HAMILTON REGIONAL LABORATORY MEDICINE PROGRAM

LAB CONNECTIONS

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IN THIS ISSUE:

- The Division of Chemistry will be introducing a new approach to testing for alcohols at the HRLMP. Read the article below by Dr. Zeidler and colleagues to learn more.
- In our Quality Snapshot we explain the process for communicating critical values.

WHAT'S NEW?

- From Anatomical Pathology: "When a pathology case is to be referred for external consultation, a copy of the referral letter will be sent to the requesting (most responsible) physician."
- Amylase testing has been discontinued in acute pancreatitis

MIND THE GAP: An Update on Testing for Ethylene Glycol, Methanol and Other Toxic Alcohols at the HRLMP

The HRLMP will be changing the way that testing for ethylene glycol, methanol and other toxic alcohols is provided to the Hamilton community and to surrounding regional hospitals. As financial resources become more constrained, we will no longer be able to provide 24 hour, on-demand service for these analytes. This newsletter will briefly review the pathobiology of toxic alcohol poisoning and will introduce our new testing protocols.

Ethylene glycol (EG), methanol, and isopropyl alcohol ingestion is associated with significant morbidity and mortality if untreated. EG is a clear, odorless and sweet-tasting substance. It is a common constituent of antifreeze and de-icing compounds. EG is rapidly absorbed and peaks in 1 to 4 hours in the serum. Minimal lethal dose of EG for an adult is 1.0 to 1.5 mL/kg or 100 mL [1].

The liver metabolizes ~80% of the absorbed dose of EG which is first oxidized by alcohol dehydrogenase to glycolaldehyde and then to glycolic acid. The rate-limiting step however, is the slow conversion of glycolic acid to glyoxylic acid. Accumulation of these metabolites contributes to toxicity rather than EG itself [2]. Similarly, methanol is converted to formaldehyde and formic acid.

EG or methanol poisoning should be suspected in patients presenting with altered level of consciousness, severe metabolic acidosis with high anion gap and osmolar gap (OG), hypocalcaemia, and urine analysis showing oxalate crystals [3]. Absence of inebriation doesn't rule out toxic alcohol poisoning.

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YOUR FEEDBACK IS VALUED!

Your feedback, suggestions and new ideas are most welcome!

Initial testing in cases of suspected methanol or ethylene glycol ingestion should include electrolytes, glucose, urea, creatinine, osmolality, ethanol and blood gases. With these results, both the anion gap and the osmolar gap can be calculated. The presence of ethanol is easily detected. All four Core Laboratories in the HRLMP and many of the regional hospitals have an automated enzymatic assay available 24 hours a day. This test will not detect methanol or ethylene glycol.

The osmolar gap is calculated as follows with mmol/L as units:

Osmolar gap = Measured osmolality - ((2x [Na]) + [glucose] + [urea])

An OG of greater than 10 suggests the presence of a low molecular weight compound other than sodium and its associated anions, glucose or urea. This could be due to the low molecular weight alcohols including ethanol, methanol, isopropanol, and ethylene glycol.

Importantly, early in the course of ingestion, EG and methanol contribute to the significant OG, but as metabolites start forming, the OG disappears and the anion gap increases. Thus OG is only valuable early in the course of intoxication. Therefore, an OG of less than 10 does not rule out this condition. The anion gap is calculated as follows:

Anion gap = $[Na^+] – ([Cl^-] + [HCO_3^-])$

If the osmolar gap cannot be adequately accounted for by the ethanol concentration (multiplied by 1.25) and the index of suspicion remains moderate to high, then testing for the toxic alcohols is warranted. Similarly, an unexplained metabolic acidosis and a moderate to high index of suspicion should prompt testing.

Enzymatic methods for toxic alcohols often suffer from a lack of sensitivity, specificity and stability. Gas chromatography is labour intensive, but is the method of choice and used for the concurrent analysis of methanol, ethanol, isopropanol, acetone and ethylene glycol.

Our ordering protocol for ethylene glycol and methanol will soon change as follows:

For orders originating within HHS and SJHH facilities, these tests are available without restriction during regular hours (Monday – Friday 8:00 a.m. until 4:00 p.m). After hours and on weekends, orders will require consultation with the Biochemist on-call.

For orders originating in regional hospitals, all orders will require consultation with the biochemist on-call (905-521-2100 x 76443) **before** sending the specimen to the HRLMP. Please ensure that the front line tests have been performed and that toxic alcohol ingestion remains high in the differential diagnosis.

References :

1. Peterson DC, Collins AJ, Himes JM, et al. Ethylene glycol poisoning. Pharmacokinetics during therapy with ethanol and hemodialysis. N Engl J Med 1981; 304:21–3.
2. Barceloux DG, Krenzelok EP, Olson K, et al. American Academy of Clinical Toxicology Practice Guidelines on the Treatment of Ethylene Glycol Poisoning. Ad Hoc Committee. J Toxicol Clin Toxicol 1999; 37:537–60.
3. Megarbane B, Borron SW, Baud FJ. Current recommendations for treatment of severe toxic alcohol poisonings. Intensive Care Med 2005; 31:189–95.

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QUALITY SNAPSHOT:

Communicating Critical Test Results

MLT: *"Hello, may I speak to the nurse caring for Joseph Smith?"*
Business Clerk: *"Yes, one moment please"*
RN: *"Hello"*
MLT: *Hello, this is Jane Carter MLT from the lab. I have a critical test result on Joseph Smith. Are you his nurse?"*
RN: *"Yes, I am"*
MLT: *"May I have your full name and designation please?"*
RN: *"Carol Robinson, RN"*
MLT: *"I'd like to confirm the patient ID with you. The following result is on Joseph Smith. Joseph – J-O-S-E-P-H, Smith, S-M-I-T-H. His Unit number is 5546782. The critical test result is: Serum Potassium 7.2- seven-point-two. Can you please read back the patient identifiers and critical test result?"*
RN*: "The critical test result is for Joseph Smith. Joseph – J-O-S-E-P-H, Smith S-M-I-T-H. His Unit number is 5546782. The critical test result is: Serum Potassium 7.2 – seven, point, two."*
MLT: *"That is correct. Thank you. Goodbye"*

The above is a typical conversation held between a Medical Laboratory Technologist (MLT) and a Nurse. This communication of critical tests results is an important priority and responsibility of Medical Laboratory Technologists. On average, the laboratories of the Hamilton Regional Laboratory Medicine Program telephone ***one-hundred*** critical test results per day.

Ontario Laboratory Accreditation and good patient safety practice require laboratories to define levels for test results that are considered life-threatening and to maintain procedures for the management of these results. To meet these requirements, a "Reporting Critical Values" process and standard operating procedure are in place for specimens processed by the Laboratories of the Hamilton Regional Laboratory Medicine Program.

A critical test result is defined as a result that indicates the patient is in imminent danger of death, significant morbidity, or serious adverse consequences unless treatment is initiated *immediately*. These results require immediate interruptive notification of the most responsible physician or delegate who can initiate the appropriate clinical action for the patient. Often the laboratory telephones these results within the hospital setting to the nurse caring for the patient, who will then relay this information to the most responsible physician. A verification process using read-back and patient identification are standard at each communication step. This communication process is important (in the absence of notification technology) to ensure that the correct information for the correct patient is heard correctly by the receiver.

At present, there are a total of ***sixty-two*** Chemistry, Hematology and Microbiology tests with defined critical values that must be communicated. These values were established through survey and consultation with Medical staff within the Hamilton hospitals. The list does not preclude the use of professional judgment by the healthcare provider when results are considered to be detrimental to a patient (morbidity or mortality).

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TRAINING PROGRAMS:

- Congratulations to Clinical Chemistry fellows, Kun-Young Sohn and Matthew Henderson. Their abstracts have won a small travel award from the American Association for Clinical Chemistry to travel to the 2010 Annual Meeting.

- Laboratory Medicine, Resident Research Day 2010 will be held on May 20th, MDCL-3020.

- For more information and the latest news on the training program follow the link; http://www.fhs.mcmaster.ca/pathres/news/index.html.