LAB Connections

APRIL 2018
ISSUE 153

HAMILTON REGIONAL LABORATORY MEDICINE PROGRAM

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The Scoop on Poop Testing

Diarrhea is a common cause of crampy abdominal pain, dehydration, and even mortality in Canada today. Worldwide, acute diarrhea remains a leading cause of children's deaths, although oral rehydration fluids and rotavirus vaccination have significantly improved survival. Diarrhea may be caused by bacteria, viruses or parasites, and is affected by geographic location, season, over-crowding, poor hygiene or food and water sources. The HRLMP microbiology laboratory provides diagnostic testing for viruses and bacteria which can cause diarrhea, while the Public Health Laboratory provides testing for parasites. While diarrhea is generally self-limited, a diagnosis may be helpful for hospitalized or immunocompromised patients, or during institutional outbreaks. For accurate diagnosis, stool samples are collected in appropriate containers with or without transport medium or preservative, and sent to the laboratory for testing.

Use for ***C. difficile*** and **Virus** detection

Use for **Bacterial enteric pathogens** (Label code ETM)

Use both containers for **Ova and Parasite (O&P)** testing (Label code SAF)

Viruses:

Young children are especially vulnerable, but viruses also cause outbreaks in institutions including hospitals, predominantly in the winter months.

Norovirus, aka "winter vomiting disease", is the most common cause of viral gastroenteritis in both children and adults and can cause widespread and severe institutional and cruise ship outbreaks. Control of norovirus in health care institutions requires strict enforcement of contact precautions to prevent transmission to staff or other patients. There are two genogroups of norovirus, GI and GII. Genogroup II is the most common.

Rotavirus used to be the most common cause of pediatric diarrhea hospitalization, but with routine rotavirus vaccination is now not as common. Infections still occur in children and in immunocompromised adults.

Adenovirus can cause respiratory and diarrheal disease which may be life-threatening in those with weakened immunity.

Testing for viruses requires a dry sterile container. Testing is commonly done for hospitalized patients with diarrhea, especially for infants with community-acquired diarrhea and during institutional outbreaks. A newly-improved, lab-developed multiplex PCR test for Norovirus, Rotavirus, and Adenovirus is now performed daily, Monday to Friday, at the Virology-Molecular Laboratory at St. Joe's.

Clostridium difficile (C. difficile):

C. difficile is a spore-forming bacterium which causes severe disease in hospitalized patients and is directly related to the use of antimicrobials. Although C. difficile infections occur year-round, they are more common when antibiotics are used extensively, as during the flu season. C. difficile spores survive in the environment, making terminal room cleaning, handwashing and other infection prevention and control measures critically important for patient safety.

Testing for C. difficile requires submission of liquid stool to the Virology-Molecular laboratory at St. Joseph's Healthcare. To enable high-throughput, highly sensitive testing, a lab-developed loop-mediated isothermal amplification (LAMP) test is used. Testing occurs up to three times daily, seven days a week, to ensure rapid diagnosis and treatment of this important healthcare-associated pathogen. The high analytical sensitivity of the assay ensures that a negative test usually rules out disease. However, as patients may have asymptomatic colonization and then develop diarrhea from another cause (e.g. laxatives), clinical judgment is still needed to prevent over-diagnosis. Researchers in Hamilton are currently studying whether patients with asymptomatic C. difficile colonization develop C. difficile diarrhea in the future, and whether C. difficile carriers contribute to transmission. These studies may improve our ability to prevent this common disease, and to help ensure a safe hospital environment.

Other Bacteria:

Salmonella is a common cause of food-borne illness. Sources include under-cooked chicken, unpasteurized milk, salads, sprouts etc., especially in the summer months. Animals may also harbour Salmonella, particularly reptiles (snakes, turtles, lizards), amphibians (frogs), birds (baby chicks) and pet food and treats.

Shigella can spread from an infected person to contaminate water or food, or directly to another person. Getting just a few Shigella bacteria into your mouth is enough to cause symptoms. The illness is most commonly seen in child-care settings and schools. Shigellosis is a cause of traveler's diarrhea, from contaminated food and water in developing countries.

Campylobacter is acquired by consuming raw and undercooked poultry, unpasteurized milk, or contaminated water.

Yersinia is an infection caused most often by eating raw or undercooked pork contaminated with Yersinia enterocolitica bacteria. The Centers for

Disease Control and Prevention in the U. S. (CDC) estimates that Yersinia causes over 100,000 illnesses, 640 hospitalizations, and 35 deaths in the United States every year. Children are infected more often than adults, and the infection is more common in the winter.

STEC (shigatoxin-producing E. coli) is also called verotoxin-producing E. coli or hamburger disease. E. coli is a common organism in our intestines where it is harmless; however, certain types (serogroups) can cause disease. E. coli O157:H7 makes a toxin called Shiga toxin and is known as a Shiga toxin-producing E. coli (STEC). There are many other types of STEC, and some can make you just as sick as E. coli O157:H7. Commonly, STEC causes bloody diarrhea, but severe complications such as hemolytic uremic syndrome (HUS) may occur. In HUS, toxins destroy red blood cells, causing anemia and kidney injury. HUS can require intensive care, kidney dialysis, and blood transfusions.

Most frequent is E. coli 0157:H7, but non-0157 outbreaks are increasingly recognized. In 2017, a Canadian outbreak of E. coli 0121 was associated with flour; a large German outbreak of O104:H4 in 2011 related to sprouts. Current lab tests which rely on culture do not detect non-0157 strains of STEC.

Testing for Bacterial Diarrhea:

Stools are submitted for bacterial culture in transport medium. Culture is performed at the Microbiology Laboratory at the Hamilton General. Bacterial culture requires 48-72 hours and may miss key pathogens such as STEC.

In June of 2018, the HRLMP Microbiology lab will discontinue regular bacterial culture of stools and start routine molecular testing using a lab-developed multiplex PCR assay in the Virology-Molecular Laboratory at St. Joe's. This will enable daily testing (Monday to Friday) with same day resulting for Salmonella, Shigella, Campylobacter, Yersinia and STEC.

For Campylobacter and Yersinia, the PCR results will be the final results. For Salmonella and Shigella positive samples, PCR results will be reported and positive specimens will then be cultured and may be tested for antimicrobial susceptibility. Salmonella and Shigella isolates are sent to the Public Health Laboratory for serogrouping to identify potential Ontario-wide outbreaks. STEC positive samples will be referred directly to the Public Health Laboratory for isolation and serogrouping of the causative organism. Collaboration with Public Health is key to tracing diarrheal pathogens which may represent contaminated food or water.

Our lab-developed PCR is more sensitive than culture, particularly for Shigella, Yersinia, and STEC. Culture only looks for O157-STEC and does not detect other serogroups. The superiority of PCR was clearly evident during the validation study, when the PCR was 80% more sensitive than culture.

As of June 2018, all diarrheal testing for viruses, C. difficile, and other bacteria will be performed at St. Joe's using molecular testing methods. This will improve test sensitivity and turn-around times and facilitate the diagnosis and treatment of patients with infectious diarrhea.

Performance characteristics of our laboratory-developed multiplex PCR assay.

Species (n=132 of 263)	Culture Sensitivity	PCR Sensitivity	PCR Specificity
Salmonella (49)	93.8%	97.9%	99.5%
Campylobacter (54)	100%	100%	100%
Shigella (11)	63.6%	100%	99.2%
Yersinia (7)	57.1%	100%	100%
STEC (11)	20.0%	100%	99.6%

By:
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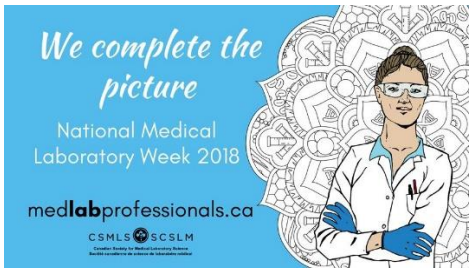
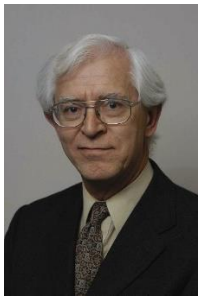
News from Administration



Dr. Fernandes, Duane Boychuk and Rebecca Repa send their *congratulations* and thanks to all HRLMP staff in celebration of National Medical Laboratory Week. Each week they see the commitment of staff to patient care and patient safety, as well as to the profession and to each other.



Recently, **Dr. Matthew McQueen**, an internationally renowned clinician, researcher and past Chief for the Hamilton Regional Laboratory Medicine Program was featured in an article in ***Clinical Chemistry***. This **Inspiring Minds** article summarizes Dr. McQueen's amazing professional and personal journey.

Click on the link below for the details on the article:
http://clinchem.aaccjnls.org/content/64/4/624

Duane Boychuk, HRLMP Director of Operations, announces the upcoming retirements of three HRLMP managers.

Michelle Somers joined the HRLMP in the role of Manager, Office Operations in September 2011. Michelle's last day with the HRLMP was April 12, 2018.

Karon Taggart was appointed Manager, HRLMP Laboratory Information Systems in November 2007. Karon has held numerous roles within the HRLMP including Technical Specialist, Senior MLT, MLT and laboratory assistant. Karon's last day with the HRLMP is June 29, 2018.

Albert Incretolli was appointed Manager of the Core Laboratories at St. Joseph's Healthcare and McMaster Children's Hospital in October 2015. He has worked 38 years in laboratory medicine, including 16 years as a LIS expert and 10 years as senior MLT with the HRLMP. Albert's last day with the HRLMP is June 1, 2018.

Please join Duane in thanking Michelle, Karon and Albert for their many contributions to the HRLMP and in wishing them all the best.

Please welcome **Sue McIntee** as she accepted the temporary appointment of Manager of the Core

Laboratory at McMaster Hospital, effective March 12, 2018. Sue will continue to also manage the Laboratory at West Lincoln Memorial Hospital.

Please also welcome **Marilyn Bello-Crispo** as she has accepted the position of Acting Manager of Office Operations, effective Monday April 16, 2018.

It is with heavy hearts that we announce the passing of **Joceline Turner** on April 25, 2018. She passed away after a lengthy battle with cancer.

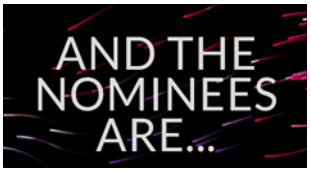
Joceline began her career as a medical laboratory technologist in Clinical Chemistry in 1980, and most recently worked as a technical specialist in Clinical Chemistry at the HRLMP.

On behalf of all HRLMP staff, we extend our sincerest condolences to Joceline's family.

Dr. John Fernandes
Duane Boychuk

Education News

2018 HRLMP Medical Laboratory Technology Excellence Awards



We had a wonderful response to the request for nominations for this year's awards, highlighting the excellent MLAs and MLTs we have within the HRLMP.

Each of these individuals truly deserves to be recognized for consistently demonstrating

excellence in their role in relation to patient care and their team.

This year's nominees (in alphabetical order) are:

- Mackensey Bacon (MLT, Genetics)
- Colleen Brooks (SMLT, Malignant Hematology)
- Nadia Caruso (MLT, Core)
- Allahna Elahie (TS, Transfusion Medicine)
- Connie Ellingham (MLA, Genetics)
- Shelly Elbe (MLA, Virology)
- Liz Feeney (LIS Specialist)
- Connie Fleming (MLT, Microbiology)
- Suzanne Kort (MLA, Core)
- Pat Ludlow (TS, Anatomic Pathology)
- Diana Munavish (MLT, Genetics)
- Robin Pickersgill (SMLT, Core)
- Janette Reed (MLA, Core)
- Niran Sabbagh (MLT, Anatomic Pathology)
- Walter Scott (SMLT, Genetics)
- Ernie Spitzer (TS, Electron Microscopy)
- Janet Todd (MLT, Microbiology)
- Kristina Wilson (MLT, Genetics)
- Crystal Woodside (MLT, Genetics)
- CQI Team (MLT and MLA, HGH Core Lab)
- MUMC Core Laboratory (MLT and MLA)
- Teaching MLAs – Michelle Hancock, Suzanne Kort, Linda Mattina, Stacey Nezic (MLAs, Core)

Congratulations to all of our nominees!

The winners of the 2018 Medical Laboratory Technology Excellence awards were announced at the HRLMP Med Lab Celebration Night, April 26, 2018.

The winners are:

- Mackensey Bacon – Genetics
- Colleen Brooks – Hematology
- Nadia Caruso – Chemistry
- Allahna Elahie – Transfusion Medicine
- Pat Ludlow - Anatomic Pathology
- Janet Todd – Microbiology
- Michelle Hancock, Suzanne Kort, Lina Mattina, Stacey Nezic (Teaching MLAs) – Outstanding Achievement

Congratulations to all the winners on their excellence in Medical Laboratory Technology!

LABCON 2018 has a new home!

LABCON2018 will take place May 25 - 27, 2018, but will be moving to Ottawa, ON!

CSMLS has been forced to move LABCON from Windsor to Ottawa due to an ongoing labour disruption at Caesars Windsor. Not to worry though, we will still be delivering the same great event you were anticipating.

Our new host venue is the Brookstreet Hotel, a 4-diamond hotel, spa and conference centre.

Registration:
The early bird rate will be extended to May 4th so it's not too late to register at the discounted rate and save over $200!

News from Chemistry

Dr. Cynthia Balion, Associate Professor, will be taking over the duties of Director of the post-doctoral training program in Clinical Biochemistry on July 1, 2018.

Dr. Balion is replacing **Dr. Stephen Hill** who has held the Director role since 2006.

News from Genetics

Replacing Single Analyte Testing by Next Generation Sequencing (NGS) Panels in Molecular Oncology

Next Generation Sequencing panels are becoming a method of choice in many diagnostic laboratories, allowing multiple genes testing simultaneously and multiplexing samples with different indications in the same batch. Our laboratories have successfully used Next Generation Sequencing for several years for constitutional disorders including hereditary breast and ovarian cancer and mitochondrial disorders.

Recently we have validated and started implementation of Next Generation Sequencing Panels for somatic cancers including solid tumors and hematological cancers. These NGS panels allow expansion of the existing testing menu to include additional prognostic and predictive biomarkers for the variety of tumor types.

Companion diagnostics testing in solid tumors:
We are happy to announce that effective April 23, 2018, the Molecular Oncology Laboratory will replace the existing single analyte testing for solid tumors for EGFR, BRAF and RAS genes by an NGS Panel. The mutation analysis for the following hot-spot regions will be reported for each indication:

Lung Cancer: BRAF exons 11 &15, EGFR exon 18-21, KRAS exons 2-4
Colorectal cancer: BRAF exons 11 &15, KRAS exons 2-4, NRAS exons 2-4
Melanoma: BRAF exons 11 &15, KRAS exons 2-4, NRAS exons 2-4
Thyroid cancer: BRAF exons 11 &15, KRAS exons 2-4, NRAS exons 2-4

Expansion of the available testing to additional biomarkers is under review. Updates to the available testing will be provided as the panel implementation continues to roll out.

Myeloid Malignancies:
Consensus pathology recommendations for complex malignant hematology were published by Cancer Care Ontario in December 2016 (https://www.cancercareontario.ca/en/guidelines-advice/types-of-cancer/43061). In addition to routine hematologic diagnostic workups and cytogenetic testing, the guideline recommends evaluation of several genomic biomarkers. For acute myeloid leukemia and myelodysplastic syndrome this includes assessment of at least 26 genes with characterized clinical relevance in myeloid cancers.

As of April 2018 the HRLMP will provide testing of the full panel of recommended genes for cases with a confirmed diagnosis of acute myeloid leukemia or myelodysplastic syndrome. The full panel will include relevant regions of the following genes: ASXL1, BCOR, BRAF, CALR, CEBPA, DNMT3A, EZH2, FLT3, IDH1, IDH2, JAK2, KIT, KMT2A, MPL, NPM1, NRAS, RAD21, RUNX1, SF3B1, SRSF2, STAG2, TET2, TP53, U2AF1, WT1 and ZRSR2.

Hematology News

Hematology is the recipient of the **2018 Internal Medicine Rotation Award**, which is awarded to the highest ranked rotation by internal medicine residents from PGY1-3. Hematology rotations consistently provide residents with an excellent clinical experience, while emphasizing teaching and supporting the objectives of learners at every level of training. Thank you to **Dr. Walker** and **Dr. Verhovsek** and to all faculty for their positive contributions to education.

This award will be presented at the Internal Medicine Research Day on Wednesday May 2, 2018.

Throughout his career, **Dr. John Kelton** has set an extraordinary example for outstanding achievement as a physician, scientist, teacher, administrator and fundraiser.

Please join in congratulating him on being awarded the honourary degree *Doctor of Science* from *Western University* at the upcoming ceremony in June.

Dr. Mark Crowther and **Dr. Wendy Lim** recently provided an editorial that accompanied a paper in the JACC that looked at whether liver status should be a major part of the decision when choosing an oral anticoagulant for stroke prevention in A-fib patients.

Click on the link below for further information: https://www.tctmd.com/news/no-increased-risk-serious-liver-injury-seen-noacs

Microbiology News

Dr. Mark Loeb and **Dr. Marek Smieja** are co-investigators with **Dr. Dominik Mertz** (Medicine, Principal Investigator) on a grant from the Hamilton Health Sciences RFA Program for "***Preventing Clostridium difficile infections by identifying asymptomatic carriers***".

This 3-year study will investigate the importance of people who carry the infection but have no symptoms, and how they may contribute to transmission and disease, with a goal of better preventing this common and serious healthcare-associated infection.

News from Pathology

Dr. Linda Kocovski, Assistant Professor, will be taking over the duties of *Director, Forensic Pathology Postgraduate Education Program* on July 1, 2018.

Dr. Kocovski is replacing **Dr. John Fernandes** who has held the Director role since the program's launch in 2011.

Quality News

The HRLMP underwent a successful Institute of Quality Management in Healthcare (IQMH) surveillance visit April 16 through April 23, 2018.

All our laboratories demonstrated our continued commitment to quality. Thank you for your work and interactions with the external assessors.