seek medical care if you have fever, cough and difficulty breathing.
- Stay home when you are sick.

The public health response is multi-layered with the goal of detecting and minimizing transmission of this virus in the United States. The FDA has approved Emergency Use Authorization for COVID-19 and the state public health lab is testing for the infection. Currently, Tennessee is one of only seven states that is testing sufficient numbers of residents to safely reopen. Tennessee performed 177,000 tests in the first twenty days of May; as many as the total tests prior to that during the pandemic.

For Interim Laboratory Biosafety Guidelines for handling and processing specimens associated with COVID-19, please visit:

- https://www.cdc.gov/coronavirus/2019-nCoV/lab/lab-biosafety-guidelines.html
- https://www.cdc.gov/coronavirus/2019-ncov/lab/guidelines-clinical-specimens.html

For current TN Department of Health information on COVID-19 and specimen submission, please visit https://www.tn.gov/health/cedep/ncov.html.

Submitted by: Rolinda Eddings, MT(ASCP), Safety Officer

Spotlight on Safety

Challenges in Preparedness for COVID-19: Strategies for Optimizing the Supply of N95 Respirators

N-95 respirators are the PPE most often used to control exposures to infections transmitted via the airborne route. As with any outbreak, especially a novel virus, supplies of respirators have been diminished quickly. In the clinical or research laboratory setting, this supply problem affects not only needs for testing and research development for COVID-19, but for other infectious organisms that have airborne transmission such as *Mycobacterium tuberculosis* and *Brucella melitensis*.

Existing CDC guidelines recommend that healthcare facilities:

- Minimize the number of healthcare workers who need to use respiratory protection through the preferential use of engineering and administrative controls.
- Use alternatives to N95 respirators where feasible:
    - Filtering facepiece respirators
    - Elastomeric half-mask and full facepiece air purifying respirators
    - Powered air-purifying respirators
- Implement practices allowing extended use and/or limited reuse of N95 respirators when acceptable
- Prioritize the use of N95 respirators for those healthcare workers at the highest risk of acquiring or experiencing complications of infection

The following measures can be considered as contingency capacity which may not have significant impact on the safety of the healthcare worker:

- Use of respirators beyond the intended shelf life
    - Note the potential exists that respirator may not perform to the requirements for which it was certified
    - Prior to use the respirator should be inspected and a seal check performed
- Extended use and limited reuse of respirators
    - Extended use refers to wearing the same N95 between infectious encounters without removing the respirator
    - Reuse refers to using the same respirator for multiple infectious encounters

Extended use and use beyond intended shelf life should only be implemented on a case by case basis taking into account multiple factors and allowed only with careful oversight by subject matter experts.

For more information, please consult the CDC website:

https://www.cdc.gov/coronavirus/2019-ncov/hcp/healthcare-supply-ppe.html

Submitted by
Rolinda Eddings, MT(ASCP), Safety Officer

CDC Webinar for Healthcare Professionals:

Strategies for Ensuring Healthcare Systems Preparedness and Optimizing N95 Supplies

https://www.youtube.com/watch?v=p_IlGsYMy3k&feature=youtu.be&t=688

COVID-19 Safety Guidance

Sentinel Laboratories with safety questions related to laboratory testing and COVID-19 can contact the TN state public health laboratory at 615-262-6318.

- COVID-19 information from CDC: https://www.cdc.gov/coronavirus/2019-nCoV/index.html
- FAQs about biosafety and COVID-19 from CDC: https://www.cdc.gov/coronavirus/2019-ncov/lab/biosafety-faqs.html

Guidelines for collecting, handling, and testing clinical specimens for COVID-19:

- Tennessee Department of Health specimen submission guide: https://www.tn.gov/content/dam/tn/health/documents/cedep/novel-coronavirus/COVID19SpecimenSubmissionGuide.pdf
- Interim Guidelines for collecting, handling and testing clinical specimens from persons for Coronavirus Disease 2019 from CDC:https://www.cdc.gov/coronavirus/2019-nCoV/lab/guidelines-clinical-specimens.html

TDH ARLN-CRO Section to Implement New Multiplex PCR Kits

According to CDC, Carbapenem-resistant Enterobacteriaceae are an urgent public health threat, and for good reason. While healthy people are at minimal risk, CRE have become a common etiologic agent of healthcare associated infections. CRE can cause infections in almost any part of the body, including urinary tract infections, bloodstream infections, ventilator-associated pneumonia, and intra-abdominal abscesses. In 2017 alone, there were an estimated 13,100 cases in hospitalized patients and 1,100 deaths. These gram-negative bacteria may produce enzymes, called carbapenemases, capable of inactivating carbapenems and other β-lactam antibiotics, including penicillins and cephalosporins. The mechanism confers resistance to this class of antibiotics and makes infections extremely hard to treat. Furthermore, carbapenemase-producing CRE (CP-CRE) are capable of sharing carbapenemase genes with other bacteria via a mobile genetic element: plasmids.

The most common carbapenemase in the United States, Klebsiella pneumoniae carbapenemase (KPC), was first found in the U.S. in the early 2000s and has since spread across the nation. The CDC established the Antimicrobial Resistance Laboratory Network, comprised of seven regional laboratories including the TDH Division of Laboratory Services, to detect and track KPC as well as four other major plasmid-associated resistance genes: New Delhi Metallo-beta-lactamase (NDM), Verona Integron-Encoded Metallo-beta-lactamase (VIM), Imipenemase (IMP) and Oxacillinase-48 (OXA-48).

When the TDH ARLN section identifies CP-CRE isolates, they work quickly to characterize the bacteria and inform the CDC. The lab can employ phenotypic tests to discern carbapenemase production, but molecular assays, such as real-time PCR allow the public health scientists to rapidly and accurately identify which carbapenemase gene(s) is present.

The TDH ARLN section is in the process of validating the Streck ARM-D β-lactamase real-time PCR kit, as well as two additional multiplex Streck ARM-D kits for the detection of plasmid-mediated oxacillinase (OXA) and mobilized colistin resistance (mcr). These kits have wide target coverage, including many variants of the KPC, NDM, IMP, OXA, mcr, and VIM gene families. Unlike ARLN's previous carbapenemase and colistin detection assays, Streck ARM-D is a multiplex PCR, which allows for the simultaneous detection of multiple gene targets in a single reaction as well as a more streamlined and efficient workflow. Once fully implemented, these Streck ARM-D kits will allow the ARLN section to detect more variants than previously, with elevated sensitivity and specificity reducing the potential for inaccurate results.

Submitted by:
Sara Belknap, MS
CDC-APHL Antimicrobial Resistance Laboratory Fellow

References:

https://www.cdc.gov/hai/organisms/cre/index.html
https://www.cdc.gov/drugresistance/pdf/threats-report/CRE-508.pdf

Announcements

⇒ Effective February 1, 2020, every baby born in the State of Tennessee is screened for Spinal Muscular Atrophy. SMA is a disease resulting in the deterioration of motor neurons and progressive muscle weakness and wasting. Early Detection of SMA provides the opportunity for treatment and disease management with new drugs such as Spinraza (Nusinersen) and gene therapy.

⇒ When submitting isolates to the TDH Public Health Laboratory, please include the antibiotic susceptibility test report from your facility.

Mycobacterium tuberculosis complex is reportable in Tennessee

Too many people in the United States still suffer from tuberculosis disease. We must continue to find and treat cases of active TB disease, as well as test and treat latent TB infection to prevent progression to disease, to turn TB elimination into a reality. In 2019, there were 129 individuals in Tennessee diagnosed with active TB disease. Of the 129 people diagnosed,101 cases were confirmed as TB by a positive culture or positive nucleic acid amplification test, or NAAT. Preliminary data shows that there were ten individuals who were either deceased at the time of diagnosis or died while receiving therapy. Of those patients with a positive culture for *Mycobacterium tuberculosis*, 96.9% had a drug-susceptibility result reported. It is important to note that drug susceptibility testing is used for patient and close contact treatment. Drug susceptibility testing results are as follows (percentage is percent of total patients with a DST result reported):

- Isoniazid mono-resistance: 1 (1.1%)
- Isoniazid and rifampin resistant (multidrug resistant TB): 1 (1.1%). *This patient was characterized as a pre-extensively drug resistant (pre-XDR) case of tuberculosis due to resistance to isoniazid, rifampin, ethambutol, streptomycin, rifabutin, ethionamide, ciprofloxacin, and ofloxacin.*
- Pyrazinamide mono-resistance: 4 (4.3%)

Mycobacterium tuberculosis complex is found on the TN reportable disease list for local/regional health office reporting by next business day and PH-1600 form submission within one week of identification. In addition culture submission is required to the State laboratory on all TN residents and in-patients being treated in a TN healthcare facility.

Submitted by Dorothy Baynham, MT (ASCP)
Manager, Special Microbiology

Special Microbiology Section Laboratory Improvements

In October, TDH Laboratory Services Special Microbiology Section underwent department safety improvement. This process took three months to complete. Four new biological safety cabinets were installed into two containment rooms. This will allow for multiple testing to occur at one time, increasing efficiency and ultimately decreasing the turnaround time for test results. A seamless textured floor was installed and sealing of all penetrations and openings were sealed (such as countertop, walls, around ducting, around outlet covers and lights). This measure was added if the need for whole room decontamination is required.

Submitted by Dorothy Baynham, MT (ASCP)
Manager, Special Microbiology

Biochemistry Basics and Newborn Screening

Newborn Screening uses Tandem Mass Spectrometry to screen for fifty seven analytes that could indicate a metabolic disease in babies. The analytes tested at Tennessee Department of Health Laboratory Services can be broken down into three categories: Amino Acids, Organic Acids, and Fatty Acids. These analytes work in cycles in our bodies to keep us alive. An example can be seen in figure (2) of the Krebs cycle which produces ATP in our bodies. [10]

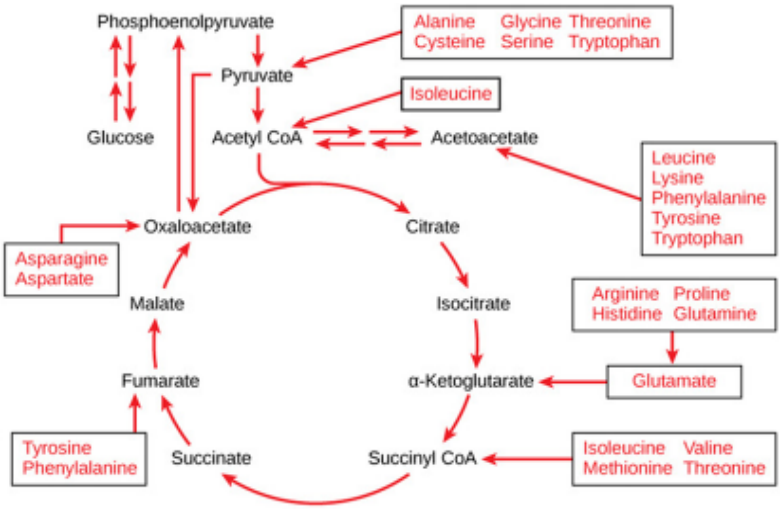

Figure (2) [10] Krebs Cycle

Starting with Amino Acids; often referred to as the building blocks of life, they build the necessary proteins for the body through anabolism.[1,2] They contain an amine group (-NH2) and carboxyl groups (-COOH) along with a side chain (R group) which is the identifying factor of an individual Amino Acid. They also experience a catabolic breakdown which in turn form Organic Acid.[3] An example of three different Amino Acids can be seen in the figure below.

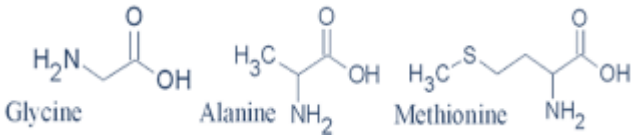

Figure (1) [11]

Organic acids are intermediaries in the body's different metabolic pathways.[4, 5] They are identified by having a carboxylic acid which is as a carbonyl group (C=O) that has a hydroxyl group (O-H) attached to the carbon atom. Diseases considered organic acidopathies such as 3Methylcrotonyl CoA deficiency (3MCC) or Isobutyryl CoA deficiency (IBCD) come from the breakdown of branched chained Amino Acids such as Leucine or Valine.

Next, Fatty Acids are a carboxyl acid with a long hydrocarbon chain attached to it.[6] They are often identified as either unsaturated with two carbons sharing at least one double bond or saturated with the carbon chain sharing no carbon double bonds. They do not naturally occur in the body but are made through the breakdown of food and through the catabolism and anabolism of Amino acids and Organic acids.

Another analyte we screen for is not an acid, but rather a by-product due to a deficiency of Fumarylacetoacetate hydrolase (FAH) causing a disruption of the catabolic pathway of Tyrosine (an Amino Acid). [8] This is Succinylacetone. It acts as a primary marker for Hepatorenal Tyrosemia Type I (HTT-1). [8,9]

In the Newborn Screening Laboratory, we focus on Primary analytes as they are identified as compounds directly involved in the metabolic pathway, which are common to all living organisms and are absolutely necessary for the survival of said organisms due to being directly involved in growth, development and reproduction. Secondary analytes come from primaries and are not directly involved with necessary survival.[10]

Tandem Mass Spectrometry is a very important test because it identifies issues in the metabolic pathways of newborns. These metabolic pathways are constant and continuous in our everyday life; from the process of glycolysis to form the energy molecule ATP. These pathways keep us living and any disruption of such could cause cataclysmic results for anyone. This test aids us in identifying issues and saving lives, but it also shows us the beauty in the science of life and how it works in us.

Submitted by:

Nicholas Vincent, PH Laboratory Scientist 1, Newborn Screening

References on page 8

TRAINING NEWS

2020 WORKSHOP INFORMATION

TDH Workshop schedules have been impacted by the COVID pandemic.

The most current workshop information and schedules will be listed on the TDH Laboratory Services Training and Workshops webpage:

https://www.tn.gov/health/health-program-areas/lab/lab-education.html

TRAINING PARTNER OPPORTUNITIES

APHL/CDC Training: Biothreat Rule Out or Refer

CDC, in collaboration with APHL and the State Hygienic Laboratory at the University of Iowa, has developed a set of virtual knowledge exercises (VKEs) on Biothreat Rule Out or Refer. The VKEs are interactive web-based exercises designed for clinical and veterinary diagnostic laboratorians performing microbiology testing to build and enhance skills in biothreat agent recognition. VKEs do not replace proficiency testing, but serve as a supportive exercise. For more information, Visit:

https://www.cdc.gov/labtraining/training-courses/biothreat-rule-out-refer-virtual-knowledge-exercise/index.html

Fundamentals of Personal Protective Equipment (PPE) in Clinical Laboratories

On-Demand Training—CDC Laboratory Training

Safety is imperative when working with potentially harmful materials and other hazards in the laboratory. This course is designed to assist clinical and public health laboratory professionals with applying risk management strategies to identify hazards, assess risks, and select appropriate personal protective equipment (PPE) options. PACE CE credit available.

Download the course brochure for more information:

https://www.cdc.gov/labtraining/docs/training/PACE_Brochure_PPE_04_07_20.pdf

For more CDC Laboratory Training Opportunities, please visit: https://www.cdc.gov/labtraining

APHL Webinars (archived):

Coronavirus Disease (COVID-19): Laboratory Risk Assessments and Lessons Learned

This webinar discussed how to safely and securely handle respiratory and other specimens from persons under investigations for COVID-19. Speakers presented on the biological risk assessment process to mitigate risks in the laboratory and reduce the likelihood of a laboratory-acquired infection. PACE CE credit available.

Coronavirus Disease (COVID-19): Biosafety on the Frontlines

This webinar will provide attendees with knowledge on how laboratories are safely testing and handling specimens during the COVID-19 response. Speakers will present on the necessary personal protective equipment for laboratories to utilize to reduce the likelihood of a laboratory acquired infection. Participants will also hear recommendations on how to handle potential positive samples and methods on how to mitigate the risk of a laboratory exposure. PACE CE credit available.

To register for the archived webinars, click on the titles above or visit the APHL Webinars webpage:

https://www.aphl.org/training/Pages/Previously-Recorded-Webinars-Convenient-Affordable-CE.aspx

Employee News

Dr. Kara Levinson selected as Deputy Director

Kara Levinson, PhD, MPH, D(ABMM) joined the TDH Public Health Laboratory as the Deputy Director on February 3rd. She comes from the Centers for Disease Control where she served in the Laboratory Leadership Service (LLS) and was based at the New Hampshire Public Health Laboratory. She has a diverse background that includes epidemiology, clinical microbiology, and extensive experience in the public health and environmental health setting, including work at six state labs (AK, IA, NY, NC, DC, NH).

Dr. Levinson received her BS in microbiology from Northern Arizona University, her MPH in hospital and molecular epidemiology from the University of Michigan, and served as an APHL Emerging Infectious Diseases (EID) Fellow at the Iowa Public Health Laboratory during the 2009 H1N1 influenza pandemic. She completed her PhD in immunology and infectious disease at the New York State Department of Health, Wadsworth Center, where she studied vaccine development and host-pathogen interaction in *Vibrio cholerae*. After obtaining her PhD, she completed a post-doctoral CPEP fellowship in clinical microbiology at the University of North Carolina Hospital. She then joined CDC, where she focused on laboratory management, safety, quality, and outbreak response at the New Hampshire Public Health Laboratory. Dr. Levinson is board certified by the American Board Medical Microbiology (ABMM).

Dr. Levinson is originally from Alaska, and recently moved from New Hampshire to Tennessee. She is recently married and enjoys traveling, curling (the sport), exploring Nashville, and talking her new husband into getting a dog in the near future.

Welcome New Employees!

January 2020

Kindall Bell
Procurement Officer 1
Procurement

Gregory Speakman
PH Lab Technician 1
Newborn Screening

February 2020

Dr. Kara Levinson
Deputy Director

March 2020

Adison Brown
PH Lab Technician 1
Newborn Screening

Jeremy Westbrook
PH Lab Scientist 1
Special Microbiology

April 2020

Kristina Lamons
PH Lab Scientist 1
Knoxville
Regional Laboratory

May 2020

Marquetta King
PH Lab Technician 2
Newborn Screening

Perry Stokes
PH Lab Technician 1
Newborn Screening

Keely Campbell
PH Lab Technician 2
Media Prep

Katie Dunn
Admin Services Assistant 2
Training, Safety, QA

Amanda Evans
PH Lab Scientist 2
Chemistry

Promotions

Kristy Hite
PH Lab Technician 2
Newborn Screening

Holly Jones
PH Lab Scientist 2
Chemistry

Daniel Wade
PH Lab Scientist 1
Chemistry

Lily Vaden
PH Lab Scientist 2
Serology

Retirements

Beverly Sanders
PH Lab Scientist 2
15 Years of Service

Lizbeth Brown
PH Lab Scientist 2
5 Years of Service

Biochemistry Basics and Newborn Screening *(continued from page 5)*

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Tennessee Department of Health
Division of Laboratory Services

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TN Department of Health

The Mission of Laboratory Services is to provide high quality analytical services of medical and environmental testing and to achieve the Mission of the Department of Health.

https://www.tn.gov/health/health-program-areas/lab.html

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