HAMILTON REGIONAL LABORATORY MEDICINE PROGRAM

LAB CONNECTIONS

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IN THIS ISSUE

WHAT'S NEW?

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The Past, Present, and Future of Innovation in the Practice of Anatomical Pathology

The practice of anatomical pathology changed considerably in the late 19th and early 20th centuries with the discovery of special staining techniques that revealed new features and properties of many disease entities. For many, this was an exciting time as the breadth and depth of knowledge surged into new territory; for others, it was a time of uncertainty and even distrust in this new information. Over time experience caught up with these new techniques and those of practical value became staples of the histology laboratory, while those that were unreliable or proven irrelevant fell by the wayside. Anatomical pathology was launched forward again in the 1980s with the clinical implementation of immunohistochemical techniques, which again showed remarkable promise for expansion of a pathologist's diagnostic abilities but also aroused fear and trepidation at having to interpret these studies in a relative vacuum of experience. Just as with special histochemical stains, the value of most immunohistochemical stains became apparent and most anatomical pathologists learned to incorporate these studies into their daily practice to improve diagnostic accuracy and precision. Today it is difficult to find an anatomical pathologist that does not rely on special staining and immunohistochemistry in their daily practice.

Genetic analysis is driving the next great change in anatomical pathology. The value of genetic analysis became apparent in the middle of the last century when correlations between structural chromosomal changes and certain syndromes and abnormal phenotypes, such as Down syndrome, were demonstrated. The application of objective testing like karyotypic analysis to the diagnosis of entities that had previously been defined by more subjective means (i.e. phenotype) revolutionized the diagnosis of many of these diseases. Initial predictions suggested such testing would eliminate the need for other analyses; however, it was quickly realized that karyotyping was not without its faults: It was expensive, it was dependent on operator expertise, and perhaps most importantly these test results did not always agree with the phenotypes upon which they were initially defined. Nevertheless, for many entities, karyotyping became the gold standard and continues to be so today.

It was not long after the application of structural chromosomal analysis to the diagnosis of syndromic diseases that the same was applied to malignancies. Many tumors were subsequently discovered to have recurrent genetic abnormalities that could be useful in diagnosis. In some cases, such as synovial sarcoma (see accompanying image), the genetic abnormality is specific and considered by many to be pathognomonic. As such karyotyping of malignancies has become an important part of the diagnostic work up and in some cases the defining feature. At present, this is most evident in acute myeloid leukemia where the presence of particular genetic abnormalities has significant prognostic and treatment implications. This has led to the subtype of AML which had previously been defined by phenotypic means, to now defined by the specific genetic abnormality it carries to more closely correlate diagnosis with treatment and outcome.

The correlation of genetic abnormality to treatment and outcome in most instances of AML, has led to a groundswell of interest in attempting to define the genetic abnormalities inherent to other malignancies. Children's Oncology Group, of which McMaster Children's Hospital is a member, brings together multiple disciplines and centers to pool tissue, experience, and resources to do just that. The massive expansion in the availability and concomitant drop in cost of research-based technologies that have become clinically applicable to genetic analysis promises to further refine the understanding of the genetic changes that define malignancy. Microarray-based technologies and massively parallel sequencing are at the forefront of this change and promise to greatly enhance the resolution at which genetic abnormalities can be detected. Many of these technologies are presently used clinically or are employed by researchers at McMaster University where multiple collaborative efforts with clinicians, including anatomical pathologists, translate these technologies to clinical use. Just as the introduction of special staining and immunohistochemistry initially caused fear and confusion amongst many anatomical pathologists, the implementation of many of these new technologies is causing similar consternation as novel abnormalities of unclear significance are being detected. The cost, although much less than it initially was, also remains a concern particularly in the present context of hospitals struggling to contain ever shrinking budgets. Undoubtedly, as with all new methodologies, time and experience will fashion these novel diagnostic tests into efficient and remarkably useful tools to improve diagnosis, treatment, and prognosis.

The success to applying research based genomic evaluation tools to anatomical pathology has opened the door for other modalities. Perhaps the most interesting of these is mass spectrometric methods to analyze the proteome in certain disease states. The technology behind this is presently very expensive and the potential for clinical usefulness in anatomical pathology is in its infancy, but mass spectroscopy has already found clinical application in other areas such as microbe identification. Also on the horizon is the massively expanding database of RNA-based mechanisms that modulate gene expression, some of which appear to be involved in disease and may find clinical applications. The continued progress in the development of diagnostic modalities keeps the future of anatomical pathology, as it always has been, exciting.

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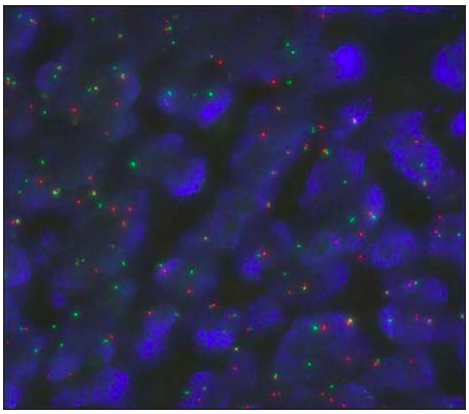


Fluorescent *in situ* hybridization (FISH) technique demonstrating the characteristic disruption (separated green and red signals) of the *SYT* gene in synovial sarcoma.

Education News

The Department of Pathology and Molecular Medicine at McMaster is pleased to welcome **Dr. Snezana Popovic** as the new Program Director for the Anatomical Pathology Resident Training Program. Dr. Popovic is taking over for **Dr. Monalisa Sur** who previously held this position for 7 years. Dr. Sur has done an outstanding job in building a quality AP program. Welcome to Dr. Popovic!

For information and the latest news on our residency training programs follow the link: http://fhs.mcmaster.ca/pathres/news/index.html

Information on the postdoctoral fellowship: http://fhs.mcmaster.ca/pathology/education/postdoctoralfellowshiptraining.html

Genetics News

Dr. Bekim Sadikovic was recruited by the HRLMP as Head of Advanced Molecular Diagnostics in 2012.

In taking up his appointment and service activities, Dr. Sadikovic has shown particular interest in cancer genetics and has taken responsibility for a significant component of the oncology workload in the genetic service. In recognition of his interest and activities in that area, we are pleased to announce that he now has the additional role of **Associate Head, Cancer Genetics**.

Congratulations to Dr. Sadikovic on this new role!

Hematology News

Congratulations to **Karen Moffat**! Karen has recently completed all of the requirements for her Master of Science in Health Research Methodology through McMaster University. She has also been promoted to the rank of Assistant Professor in the Department of Medicine. Karen continues to hold the position of technical specialist in Special Coagulation and is the supervisor of Special Hematology within the HRLMP.

It is with mixed emotion that we said farewell to **Andrew McFarlane** on August 30, 2013. Andrew had been the Technical Specialist for the Molecular Hematology Laboratory and has left to become the Hematology Consultant Technologist at QMP-LS. Andrew's work in Hamilton will continue in his role as Lecturer with the Department of Medicine, McMaster University.

Microbiology News

Microbiology continues to move towards automation, and we are on schedule to be up and running by February 2014. Most of the construction in the lab has been completed and the automated specimen processing systems will start arriving next week. We look forward to providing microbiology services for Joseph Brant Hospital on October 15 and wish to welcome the MLTs who are transferring to Hamilton with the work. Niagara Health System will be transferring their microbiology work to the HRLMP on November 1. It is a very exciting time for Microbiology in Hamilton!

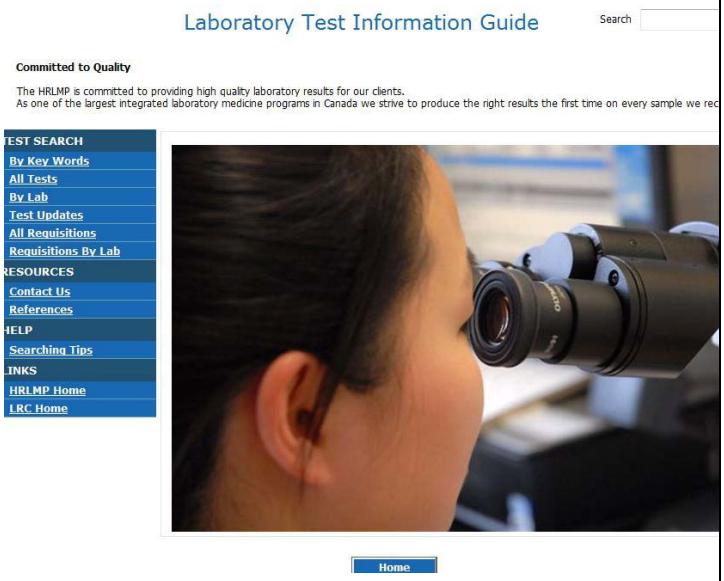
We will soon be changing the way we screen for urine culture. HRLMP currently uses urinalysis as a surrogate to determine which urines may be infected, and only urines which test positive for leukocyte esterase, red blood cells or nitrates are set up for culture. Within the next month urinalysis will be replaced by a culture based screening method. The Alfred HB&L system from Alifax detects bacterial growth in culture broth. Negative urines can be reported out in as early as 5 hours of incubation and positive urines will go on to routine culture. This screen method is sensitive and more specific than urinalysis. Watch for more information on this exciting change!

Hamilton will start transitioning from the charcoal-based culture swabs currently in use to E-swabs later this month. This change will improve patient care as E-swabs are more effective at picking up bacteria and releasing them for culture.

On Monday September 30 the Regional Virology Laboratory started performing PCR for Rhinovirus/Enterovirus as part of the current respiratory virus panel for nasopharyngeal swabs, bronchoalveolar lavage and other specimens submitted for respiratory virus PCR. Our Respiratory Virus panel currently includes a multiplex PCR for influenza A and B, Parainfluenza 1-3, RSV, metapneumovirus, adenovirus and a stand-alone enterovirus PCR.

HRLMP Updates

The HRLMP Laboratory Test Information Guide has been updated. Check out the new look!



We are pleased to announce the 6th Annual HRLMP Rapid Fire Showcase "**Emerging Technologies and Methodologies**" which is being held on Saturday October 26th 08:15-12:15 at SJH. Some of the topics include:

- POC and our little patients
- ALFRED in Microbiology
- 10 colour flow cytometry
- EBUS (endobronchial ultrasound) in cytology
- MERS – Middle Eastern Respiratory Syndrome

Mark your Calendars…….

HRLMP Open Staff Forums

Tuesday November 19, 2013
10:15 to 11:15
Host site: JCC Auditorium (A4-4)
Videoconferencing
MUMC 2G61
HGH Theater Auditorium
SJH Stelco Amphitheatre
King Street Campus Room 2314

11:45-12:45
Host site: SJH Stelco Amphitheatre
Videoconferencing
JCC Auditorium A4-4
MUMC 2G61
King Street Campus Room 2314