### 2016 Annual Report





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Submitted by: Dr. Christopher Naugler Associate Professor and Head Department of Pathology & Laboratory Medicine University of Calgary, Cumming School of Medicine Alberta Health Services - Calgary Zone

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> > Content Prepared by: Christopher Naugler Sherry Mount Shawna Symington

Submissions from: Division/Section Heads Managers Supervisors

### **Executive Summary**

### Department Structure and Organization

The Department of Pathology & Laboratory Medicine (DPLM) comprises the medical and scientific staff for Calgary Laboratory Services (CLS). Throughout 2016 it was composed of 6 CLS Divisions and had 84 primary clinical MD appointees and 11 clinical PhD scientists. There were 27 members with University of Calgary GFT and 69 with Clinical Faculty appointments. The Medical/Scientific staff are located at all 5 acute-care hospital sites, at CLS' central laboratory facility the Diagnostic & Scientific Centre (DSC), and at the University of Calgary Health Sciences Centre, Heritage Medical Research Building, and Health Research Innovation Centre.

### Accomplishments and Highlights

The major clinical accomplishments of each of the 6 Divisions are described individually in the report and are too numerous to list here. Academically, 2016 was a record year for publications despite an overall reduction in research FTEs. Our residency training programs and fellowship training programs also continue to thrive.

### Challenges

CLS performs >30 million laboratory tests per year. Every year, we face the challenge of providing increased services without proportionate increases in funding. Operationally, our biggest challenges are capital funding and space limitations in acute care sites and the DSC.

### Workforce Planning

Because pathology and laboratory medicine is a service to other specialities, we have no ability to control our own workload, as this is determined by numbers of surgical procedures, orders for laboratory tests, etc. Since laboratory physicians are not fee for service, there is no simple mechanism to fund new positions based upon workload expansion. There is a need to look at laboratory workforce planning from a provincial perspective and ensure that there are adequate clinical FTEs in place to safely handle the increasing workloads.

### **Quality Programs**

CLS' comprehensive quality assurance program is based on a Quality Management System model designed to support high quality, cost-effective laboratory services with a strong focus on patient safety. Laboratory-wide performance indicators are reported monthly and there are formal systems in place for serious adverse events, and patient concerns reporting and resolutions. CLS continues to support provincial laboratory services standardization initiatives including the implementation of the province-wide Anatomic Pathology Quality Assurance Plan.

### Future Directions and Initiatives

The year 2017 will see the recruitment of several new pathologists to fill areas of acute need and replace recent retirements. A number of exciting research initiatives are underway and we will continue to work toward improved integration of laboratory services from a provincial perspective.

WAN

Christopher Naugler, MD Head, Department of Pathology & Laboratory Medicine University of Calgary Cumming School of Medicine/Alberta Health Services – Calgary Zone

Governance

It should be noted that Clinical Sections & Section Chiefs are Divisions and Division Heads in the U of C organizational structure.

# AHS CALGARY ZONE DEPARTMENT OF PATHOLOGY & LABORATORY MEDICINE



March 6, 2016



## **CLS Governance and Reporting Structure**



Cancer Pathology Lead

February, 2017

### Departmental Committees

### CLS Medical Advisory Committee/AHS Calgary Zone Medical Executive Committee

Dr. Leland Baskin, VP of Medical Operations, CLS & Clinical Section Chief, Transfusion Medicine, Co-Chair Dr. Christopher Naugler, Zone Clinical Department Head (ZCDH), DPLM & Medical Director, CLS, Co-Chair Dr. Ranjit Waghray, Clinical Section Chief, Anatomic Pathology/Cytopathology (DSC) Dr. Hossein Sadrzadeh, Clinical Section Chief, Clinical Biochemistry (DSC) Dr. Ethan Flynn, Clinical Section Chief, General Pathology (DSC) Dr. Meer-Taher Shabani-Rad, Clinical Section Chief, Hematology (FMC) Dr. Deirdre Church, Clinical Section Chief, Microbiology (DSC) Dr. Travis Ogilvie, AP Site Leader, Foothills Medical Centre (FMC) Dr. Andrew Schell, AP Site Leader, Peter Lougheed Centre (PLC) Dr. Andrzej Kulaga AP Site Leader, Rockyview General Hospital (RGH) Dr. Marie-Anne Brundler, AP Site Leader, Alberta Children's Hospital (ACH) Dr. Steve Gorombey, AP Site Leader, Diagnostic & Scientific Centre (DSC) Dr. Karl Anders, AP Site Leader, South Health Campus (SHC) Ms. Tammy Hofer, Acting Chief Operating Officer, CLS Mr. Dale Gray, VP Technical Operations, CLS Ms. Sandy Broen-Dupuis, Quality Manager, CLS

Laboratory Services Calgary Zone Quality Assurance Subcommittee of the Laboratory Services Provincial Quality Assurance Committee

Dr. Anna Sienko, Chair, Lead Cancer Pathologist Calgary Zone, CLS Dr. Leland Baskin, VP of Medical Operations, Deputy Medical Director, CLS Mr. Dale Gray, VP Technical Operations, CLS Dr. Lisa DiFrancesco, CLS Pathologist Dr. Ranjit Waghray, AP/Cyto Clinical Section Chief Dr. Maire Duggan, CLS Pathologist Ms. Patricia Boutilier, Clinical Safety Advisor, CLS Ms. Sandra Eyton-Jones, Zone/Program Quality Coordinator, CLS Ms. Denise LaPerle, Provincial Anatomic Pathology Quality Lead Dr. Christopher Naugler, Zone Clinical Dept Head, Pathology & Laboratory, Medical Director CLS Ms. Tammy Hofer, Interim Chief Operating Officer, CLS

### CLS Department of Pathology & Laboratory Medicine Business Meeting

This is a quarterly meeting of all laboratory medicine medical and scientific staff in the Region. Co-chaired by the Department Head and CLS VP Medical Operations.

### Anatomic Pathology Residency Training Committee

Dr. Carolin Teman, Co-Program Director Dr. Amy Bromley, Co-Program Director Dr. Travis Ogilvie Dr. Iwona Auer-Grzesiak Dr. Margaret Kelly Dr. Charlene Hunter Dr. Bamidele Adeagbo Dr. Shaun Medlicott Dr. Sandra Lee Dr. Kyle Kurek Dr. Byung Kim Dr. Davinder Sidhu Dr. Christopher Naugler Dr. Lisa DiFrancesco Dr. Marie Dvorakova Junior Resident (rotates) Chief Resident (rotates)

### General Pathology Residency Training Committee

Dr. Davinder Sidhu – Program Director Dr. Christopher Naugler Dr. Amid Abdullah Dr. Carolin Teman Dr. Iwona Auer Dr. Alex Chin Dr. Wilson Chan (Interim) Dr. Heidi Paulin Dr. Bamidele Adeagbo Dr. Amy Thommasen

### Microbiology Residency Training Committee

Dr. Julie Carson – Program Director Dr. Wilson Chan – Interim Program Director Dr. Andrew Johnson Dr. Rupesh Chawla Dr. Joseph Kim Dr. Raymond Tellier Dr. Davinder Sidhu Dr. Dan Gregson

### Neuropathology Residency Training Committee

Dr. Leslie Hamilton – Program Director Dr. Lothar Resch – Assistant Program Director Dr. Jeffrey Joseph Dr. Jennifer Chan Dr. Denise Ng Dr. Tera Jones Dr. Marie-Anne Brundler Dr. Christopher Naugler (ex-officio) Chief Resident (residents' representative)

### Fellowship Committee

Dr. Christopher Naugler (Interim Chair) Dr. Carolin Teman Dr. Davinder Sidhu Dr. Jessica Boyd Dr. Walid Mourad

### Divisions, Sections and/or Programs

Alberta Health Services Clinical Sections/University of Calgary, Cumming School of Medicine Divisions:

Clinical Section/Division, Anatomic Pathology/Cytopathology Clinical Section Chief/Division Head, Dr. Ranjit Waghray Clinical Section/Division, Clinical Biochemistry Clinical Section Chief/Division Head, Dr. Hossein Sadrzadeh Clinical Section/Division, General Pathology Clinical Section Chief/Division Head, Dr. Ethan Flynn Clinical Section/Division, Hematopathology Clinical Section Chief/Division Head, Dr. Meer-Taher Shabani-Rad Clinical Section/Division, Microbiology Clinical Section Chief/Division Head, Dr. Deirdre Church Clinical Section, Transfusion Medicine Clinical Section Chief/Division Head, Dr. Leland Baskin

### Membership (Appendix 1.1)

### Clinical Service (by Section)

### Anatomical Pathology/Cytopathology Section (AP/Cyto)

### Workload

	2016 Specimens	% change (vs. 2015)
Anatomic Pathology (blocks)	549,066	+0.3%
Cytopathology	202,765	-5.5%
Non-Gyne Cytology	12,043	-1.8%

### Equipment

- A tissue microarray instrument was acquired to construct TMA blocks to be used as on slide positive controls for immunohistochemistry (IHC). Project to begin once the Dako/Millennium interface is in place as this will eliminate the need for Immuno staff to double label all IHC slides.
- Acquisition of a fifth Omnis immunostainer is in progress as the four are fully used.
- The AP lab at McCaig Tower (FMC) went live with the Vantage Barcode Tracking System in February 2016 and successfully passed accreditation post move from the 11th floor.
- Acquisition of mass array instrumentation pending for Molecular Pathology has been approved by Executive.
- Vantage Barcode Tracking System was implemented in the FMC Morgue and the FMC Research desk in December.

### **New Projects**

- AP Process Excellence TAT Project.
- An implementation committee was formed and met biweekly during 2016.
- Quick wins were identified and implemented to improve workflow efficiency.
- Paperless workflow is currently being trialed at SHC; a project team with frontline staff has been formed to identify obstacles and investigate potential resolution. First meeting to occur in January 2017.
- The implementation of the interface for Dako and Millennium presented multiple challenges. A revised code from Cerner was finally delivered in December; initial testing was successful in validating an immunohistochemistry stain order at the Dako instrument in the Millennium Cert environment (end to end testing). We are expecting to begin full Cert validation mid to late January, 2017.
- Evening shift at SHC was implemented in July to assist with improving overall TAT.
- Monthly Vantage reports are generated by the AP Project Coordinator to monitor the "case assembly" volumes at all sites
- 43% of special stains have been automated on the Artisan special stainers. The evening shift at the DSC is being trained on the instruments to allow special stain requests to be performed in the evening.
- AP Process Excellence Clerical TAT project:
  - Implementation committee was formed and met biweekly during 2016.
  - Quick wins were identified and implemented to improve workflow efficiency.
  - Standardization opportunities are being investigated as medical transcriptionists (MTs).type for all sites. Several grossing templates have been reviewed by the Specialty groups and standardized.
  - Requisition scanning into DocVue is being performed in Accessioning at SHC, RGH and the DSC to allow the MTs to focus their efforts on transcription.
  - Individual productivity is being monitored with the goal of establishing a higher daily benchmark. AHS has established a productivity benchmark at 85 minutes/day.

### **Quality Reviews**

- CLS is currently compliant with and actively participating in the AHS APQA plan.
- CLS is also actively participating in the development of the AHS Cytopathology QA plan.

### Fiscal Responsibility

- RFP for slide labels was released in November. Sample trial in progress.
- Hologic was awarded the RFP for both the Liquid Base Cytology and HPV platform. Contract is yet to be finalized. Cost savings with the new reagent lease agreements estimated at \$335,963.00 annually based on F2016 volumes.
- Gyne samples have decreased in volume by 4.7% over 2015. As a result, a Cytotechnologist maternity leave position has not been backfilled.

### **Process Reviews**

- A workflow analysis was completed in Cytology Data Entry to identify improvement opportunities.
- An AP Data Maintenance audit enhancement was developed to capture patient discrepancies.

### Staff

- New AP Supervisor for FMC & ACH hired in October.
- New Laboratory Director for Immunopathology was appointed Dr. Paul Klonowski.
- New Specialty Group Leader for Dermpath was appointed Dr. Charlene Hunter.
- New Dermatopathologist recruited Dr. Michelle Schneider.
- New Cytopathology Supervisor, Tracey Jarvis, hired in August.
- New Clerical Supervisor, Angela Jager, hired in April.
- New Cytopathology Specialty Group Leader, was appointed Dr. Marie Dvorakova.
- Two new Cytopathologists recruited were unable to start work in 2016.
- Cytogeneticist recruited requested start date for February 1, 2017 Dr. Catherine Li.
- MLT IIs at ACH, RGH and PLC were replaced with a Path Tech II or Pathology Scientist as the former model of MLT IIs at the sites was not utilizing the full skill set of the MLTs. Grossing only sites are better suited to be staffed with grossers vs MLTs.

### **Technical Updates**

- Gastric Her2Neu testing to be performed provincially at CLS once validated February 2017 target
- A team from Roche performed post "go-live" assessments at sites that went live with the barcode tracking system in 2015. Feedback from the team indicated CLS was a model site and one of the best labs they have had the privilege of reviewing. One of the Pathology Scientists was interviewed by Roche for a white paper on gross dissection best practice.
- Neuro autopsy work is being transferred to CLS from the Edmonton Zone starting December 12th for approximately 8 months due to a Neuropathologist vacancy.
- The AP Provincial requisition is still pending.

### **Clinical Biochemistry Section**

### Faculty

- Dr. Richard Krause was diagnosed with cancer in summer of 2016 and passed away on October 25, 2016. He worked at CLS for over three decades and was in charge of Quality Control and Quality Assurance department in the chemistry section as well as general chemistry lab at DSC.
- Dr. Allison Venner, PhD Clinical Biochemist was hired to fill the vacant role of quality control lead. Dr. Venner received her PhD from U of Calgary and her training in clinical biochemistry from University of Toronto. Dr. Venner worked as a clinical biochemist at Red Deer from 2011 to 2016. Dr. Venner Joined CLS in January 2017.
- Laboratory Scientist, Hanan Awad, MS started her job as a new lab scientist in toxicology in November 2016.
- Dr. Lawrence de Koning passed the CACB oral exam and is now the Fellow of the Canadian Association of Clinical Biochemist.
- Dr. Jessica Boyd passed the CACB oral exam and is now the Fellow of the Canadian Association of Clinical Biochemist.
- Dr. Alex Chin passed the CACB oral exam and is now the Fellow of the Canadian Association of Clinical Biochemist. Dr. Alex Chin has been actively involved in training in immunology including attending workshops and meetings and regular sign outs with Dr. Marvin Fritzler at MADL.

### Research

- Alberta Tomorrow Project. Biochemistry section won a contract to test approximately 31,000 specimens for 15 different tests in serum, whole blood and urine. In this study, subjects will be followed for three years. Tests are: Albumin, ALT, Creatinine, Cholesterol, HDL/LDL/non-HDL, Triglycerides, hsCRP, TSH, FT4, Ferritin, HBA1C, Urine Creatinine, Urine albumin (formerly called Microalbumin), Urine Na and Urine K. Testing for the specimens should start in March 2017.
- Canadian Longitudinal Study on Aging (CLSA). Testing started in May 2016 and has been continued smoothly.
- Pegasus first trimester screening research project sponsored by Perkin Elmer continues.
- Active vitamin B12 project (PI, Dr. Hossein Sadrzadeh) started in late 2016 and continues in 2017. The results of this study can help to improve utilization of this test, especially in elderly population, by eliminating the need for other tests such as Homocysteine and Methylmalonic acid to confirm B12 deficiency.
- Thyrotropin receptor antibody (TSI) project (PI, Dr. Sadrzadeh) has been approved by the sponsor and we are looking for an endocrinologist collaborator to start in early 2017. The study will evaluate the diagnostic and prognostic potentials of TSI (a chimeric test to measure anti TSH receptor antibody) to diagnose Graves' Disease and follow the patients during therapy. TSI from Siemens will be compared with TRAB the current assay on Roche. The initial approved budget for this project is \$70,000 and may increase to \$140,000.
- Myeloma project (PI, Dr. Sadrzadeh). This study has been designed to investigate the prognostic potential of a new test panel in patients with multiple myeloma. The study was funded by the Binding Site (\$25,000).
- CLS Grant Competition (PI, Dr. Jessica Boyd, Co-PI, Dr. Sadrzadeh received) \$30,000 to study analysis of everolimus and other immunosuppressants from dried blood spots.
- CLS Summer Undergraduate Studentship (\$5200) (PI, Dr. Isolde Seiden-Long) awarded to William Nguyen under the supervision of Dr. Seiden-Long. Project title: "Improving Specimen Stability for Ammonia Testing.
- Graduate student- Deema Qasrawi, graduate student started to work with Dr. Sadrzadeh. Her project is to develop a LC-MS/MS method to detect 6 steroids simultaneously from dried blood spot and liquid blood specimens. This method will be used to detect Congenital Adrenal Hyperplasia. Currently, these tests are sent to a reference lab.
- An undergraduate summer student, Stephanie Chin, completed several projects in toxicology including a utilization analysis of vitamin A and E testing and converting our drug standard logs to an electronic format.
- Graduate student, Michael Gerling (2014-2016), MSc Pathologists Assistant program worked with Dr. de Koning on using lab test data to refined prognostication in coronary artery disease.
- Undergraduate student, Michael Korostensky, BSc, worked with Dr. Lawrence de Koning on development of a quantitative fecal fat test based on microscopy and automated image analysis.
- Establishing reference intervals for chemistry tests in Alberta. This committee has been established to harmonize all the tests across the province. Committee members are: Hossein Sadrzadeh, Trefor Higgin, Jessica Gifford, Yury Butorin, Allison Venner and Colleen Band. So far, the work on electrolytes, creatinine, albumin and total protein has been completed.
- Establishing reference intervals for thyroid markers in different trimesters during pregnancy, Drs. Alex Chin, Richard Krause and Donovan were the investigators.
- Alberta Precision Health Initiative Development Grant (PI, Dr. de Koning) January 2017 Registration "Developing real-time laboratory data-based risk estimation for precision care of patients with coronary artery disease" 2017-2018 (Submitted Jan 16 2017).

### Clinical Trials (outside CLS)

- Alberta Tomorrow Project. Biochemistry section won a contract to test approximately 31,000 specimens for 15 different tests in serum, whole blood and urine. In this study, subjects will be followed for three years. Tests are: Albumin, ALT, Creatinine, Cholesterol, HDL/LDL/non-HDL, Triglycerides, hsCRP, TSH, FT4, Ferritin, HBA1C, Urine Creatinine, Urine albumin (formerly called Microalbumin), Urine Na and Urine K. Testing for the specimens should start in March 2017.
- Canadian Longitudinal Study on Aging (CLSA). Testing started in May 2016 and has been continued smoothly.
- Pegasus first trimester screening research project sponsored by Perkin Elmer continues.

### Clinical Studies by the Faculty

- Active vitamin B12 project (PI, Dr. Sadrzadeh) started in late 2016 and continues in 2017. The results of this study can help to improve utilization of this test, especially in elderly population, by eliminating the need for other tests such as Homocysteine and Methylmalonic acid to confirm B12 deficiency.
- Thyrotropin receptor antibody (TSI) project (PI, Dr. Hossein Sadrzadeh) has been approved by the sponsor and we are

looking for endocrinologist collaborator to start in early 2017. The study will evaluate the diagnostic and prognostic potentials of TSI (a chimeric test to measure anti TSH receptor antibody) to diagnose Graves' Disease and follow the patients during therapy. TSI from Siemens will be compared with TRAB the current assay on Roche. The initial approved budget for this project is \$70,000 and may increase to \$140,000.

- Myeloma project (PI, Dr. Sadrzadeh). This study has been designed to investigate the prognostic potential of a new test panel in patients with multiple myeloma. The study was funded by the Binding Site (\$25,000).
- CLS Grant Competition (PI, Dr. Sadrzadeh, \$40,000) to support a graduate student- Deema Qasrawi, to work with Dr. Sadrzadeh to develop a LC-MS/MS method for detecting and measuring 6 steroids simultaneously from dried blood spots and liquid blood specimens. This method will be used to detect Congenital Adrenal Hyperplasia. Currently, these tests are sent to a reference lab.
- CLS Grant Competition Drs. Boyd and Sadrzadeh received \$33,523.88 to develop a method to analyze four immunosuppressant drugs from whole blood or dried blood spots using 96 well plate technology.
- CLS Summer Undergraduate Studentship (\$5200) (PI, Dr. Seiden-Long) awarded to William Nguyen under the supervision of Dr. Seiden-Long. Project title: "Improving Specimen Stability for Ammonia Testing.
- An undergraduate summer student, Stephanie Chin, completed several projects in toxicology including a utilization analysis of vitamin A and E testing and converting our drug standard logs to an electronic format.
- Graduate student, Michael Gerling (2014-2016), MSc Pathologists Assistant program worked with Dr. de Koning on using lab test data to refined prognostication in coronary artery disease.
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- Establishing reference intervals for thyroid markers in different trimesters during pregnancy, Drs. Chin. Krause and Donovan were the investigators.
- Alberta Precision Health Initiative Development Grant (PI, Dr. de Koning) January 2017 Registration "Developing real-time laboratory data-based risk estimation for precision care of patients with coronary artery disease" 2017-2018 (Submitted Jan 16, 2017).
- Alberta Maternal, Newborn, Child and Youth Strategic Clinical Network Research Competition (Drs. Boyd and Sadrzadeh) "Development of a liquid chromatography tandem mass spectrometry method for detection of drugs of abuse in human breast milk" (Submitted October 2016).
- Alberta Maternal, Newborn, Child and Youth Strategic Clinical Network Research Competition (Drs. Gifford, Boyd and Sadrzadeh) "Improved maternal and child malnutrition assessment through the development of high sensitivity liquid-chromatography tandem mass-spectrometry methods." (Submitted October 2016).

### New Instruments

- The new Waters LC-MS/MS system has been installed in the laboratory (after two years of waiting). The instrument is being evaluated and should be ready for testing patient specimens in April, 2017.
- The new Hamilton Nimbus automated liquid handling system has been installed. This system will significantly improve our specimen processing operation. The sample processing for the LC-MS/MS urine drugs of abuse assay has been validated and was implemented for clinical service in November.
- Connectivity. Currently, all of our toxicology results are reported manually. Results from LC-MS.MS and GC-MS are manually entered into Millennium. This has not only taken a great deal of highly skilled technologists' time, but has also caused many postanalytical errors. We have been working with Data Innovation to develop a middleware, so that all the results from LC-MS/MS can be directly reported to our LIS. This project should be completed by June 2017.
- New Osmometer A2O implemented and evaluated at PLC in Jun 2016.

### New tests

- Mitogen Advanced Diagnostic Laboratory (MADL)-Work continues with MADL to transfer more tests to CLS. ENA testing has been transferred to CLS on June 2, 2016 and is done on the BioPlex.
- Cannabinoids confirmation moved from GC-MS to LC-MS/MS in April 2016. The new method has an extended linear range reducing the number of repeats performed.
- Fentanyl slide screen implemented April 1, 2016.
- New HBT instrument implemented. The run time is much shorter than on the old instrument so samples can be run faster.

- Transfer of Fluids testing from DSC to RRLS.
- Acetaminophen method updates.
- Lithium testing moved from DSC to FMC.
- Implementation of tube recapper at FMC.
- Successful move and accreditation of McCaig tower lab by CPSA with no impact to patient care in Jan 2016.

### Fellowship Update

- Drs. Sadrzadeh and Chin are the new Co-Directors of the program.
- COMACC Approval. Commission on Accreditation in Clinical Chemistry (COMACC) inspected our program in May 2016 and has accredited our program till 2020. CLS and University of Toronto are the only two clinical chemistry training programs in Canada that are accredited by both CACB and COMACC.
- Dr. Dennis Orton accepted a clinical biochemist position at DJ Coady and Associates in Surrey, BC.
- Dr. Orton successfully passed the written CACB exam. He will take the oral in fall 2017
- Dr. Gifford, our Chief Fellow, will complete her training in June 2017.
- Dr. Gifford accepted a position of clinical biochemist at DynaLife Lab in Edmonton.
- We have received many applications for 2017-2019. Drs. Boyd, Chin and Sadrzadeh reviewed the applications and selected three applicants for telephone interview and three applicants for in person interview.

### Utilization/Process Excellence

• Major utilization work was initiated in early 2016 to eliminate or significantly reduce the number of "comprehensive drug screen" ordered by the caregivers at methadone clinics. The comprehensive screen which is done on GC-MS screens for over 400 different drugs. It takes an experienced tech at least 10 minutes just to interpret and report the results of each sample. Least estimated cost was \$120 per sample. The high volume of comprehensive screens caused toxicology lab to be behind on its daily service with an average backlog of 550 samples. That affected both the patient care and the morale among the lab staff.

Drs. Boyd and Sadrzadeh studied the testing patterns at all the addiction clinics and determined the number of positive result for each clinic. After meeting and consultation with all the caregivers in opioid dependency clinics in our territory, we developed a new panel for each clinic based on their lab result history. The number of tests for the new panels ranged from 8 to 23 drugs (depending on the clinic and the patient population), which was significantly less than previous 400 drugs. Also, the new process significantly improved patient care by reducing the turn-around time (TAT) from 60 days to 5 days. All the physicians at the above clinics are very happy with the new system. The new panels for urine drug screening for those clinics were developed on LC-MS/MS system.

We are in the process of completely removing drug screen by immunoassays (expensive and non-specific) and running all the screens by LC-MS/MS (one step testing for screen, confirmation and quantification). This will result in more savings of at least \$340,000.

- Conclusion: This approach improved patient care by significantly reducing TAT and resulted in an approximate savings of about \$1.4 million per year. If we had not changed to LC-MS/MS from GC-MS and not restricted the comprehensive screen, our cost for testing would have been greater than \$2.1 million in 2016 and greater than \$2.4 million for 2017. Plus, our backlog would likely be greater than 2000 specimens (at least five months behind) which would have had a significant negative patient impact, and decreased morale among staff.
- Process Excellence performed workflow analysis of the immunosuppressants bench (B Bench). Trialed two different workflows over two months. Selected 7 am start with coverage until 5 pm on Monday and 4 pm on Tues, Weds, Thurs, Fri.

### **General Pathology Section**

The General Pathology Section has medical oversight for CLS Pre-Analytical and Post-Analytical activities, including Operational Services (including Accessions and Outpatient Labs), Community Services (including 19 Patient Service Centres), and Client Services (including Records Management, Client Interface Team, Patient Appointment Line, Mobile Collection Services, Laboratory Information Centre); as well as medical oversight for the 4 Health Care Testing Laboratories (HCTL), 9 Calgary Zone Rural Laboratories (CRL), and the 4 Calgary Zone Rapid Response Laboratories (RRL).

Due to CLS organizational restructuring, Process Excellence/Data Integrity ceased to be under the General Pathology section as of Dec 1, 2016. Process Excellence was merged into a Functional Centre with Quality Department; Lab Analytics Team transferred to Corporate Services. These areas continue to function with respective Manager-Medical Director dyads.

### Community Services

- PSC Patient Wait Times Project ongoing Ranchlands PSC now additionally open Saturdays 0700-1515 for appointment-only patients as of June 18, 2016. This has been well received by our patients. Appointment slots are being utilized.
- Process Excellence project for Patient Wait Times and PSC Scheduling: Kaizen event held and Airdrie PSC identified as trial site. Trial commenced the week of October 11, 2016. Project expanded to Market Mall PSC November 2016. Process continues to be accessed before being rolled out to all sites. Site schedules being reviewed to ensure consistency of staff and optimization of worked hours.
- Refugee patients were seen at Marlborough PSC appointment times blocked in for these patients mostly through first influx. Marlborough continues to support the Mosaic refugee clinic and the process in place appears to be successful. Any future intakes of refugee families will have to be reassessed as current process may not be able to sustain or manage the additional volume. To help manage huge intake and ensure the families received their results in a timely manner CLS worked with the clinics and CLS stakeholders. On February 8, 2016 two satellite sites were opened in Sunridge Family Medicine and East Calgary Centre. The Alex Community Health Centre had assistance for pediatric collections and the Marlborough Patient Service Centre (PSC) supported the Mosaic group. The satellite sites were staffed primarily with PSC employees who offered to work additional shifts and some of which were fluent in Arabic. Even with the complexity of the immigration process, the logistics and challenges were met. As of March 31, the clinics closed, the target had been met and CLS had served 679 refugees.
- PSC staff schedules adjusted to ensure better patient flow at opening when largest influx of patients occurs.
- Additional appointment slots were added to Riverbend PSC.
- Worked with Chemistry and Microbiology Clinical Sections for introduction of H. pylori stool collection in adults, to decrease Urea breath test appointments, to improve patient care and reduce wait times for appointments for Urea breath test. Working with the Clinical Section Chiefs of Microbiology and Chemistry to implement the change.
- Changes made to Orientation of New Hires implemented in April 2016 indicated success. Staff appeared to be more proficient and confident.
- Effective Sept 24, Supervisory portfolios were adjusted to ensure a more equitable number of staff.
- Work continued with CLS Communication and AHS Diversity group to assist the diverse patient population.
- Implementation of One Flow at Glenbrook, South Calgary, Avenida, and Market Mall PSCs has been tentatively withdrawn pending the outcome of the Process Excellence Patient Wait Time event.
- Hours at Chestermere were adjusted to increase patient appointment availability.
- Cost savings initiative with Purchasing reduced the need of special glove orders.
- Completed work with Chemistry Section on new processes with Fecal Immunochemical Test (FIT), and Glucose Pregnancy Tolerance Test cutoffs.
- Improved protocols for dealing with illegible lab requisitions worked with other provincial labs who are interested in following CLS's lead on this.
- Continuing work on updating CLS Intranet, including document transfers from the old I-Web primarily involving PSC, Mobile, EH+S.
- PSC and Mobile Collection Services Internal Audit completed by December 2016.
- Working on aligning signage across all PSCs (collection areas, patient waiting rooms) to make sure signage is approved and consistent at all PSC sites. This is being phased in to the sites with the support of Facilities to prevent additional costs of rework such as painting, patching, etc. 80% of sites are completed as of the end of 2016.
- Employee engagement working with the PSC front line staff on providing input on engagement and looking at areas to focus on in 2017.
- Worked with Organizational Development on In-service for team leads: customer service and conflict management. Conducted December 20th and will help staff when dealing with upset patients and addressing patient expectations. April 2017 next session for remainder of MLA IIs and Designates.
- Working with Clinical Biochemistry section and on communication to patients at PSCs on high-dose biotin interference with lab tests (HUTV, signage in waiting areas).
- ECGs: Netcare interface to TeleMed implemented so now all physicians with Netcare access have access to new ECGs (previously was ECG reader only) this cuts down on repeat ECGs being done on ED patients because ED physicians now have direct access to recent ECGs. Improves patient continuity of care.
- ECG learning modules (General Overview, ECG Escalations) were rolled out in November to MLA staff, in collaboration with C-Era, with the second phase being developed as of the end of 2016.
- We have an ECG Escalation process which has been very effective and has improved patient care and expedited their treatment.

- Respectful Workplace HR policy has been shared with PSC Site Leaders and Leadership Group. Working to develop a plan on how to roll the policy out to all staff within the PSCs.
- Site schedules are now electronic which allows staff easy access to their schedules and save on paper copy print. Schedules are current and up to date and include vacations to help staff when planning request for time off.

### **Client Services**

### Laboratory Information Centre (LIC)

- Developed a database of common questions and answers for quick reference for LIC MLTs to standardize customer response for infrequently asked questions and to provide quick access to reference information not stored in SoftTech such as CLS memos for process changes.
- Introduced secure electronic storage of LIC phone and fax logs. This reduced paper utilization by eliminating the paper logs and eliminated the need for off-site storage. This also improves our ability to search phone records for any follow up required which has led to a reduction time required for investigations.
- Introduced a telephone call quality monitoring system for LIC MLTs & clerks. Staff are provided monthly feedback regarding their incoming calls. Calls are monitored to identify opportunities for improved efficiency, education or training gaps, and for process improvement opportunities.
- Developed individual monthly workload metrics for all LIC staff. This includes call volume, call length, and stat and critical queue completion rates for each month.
- Arranged Netcare access for most LIC MLTs. This provides another avenue for LIC MLTs to find information to respond to telephone calls when information is difficult to find or is unavailable in Millennium.
- Introduced new process for communicating with DSC Accession re: add on requests. These requests were previously faxed from LIC to DSC Accession. An electronic form was developed which is sent to printer in DSC Accession. This process is more secure, faxing is reduced and final product is more legible for DSC Accession staff to manage the request. Will roll this process out to RRLs within the next few months.
- AD13-1.57 Sending and Receiving a Fax was updated to allow the faxing of Medical HIV results to Health Care Providers involved in the patient's care.

### Patient Appointment Line (PAL)

- Moved the Patient Appointment Line Frequently Asked Questions from the CLS external website to the Patient Appointment Booking System. FAQ pages now are mobile optimized and easier for patients to locate and read on mobile devices.
- Provided in house Excel and Outlook education sessions for PAL staff using knowledgeable peers. Increased knowledge and engagement with staff, without incurring any cost.
- Arranged additional Immigration Appointments for Syrian Refugees.
- Added 0830-1645 shift to cover heavier call volumes; this has resulted in PAL surpassing service metrics for answering 80% calls within 90 sec for 11 months out of 12; also having less than 7% abandoned calls in the last 12 months.
- Client Interface Team (CIT).
- Developed Overlay Tracking spreadsheet to provide accurate statistics to provide opportunities for targeted information to work to reduce the number of overlays.
- Worked closely with project teams to implement a paperless reporting system for Ambulatory Clinics on SCM. This project has led to a reduction of approximately 105,000 paper reports to date (93,000 in 2016 alone).
- Supported the transition to new Micro testing process for CT/GC by providing education sessions to high volume users (E.g. Urgent Care sites, Emergency Departments, sexual health clinics).
- Worked with Anti-Coag Clinic to change reporting process. Now printing an hourly permanent report instead of an interim Expedite report. This reduced duplication and improved service level.
- Developed and implemented process to follow up with Chiropractors who have ordered lab tests in an effort to educate and reduce the number of orders received from unauthorized health care providers.
- Supported new paid test process in Flow Cytometry by accepting responsibility to be the first point of contact for out of province requests for Flow Cytometry testing.
- Presented Overlay education session to the Calgary Rural Lab group to help them better understand overlays and how to handle them.
- A problem was identified that impacted paper cessation; when Unknown Physician was left as the ordering, a paper chart printed and results did not file into the correct ordering physician's SCM Inbox. At the instigation of CIT, Operational and Community Services implemented a new rule November 1, 2016 for Clinibase encounters in Millennium to warn users that the ordering physician was Unknown Physician and it must be changed to the correct ordering physician. This process change resulted in a dramatic decrease in "Unknown Physician" from 1165 occurrences January

through October 2016, to only 12 occurrences in November-December 2016, for the paperless SCM Ambulatory Clinics. If the analysis were extrapolated for all Clinibase encounters, the improvement would be even more impressive.

### **Records Management:**

### Data Integrity Team

- Reduced paper consumption.
- Utilizing dual computer monitors.
- Vacation/ time away requests submitted, stored and responded to electronically.
- Printing double sided when applicable.
- Utilizing Microsoft Sticky notes replacing "post it" notes.
- Fix and demographic groups began saving errors electronically and transfer to client is completed by email or internally on the "T" drive.
- Stopped printing a number of daily audits.
- A number of audits were reviewed to ensure the right information was be captured and refined to eliminate data that was of no value.
- Utilizing electronic solution for saving documents rather than printing .
- DIT Demographic team is fully cross trained to work on all demographic audits and Meditech LIS corrections. All team members have started to train in overlays.
- Departmental cross training.
- Physician Fix group was trained on several demographic audits.
- Some Fix Group members were trained in provider build area and currently alternate between the Physician Fix and Build areas.
- There has been continual collaboration and team work with ProvLab North accession staff to streamline and standardize Millennium patient registration procedures.
- Inventory controls were established for office supplies.
- A 5 S audit was conducted in the department to standardize workstations. A quarterly audit is conducted to sustain the changes.
- Developed a new procedure to update notification to the Medical Officer of Health (MOH) to support ProvLab notifiable process.
- Incorporated Meditech e-mails into DM Support e-mail to facilitate maintaining Meditech skillset and number of hours each team member monitors the shared e-mail address.
- Modified Correct Ord or Con Dr Cerner Command Language (CCL) in Explorer Menu to have search option changed from provider number only to both provider number and physician name.
- Created new CCL for CLSA Study to capture order entry errors and ensure success for data pull, as request was made for the charts to not print.
- Worked with Telemed to align ECG Vitalflo print template with Netcare template. Netcare originally displayed 10 comment lines and Vitalflo displayed 2 lines.
- Updated the Cancel Chart CCL to recognize 14 characters. Clinibase numbers were being left off on chart print.
- Updated the Health Care Provider information package for new clients to align with the Intranet physician information. The package was reduced from a ten to two page information package.
- Created warning messages in Millennium LIS Modify Person to capture unique life identifier (ULI) discrepancies not previously captured.
- A 5 S audit was conducted in the department to standardize workstations. A quarterly audit is conducted to sustain the changes.
- Reviewed and updated document retention for cost savings opportunities and reduced future Off-site storage costs.

### Records

- The DSC basement report storage was reorganized to reflect the new records retention guidelines.
- A review of requests for laboratory result greater than one year was conducted to ensure that clients with access to Netcare have legitimate report requests to Records Department. Clients are encouraged to access Netcare whenever possible.
- Records staff now fax request for results through the Lab Information System whenever possible.
- All Records staff have been trained in refiling of tissue blocks and slides to ensure timely transfer to off-site storage.
- Retention changes/ updates to Iron Mountain database (offsite storage) are submitted at the time of the annual trim.

### Mailroom

- A system was set up to continually monitor/ screen reports for correct courier routes and client addresses. Problems identified are sent to DIT Build group for correction.
- Staff are continually monitoring reports sent by Canada Post and identifying opportunities for electronic report distribution.

### Optical Scanning

- Continual monitoring and feedback to pre-exam regarding the use staples, paper clips and missing bar codes.
- Monthly report cards of requisition deficiencies are sent to all collections sites. Quarterly reporting is being presented at PSC leadership meetings.
- Cross training staff members from other areas (Records, Mailroom) were trained in Optical scanning to support staffing/operational needs in the department.

### Mobile Collection Services

- Data entry of Long Term Care (LTC) requisitions was transferred from CLS DSC accession team to the Mobile Collections office staff in the Fall of 2016.
- Updated the Mobile Collections requisitions, Mobile Patient Reassessment form, Information for Physicians and the CLS External website align and standardize the eligibility criteria.
- Mobile collector binder that contained hardcopy reference documents for all LTC and Supportive Living (SL) facilities was transferred to contact cards for easy access by Mobile cellular phones.
- New training checklists were developed for clerical staff.
- Standard Operating Procedures (SOPs) have been created for the mobile office.
- A spread sheet was developed for controlled inventory to align netbooks to the recorders.
- Mobile Medical Lab Assistant (MLA) Blackberry phones were migrated to Samsung Galaxy phones.
- An initiative was undertaken to ensure that a copy of all ECGs for LTC patients is sent to the ordering facility.

### Clinical Education

- MLT pass rate for June 2016 CSMLS exam: 98% / National Average for accredited programs: 96.2%.
- Currently have 24 SAIT MLA students performing practicum at CLS.
- Currently have 40 MLT students performing practicums at CLS.
- As of Oct 18, 2016 CLS hired: 36 ABES MLA graduates and all 36 are still employed. 38 SAIT MLA graduates were hired of which 36 are still employed. 15 MLT graduates were hired and are still employed.
- SAIT is applying to CSMLS to make their MLA program an accredited program as is the MLT program.
- Dr .Howard Waldner is the new Dean of the School of Health and Public Safety at SAIT (Oct 2016).
- Dr. Hossein Sadrzadeh (Clinical Section Chief, Clinical Biochemistry Division, CLS) and Anita Bamford (Manager, Clinical Education, CLS) are both voting members of the SAIT MLA and MLT Advisory Committee (Anita Bamford chairs the committee).

### Health Centre Testing Laboratories (HCTL)

- ACL Top coagulation analyzer instruments were in production at Cochrane Community Health Centre (CCHC), Airdrie Community Health Centre (ACHC), South Calgary Health Centre (SCHC) and Sheldon Chumir Health Centre (SMCHC) as of September 21, 2016.
- D-Dimer testing removed from the Mini-Vidas now tested on TOP 300.
- By close of 2016, LH500 hematology analyzers will be replaced with Sysmex XNL550 analyzers. Validation and MLT training completed in December and go-live planned for January 23, 2017.
- Ongoing discussions with AHS on lab support/operations for Airdrie Community Health Centre conversion to 24/7 operation (planned for early April 2017). Working collaboratively with AHS, CLXTs will be hired to cover both DI and Lab on the night shift as a cost savings initiative.
- HCTL continues to meet the targets as established in the TAT metrics.
- HCTL Supervisor meets regularly with AHS Urgent Care Centres and Outpatient Renal Clinics working through issues resulting in an enhanced spirit of collaboration.
- With the installation of a generator at Sheldon Chumir Health Centre, loss of power occurred for several hours. HCTL Supervisor successfully maintained services during that period.
- 2016 workload increases of 2.72% at Airdrie Testing Lab, 0.79% at South Calgary Testing Lab and 0.67% at Cochrane Testing Lab.
- HCTL successfully passed CLS Internal Audit June 2016.

- As of December, Sheldon Chumir Testing Lab is the alternate site for BHCG and Troponin testing when Biotin Interference is suspected in emergent cases.
- HCTL Supervisor organized clot curve TeleHealth presentation by IL to CLS & Rural Hematology staff.
- HCTL near completion of removing paper version of SOPs.
- Clinibase conversion at Airdrie Community Health Centre October 24.
- Four new Excyte instruments received February.
- Revision to the CSART requisition in collaboration with CLS and AHS Stakeholders.
- Started transport of Blood products through the Pneumatic Tube system at Sheldon Chumir.
- Dr. Ethan Flynn presented blood smear in-service to staff at all four HCTL sites.
- Collaborative effort with AHS for Renal Dialysis expansion at Sheldon Chumir.

### **Operational Services**

### **QSE:** Organization

- First initiative for Provincial Laboratory / CLS interlab improvements. Review and enhancement of CLS Guide to Services. Proposed for ProvLab pages to have succinct referral lab heading, a link to ProvLab GTS and will describe only CLS / CRL necessary information related to specimen collection and handling. Work on-going into 2017.
- In Aug 2016 PLC Accession met with ED and Women's health and facilitated change for these areas to order endocervical swabs from PLC facility central stores, with projected CLS estimated savings of \$8K per year.

### QSE: Customer Focus

- Adapted demand model utilized at PSCs as best practice implementation at SHC (Aug 2016) and FMC Special Services Building (SSB) Outpatient (Oct 2016) collections. Workload staffing balance model redeploys staff from Inpatient collections during peak Outpatient collection times with small effect to Inpatient routine TAT. SHC and FMC SSB Outpatient laboratory Patient Wait Times (PWT) meeting targets and sustained since implementation.
- Aug 2016 PLC OP Lab initiated internal PE event assessing waste processes and flow. New processes implemented and standard work have improved PWT to meet targets with positive staff feedback.
- FMC Accession, May 27, 2016 McCaig laboratory tour for Roberta McCombie and Tamalee Andersen, members of AHS Infection Prevention & Control (IP&C), to familiarize both with laboratory design and accredited laboratory processes as they are to be consulting on a laboratory project in the future. Tours of Anatomical Pathology (AP), General Laboratory and Specialty Areas included a focus on quality control and laboratory safety and evolved into questions about the struggles overcome with a major laboratory move, especially in regards to safety, for example wax on floors from AP, the distance in Accession's receiving area and the safety issues with mobile shelving units. Accommodating this request strengthens our already positive relationship with IP&C and allows shared information to apply to their future laboratory design and safety.
- November 2016: LifeMark Aftercare program in support of anonymous physician drug testing has been expanded from RGH only, to all Calgary Zone hospitals.
- Service Level Agreement, procedure and safety impact assessments developed upon request from Rotary Flames House: Children's Hospital and Palliative Care Services, to provide phlebotomy services, testing and blood products. Estimated start of service Feb 2017.
- SHC, FMC, RGH, PLC Accession sites collaborated with the respective Emergency Departments' Process Improvement and patient flow.

### **QSE:** Safety and Facilities

- January 2016: Full move of laboratory services to McCaig building from Main building at FMC Site. This is a culmination of 8 years of planning for the new space and planning for the execution of the move. Successfully moved with no known negative impacts to patient care or services.
- June 2016 ACH: ACH Accession completed initiative to ensure that all MLA's have a pair of their own fitted safety glasses/goggles. This initiative helps to further protect our employees and promote a culture of safety in the workplace.
- Continued work on Calgary Cancer Centre Project, Statement of Requirements (SOR) and Request for Proposal (RFP).
- Referrals laboratory RFP work on-going.
- Safe Phlebotomy On Time (SPOT on) poster: In collaboration with EH&S, and based on CLS Accident/Incident Data, a poster outlining employee safety risks during phlebotomy was created and published with input from PreExamination CLS/CRL and Human Factors. SPOT poster is associated with CLS Venipuncture procedure and training. Poster was also shared with SAIT and ABES educators and CLS orientation so that the poster can be used for proactive safety measures, training, and education to help prevent needle stick injuries.

- Hand Hygiene: continued progression with Hand Hygiene initiatives including select Accession MLA's trained in AHS auditing at each hospital. Outpatient Labs now included onto the AHS Hand Hygiene (HH) Portal as separate units. OP Labs now can post HH monthly compliance rates in the customer waiting room. Monthly reports pulled by CLS Ops Services advanced user, for reporting in CLS Safety Index. Consistent achievement of >90% compliance rates for Hand Hygiene.
- Influenza vaccination preparedness: All hospital sites involved in staff education and awareness for improved rates of employee vaccination. Staff scheduling altered in some cases to ensure continuity of provision of services. Daily updates on quarantined units provided, to ensure appropriate coverage.
- Viral Hemorrhagic Fever (VHF) preparedness at ACH and SHC: continual update of procedures and supporting documents. Simulations drills held to ensure staff awareness.

### QSE: Personnel

- All Accession areas sent MLA I's to the SAIT preceptor day on May 10th and MLA IIs to the Head Preceptor training at the DSC on Feb 24th and 26th as a recognition of excellent work and dedication to their jobs and to encourage front line staff to become more engaged in preceptor training. The power point presented at the head preceptor training was slightly altered and emailed to all of the MLA I's at FMC to view. This allows MLA Is and MLA IIs to improve their preceptor skills and provides a better understanding of preceptor expectations which can lead to stronger students and future CLS employees.
- Stakeholder and input on CLS Respectful Workplace Taskforce, for review and update of CLS Respectful Workplace policy. Roll out of updated policy CLS wide in Jan 2017.
- Appreciative Inquiry or World Café Sessions used at all sites for improved staff engagement and team building.
- Nov/Dec 2016 FMC: Team building session with MLA IIs. To increase resilience and adaptability to change with the MLA IIs, a Christmas Potluck and teambuilding session was conducted by supervisors using material from Leadership courses. Wellness and Stress Reduction were important topics for leading themselves and others through rapid change initiatives. Session included improving coaching skills by incorporating concepts from Speed of Trust, Respectful Workplace, Conflict Management, and the Stew Model.
- Nov/Dec 2016 FMC: Team building session on evening shift. Results/Behaviour model used to help MLA's focus on their own performance and meet expectations in both technical and behavioural expectations. Performance expectations on Results/Behaviour then matched to CLS's Performance Matrix. Expectations emphasized on teamwork, personal leadership and contributing to improving their team and adding positively to the workplace culture.
- All sites implementation of Team Huddles at shift start. Opportunity to check in and disseminate immediate information and patient safety learnings from RLS's or incident review, or employee safety learnings.
- May 2016 SHC: Team building session for all employees. Expectations emphasized on teamwork, personal leadership and contributing to improving their team and adding positively to the workplace culture.
- RGH Test Your knowledge Soft Tech exercises Q&A engagement during Team Huddles (standing item Team Huddle).
- RGH Online staffing schedule implemented centralizes scheduling, improving efficiency.

### QSE: Purchasing/Inventory

- Nov 2016 FMC: Since the move to McCaig building, the Main building 6th Floor touchdown space had supply inventory levels that were not being sufficiently rotated ending up in expired blood collection tubes or inventory. Inventory was organized and labelled for min and max levels after auditing inventory usage, flats for tubes used to track expiry dates, non-routine tubes not stored. This resulted in less waste, better inventory management, and ability to share supplies at all RRL sites before expiry dates. Inventory system was incorporated onto the 7th floor McCaig Accession area.
- July 2016: CLS transitioned to Medline Gloves, with considerable cost savings. New system of assessment in place for glove sensitivities.
- Butterfly needle usage initiatives to reduce costs and unnecessary usage, include staff education, sign out processes. Evaluations in progress to assess success in reduction of unnecessary butterfly needle use.
- Review and delineation of standard administrative supplies template: standardize, remove unnecessary discretionary items, and allow for operational related items only, with the goal to reduce costs of admin supplies.

### **QSE:** Equipment

• Movement of centrifuges not in use at SHC to RGH as per demand.

### QSE: Process Management

- Sept 2016 DSC: Implemented tagging chemistry racks according to color clock with reusable tags, to reflect time of delivery to Chemistry. This is QSE process improvement and economic value add as this saves \$300/month as disposable labels are no longer used.
- Sept 2016 DSC: DSC Accession now participates in annual Chemistry fellowship rotations by providing a tour and information regarding preanalytical processes, including Referrals. QSE personnel and Customer Value Added (CVA).
- QI project: Clinical Nursing Education tool Blood Collection video completed by Dr. Lawrence de Koning (Clinical Chemist), to reduce hemolyzed specimens. Consultation with PreAnalytics Quality Coordinators. Video shared with PreAnalytics Network on September 29 2016, CLS Communications placed link to video on CLS website on October 28, 2016.
- ILLTEST orderable activated to capture 'unreadable' tests on requisitions, or unidentified tests on requisitions with notification to ordering physician of such, and quarterly auditing of frequency.
- LEAN procedure development underway at DSC Accessions for bucket/canister unpacking.
- Sept 2016: Referrals Improvement and roll out of Referrals Test menu.
- Update to Guide to Services (GTS) pages for ease and centralized system for Mitogen Advanced Diagnostics Laboratory (MADL) test menu.
- Nunavut sample testing ended Dec 2016 = transferred to DynaLife Edmonton.
- Sept 2016 simplification of MADL report distribution.
- Aug 2016: in collaboration with Sunrise Clinical Manager (SCM) Ambulatory, and Patient Service Centre (PSC) Manager, impact review and assessment of feasibility for PSC's to utilize SCM requisitions or SCM Orders. For the use of Ambulatory Clinics to utilize SCM for laboratory order entry.
- RGH Accession, Rapid Response Lab (RRL) technical collaboration with NICU to reduce CBC clotted specimens.
- Standing Order Update use of SOPO orderable (Jan 2016) to align with PSC practice. When SOPO is entered it produces a label with an accession # that has all the orderables needed to enter into the standing order database. The accession # is used to track the original date and time the standing order request was received. Whoever enters the requisition into the standing order database scans the accession number within the function and it captures all the originally entered information such as ordering physician, priority and location to assist with the data entry.
- Biotin interference: collaboration with Clinical Chemistry to ensure communication plan and process in place to mitigate risks of biotin interference in clinical biochemistry lab testing.
- Collaboration with Microbiology, Chemistry, Client Services, Community Services to transition some testing from Urea Breath Test to H. pylori Antigen stool testing, to reduce costs while maintaining appropriate utilization and clinical care.
- Collaboration with Millennium Information Technology (IT), Client Services, Community Services to assess reduce number of unknown physicians and incorrect physicians on Clinibase encounters. Implementation of "unknown physician flag" in Millennium along with education system has significantly reduced occurrences.
- Microbiology requisitions without encounter or location information, collaboration with Diagnostic Imaging (DI) to ensure correct information on requisition. Proposed by DI to have Millennium-based label – still pending implementation.
- Collaboration with Clinical Biochemistry section on Galactosemia screens collections on Newborn Metabolic Screening (NMS) cards. Changes to GTS made.
- DSC Accession Implementation of services for CLS.
- DSC Accession: project review to provide services for Alberta's Tomorrow Project.
- Continued participation in AHS PreAnalytics Network, meeting monthly.
- South Zone East and West, implementation of significant additional workload to DSC Accession on the night shift.

### QSE: Document or Records

• New procedure and checklist developed in response to patient safety events.

### QSE: Information Management

- Specimen bucket lids transported by non-CLS couriers (Greyhound, taxi cab, Silver Star courier, AHS volunteer) will be secured by cable ties, in application of transport of materials with confidential protected health information. Hazard assessment has been updated to include risk of cutting cable ties.
- System set up for centralized retention of Cerner Millennium Preanalytics testing scripts and Millennium testing coordination assigned, in collaboration with PSC's testing coordinator.
- Collaboration with Millennium IT to change pending discharge flag in SCM to include nurse collected requests to ASAP.

- DSC collaboration with UofA Referrals bench to have Millennium portal for data entry of tests sent to CLS. Training and implementation pending equipment install at University of Alberta.
- Implementation of change to Extractable Nuclear Antigen antibodies (ENA) testing from MADL to CLS, with new orderables.
- Millennium system upgraded to versions 0.48 and 0.51, with corresponding downtimes during upgrades.

### QSE: Nonconforming Event Management

- Nov/Dec 2016 FMC: Changes to specimen receiving intake bench as improvement from AHS Reporting and Learning System (RLS) reports of samples being sent back to sending location resulting in delay of testing. All incoming buckets whether they contain samples or are buckets being returned to FMC are all dropped off at one bench. Outcome: all buckets are now checked for samples, no confusion for couriers or porters or staff. No RLSs for samples being sent back and not being unloaded since this change was made.
- Identification (ID) Band trial at RGH, in collaboration with site Safety office and CLS safety office. Goal: Reduce the frequency of patients having no ID band, or illegible ID band. Accent the nursing accountability to pro-actively ID band the patient in all cases, and where not possible for a clinical reason, then a CLS Patient Safety Phlebotomy Alert (PSPA) form is completed, indicating the reason. RGH data: 107 forms in 2015; 31 forms in 2016 and none in December 2016. Early 2017, pre-data collection in progress at other Calgary Zone hospitals, with the intent to roll out the new system in first quarter of 2017.
- Systemic review of ACH request-to-draw turnaround time (TAT). Analysis shows low number of data points, and delays due to systems external to CLS control (i.e. assistance with holding, patient with physician, unavailable) as phlebotomists respond appropriately. No RLS of customer complaints of response delays.
- Sept 2016 PE led trial with Richmond Road Diagnostic and Treatment Centre (RRDTC) re: end to end tracking of specimens from RRDTC to DSC.
- Patient safety review and recommendations ongoing, related to tracking and handling of AP and other precious specimens such as Bronchioloalveolar lavage (BAL) and Bronchial Wash specimens.
- Collaboration with Calgary Zone Newborn Metabolic Screening (NMS) Coordinator, to improve system and updating of NMS checklist to reduce error rates on NMS cards.
- Complaints related to HbA1c from endocrinologists: investigations reveal systems were adhered to in most cases in Operational Services. Collaboration with Clinical Biochemistry Section to create new orderable "approval by endocrinologist" pending implementation in Feb 2017. Millennium cancel time periods were adjusted for women due to complaints from endocrinologists.

### QSE: Assessments

### QSE: Continual Improvement

- Feb 2016, DSC review of work flow triggers and redeployment systems from unpacking to Data Entry, to proactively plan to reduce workflow bottlenecks.
- Jan 2016, calculation and development of DSC individual and department productivity goals for data entry.
- Nov/Dec 2016 FMC: Outpatient Lab schedule adjustments to reduce the cumulative effects of backlog from the morning peak volume time. A minor change in staffing for 1 hour each morning, resulted in a considerable improvement in the backlog and patient wait time. By adding 2 extra team members to SSB from 0730-0830 on Mondays, one being the outpatient MLA II. Break times and roster adjusted to balance duties.
- Nov/Dec 2016 FMC: Schedule optimization and creation of master schedule with goal to improve regular rotation through all duties reducing costs, time, need for re-training of staff while improving employee competency and proficiency. Proactive work to prepare department for future growth and flexibility to schedule staff where needed.
- DSC Accession: Collaboration with LIC to change add-on process to reduce faxing and instead print directly to DSC Accessions printer, with improved readability. Roll out to RRLs pending.
- Dec 2016, Continued review of hourly workload/staffing modelling and optimization at ACH, FMC, SHC, PLC, RGH to optimally schedule staff according to workload and cycle times, and to reduce hours worked where possible.
- Fecal Immunochemical Test (FIT) cancellations: Dec 2016, aligned with PSC systems to cancel FIT testing as appropriate.
- DSC best practice implemented for standard work for bucket/canister unpacking.

• Jan - Dec 2016 FMC: McCaig Phlebotomy Dispatch review Workflow- Since the move to McCaig, the increased tracking of phlebotomists and communication to phlebotomists in order to dispatch orders had caused an increase in Request-to-Draw TATs for Stat collections as well as an inefficient use of resources. Three PE trials ensued, with the final implementation of Stat Collectors, flexible break times, a workload/staffing review and changes in the dispatch process with reduced reliance on Vocera, paging, phone calls, and tracking of phlebotomists.

### Calgary Rural Labs

### Quality: Enhancing Quality in HealthCare

- Ammonia rerouted from DSC to SHC to improve TAT.
- Changed CSF routing to FMC and DSC in May 2016.
- Clinitek Advantus settings re-examined to decrease unnecessary microscopic examinations.
- Installed new coagulation analyzers; 3 purchased for Black Diamond, Claresholm and Banff, and 3 refurbished and placed in Okotoks, Vulcan and Didsbury; operational as of October 2016.

### Access: Support Increased Access to Healthcare System

• Rectified scheduling issues pertaining to distribution of FTE in High River, Okotoks and Canmore to improve shift coverage, patient care, and staff satisfaction.

### Sustainability: Provide Value to the Healthcare System

- Merged Tech III and rural LIS Tech II responsibilities in Claresholm resulting in cost savings.
- 0.5 FTE eliminated in Claresholm through attrition, 0.2 FTE transferred to Diagnostic. Imaging to help support hiring of Combined Laboratory and X-Ray technologist for evening shift.
- Introduced an evening shift/on call exclusive Combined Laboratory and X-Ray Technologist at Vulcan and Claresholm, shared cost with Diagnostic Imaging to eliminate the requirement for two technologists to staff the departments.
- Discontinued GEM 3500 blood gas analyzer and installed iSTAT analyzer at Vulcan and Black Diamond for cost savings.
- Discontinuation of malaria testing at High River, rerouted to DSC.

### Innovation: Pursue creative solutions to demands in healthcare

- Community volunteer drivers implemented at Claresholm.
- Implementation of loan agreements for patient Holter equipment to encourage compliance of return and tracking of loaned equipment in Didsbury.
- Implemented KanBan inventory management system in Okotoks outpatient service area.

### Training and Education

- CRL staff are now completing TDG training on Traccess allowing supervisors to monitor staff competency (Participated as CLS pilot group).
- All CRL Senior Technologists have completed the Understanding Yourself as a Leader educational course.
- High River lab accepted a SAIT MLT student for clinical pre-examination rotation.
- 2 High River lab staff and 2 Canmore General Hospital lab staff went to Peter Lougheed Centre in late September to work with NICU Respiratory Technologists to observe the process for capillary blood gas collection.

### Lab Analytics Team

### Infrastructure - Laboratory Provincial Data Warehouse (Consolidated Laboratory Data Repository, CLDR)

- The data warehouse (CLDR) is now receiving daily extracts from all six Meditech Systems, Millennium and Sunquest. Extracts are loaded daily into the CLDR and available immediately for analytics, including a live connection to Tableau reporting in some instances.
- Across all AHS analytics users, the CLDR is the fourth most in-demand repository of ~40 clinical analytics sources. A provincial Secondary Use Data Policy has been developed to share and integrate datasets across departments. Limited pilots are ongoing under the draft policy which will permit laboratory data to be accessed by non-Laboratory analysts.

### Insight – Regular Reporting

- Provincial test volume reporting has been adjusted to daily reporting, resulting in a 15-45 day improvement in timeliness of information. Meditech has been added to a new provincially standard Patient Wait Time report. PWTs are reported daily across all Calgary zone sites. Meditech and Sunquest data are being conformed to allow for daily PWT reporting.
- Majority of Key Metrics Reports charts have been migrated to Tableau, typically as part of a new or existing provincially-standard metric.

- A project-specific Tableau dashboard was created to support the CLS wait time improvement PE project at the PSCs. This dashboard features daily early-morning updates of wait times and patient volumes. Additionally, in the same dashboard, the third-next-available appointment is updated weekly, and productivity is updated bi-weekly.Fractile (percentile) reporting has replaced percentage-meeting-target reporting. The difference between target and actual performance is measurable in time, and different targets can be considered without redrawing the chart. The raw underlying data is immediately available for ad-hoc investigation of outliers and other patterns.
- APQA reporting (including the Tableau dashboard) was published in the Canadian Journal of Pathology (Issue 8-3), and we have taken ownership of the reporting under the AP Workload Measurement System, defined by CAP-ACP.

### Inquiry – Ad-Hoc Data Requests

• Three hundred seven (307) Requests for Data (RFD) were completed in 2016, a 15% increase over 2015. Twenty six (26) were for research purposes, an increase of 62% from 2015. Half of all requests were completed in less than 18 days. RFD complexity is increasing as more general-purpose data becomes available on Tableau, and the easy-to-answer questions are answered without an RFD.

### Rockyview General Hospital (RGH) RRL

- The successful implementation, validation, and installation of Tango Analyzer for type and screen testing in Transfusion Medicine.
- Acquired two new plasma thawers in Transfusion Medicine through F2016 Capital Equipment funding.
- Reconfigured the space within the laboratory to accommodate the Tango Analyzer without costly renovations.
- Decreased traffic flow through TM by moving lockers outside of lab and changing the old break room to two office areas, and freeing up more lab working space.
- Acquired the previous doctor's lounge for a much needed larger break room for all lab staff. This included a TV, 2 leather couches, coffee tables and extra locker space, where the previous lunch room had a table and 5 chairs.
- Completion of 5S project to decrease clutter and increase line of vision for a much more open space.
- Removal of unused drying oven in wash up area and eventual storage area for Accession carts, freeing up space in Accession and increased safety by reducing tripping hazards and clutter.
- Removal of 2 benches in Hematology for installation of Sysmex analyzer with minimal impact to workflow. Ongoing training for go live date Feb 2017.
- Audit and process change for NICU baby collections. 2 year project completed with best practices implemented by nursing to draw their own collections to improve specimen integrity and reduce recollects. RRL MLA redeployed to cover urine bench from 7-8 AM. Reduction of draws in NICU for Accession staff.
- Achieved overall savings of targeted amount of \$53,121.00 for F2017.
- Implemented electronic schedule for easy access to staff working off-shifts and part-time.
- Osmometer sample cups introduced by Chemistry Tech II, to realize a savings of \$14,000 between FMC and RGH.
- Two MLTs cross-trained in 3 departments.
- Ongoing training of student MLTs with 18 students trained in Chemistry and Hematology since January 2016.

### South Health Campus (SHC) RRL

- Validated, installed and retrained staff for new Excyte 20 that uses plastic tubes instead of glass.
- Need less QC poured for plastic ESR tubes as tests are now more stable. Only one set required per month instead of 2 required for previous glass tubes.
- Training Secondary Backup for Tech II in each department to assist with mentorship and succession planning.
- Took on extra students to facilitate renovations at other sites for new Sysmex analyzers.
- Coordinated creation and LIS validation of new Body Fluid Referral worksheet that will track smears referred to the Hematopathologists. Go-live to coincide with WAM in early 2017.
- Major revision to how critical comments are appended to INR and PTT. Annual RRL competency monitored all staff competent on this change.
- Staff and students attended an Instrumentation Laboratory (IL) clot curve presentation.
- Training began on self-directed payroll (ESS).
- Dr. Flynn (General Pathologist) departed SHC site, requiring Hematology to send all peripheral blood smears for Pathologist review off-site to FMC.
- Funding changes for poc-Hi analyzer used for suspected Viral Hemorrhagic Fever (VHF) patients reverted to Hematology department functional centre from project funding.
- Participation and fundraising in SHC Run in September.
- Tech II attended advanced Cellavision/Sysmex workshop.

- Updated SHC RRL computers and Cellavision to accommodate Windows7.
- Tech II investment in reviewing Financial reports to ensure accurate billing in each dept.
- Began shipping the more stable CAP surveys in bulk first to DSC, then redistributed by courier from DSC to each RRL site to save shipping dollars.
- Finalized and published the new PBS referral rules that resulted in a 70% decrease in the number of SHC peripheral blood smears needing to be referred for Hematopathologist review.
- Cycle Time Bar Chart and Workload Balancing Changes to float start time and break times on day shift post cycle time evaluation-which resulted in a more efficient use of staff time.
- Region-wide evaluation of waste from ACL TOP analyzers for volume of azides being disposed.
- Started monitoring the room temperature where coagulation and hematology reagents are stored, to improve accreditation readiness.
- Software upgrade to 3.1.0 on DxH Hematology analyzers.
- Implementation of Troubleshooting Log for minor troubleshooting on DXH analyzers-no need to fill out OP7005 every time minor troubleshooting takes place; less documents to review and store.
- Multi-head microscope education sessions with Hematopathology Clinical Section Chief Dr. Rad for senior Hematology staff.
- Implementation of Transfix tubes at collection site for CSFs requiring Flow Cytometry, resulting in improved specimen integrity.
- Participation by staff in SHC YMCA/Wellness Fitness Challenge.
- Turn around report created for Stat Hematology differentials.
- Repatriation of centrifuge to Microbiology for \$15K cost avoidance.
- SHC iChem Urine Analyzer was sent to DSC to temporarily replace their damaged one. SHC was sent a refurbished analyzer as a replacement. This analyzer was validated but will not be put into service until the DI interface can be installed sometime in 2017.
- Abaxis Piccolo Xpress Chemistry analyzer for suspected VHF patients CAP survey enrolment was discontinued for 2017. Under instruction from Dr. De Koning (Clinical Chemist) we will perform inter-site correlations instead. This will satisfy any accreditation requirement.
- On March 22, RRLs began performing fluid testing for ALB, BilT, Electrolytes, CA, Gluc, Total Protein, LD, Lip, Crea, Phos, Urea, and Urate. Each of these analytes was validated on the Cobas 6000 at each site.
- June 2016 Discontinued printing results for the GEM 4000 blood gas analyzers, a cost saving initiative.
- SOPs were removed from the bench. There are quick reference documents still on the Cobas bench, but most documents are accessed through SoftTech.
- Sept 1 Mnemonic for BHCG on the iSTAT was developed (WBBHCG) and is now available in Millennium, for suspected VHF patients.
- October 31, 2016 Provincial-wide discontinuation of Fetal Fibronectin testing. All devices, supplies, and documents pulled from the RRL bench.
- Ebola simulation (SHC RRL) performed April 2016.
- December 1 Changed TAT from <70 min to <90 min for Transfusion Type & Screen.
- Layout change/re-organization of analyzer for safety shields Moved Tango Blood Bank analyzer in order to facilitate face shield usage during specimen uncorking, improving lab safety.
- Participated in MLT job fair (June) with staff involvement (poster creation).
- TM Product Notifications at print out changed (all sites except CRL) for Calgary Zone so that PRBC, platelet/plasma has one, and derivatives (RhIg, albumin, etc), based AHS Human Factors recommendations.
- Early 2016: Primex remote temperature monitoring sensors installed for satellite TM Product refrigerators (ED, OR, Day Medicine).
- No more Avid on Tango and no longer washing blood cells and platelets cost savings No more panels for Tango, etc.
- Staff Competencies Completed for 2016.
- Collaboration with SHC ED to improve TM service for Rural coming into site there is now a list in ED as to what hospitals can accept type & screen (e.g. Lethbridge T&S not accepted at SHC).
- Southern Calgary Zone Rural sites now get more blood products (such as Platelets) from SHC rather than FMC. This reduces travel time for blood products and increases efficiency.
- RRL bench phones: SHC RRL supervisor phone placed on speed-dial improving efficiency during busy MLT times when Supervisor assists with contacting extra MLTs to come in Process improvement.
- Call list for short notice made and posted in Lab to increase efficiency in times of crisis.

- Worked with Calgary Zone Ob/Gyn Department on initiative to reduce number of unnecessary type & screens from Calgary Zone Maternity patients.
- TSO office visited SHC and conducted education for ED for new hires.
- Travelling huddle implemented to improve communication during shift transitions.

### Alberta Children's Hospital (ACH) RRL

- Suspect VHF patients: VHF documents revised, reformatted and published. Participated in internal VHF simulation.
- 72 hour fecal fat testing decreased to 1/month, for pediatrics only (unless approved by Clinical Biochemist).
- Performed timings of workflow for all three disciplines. Reviewed timings, workload and TAT data to modify bench schedule. Trial to decrease hours scheduled by 0.4 FTE in progress.
- Implemented a cut point for fasting glucose for gestational pregnancy glucose tolerance testing.
- Adopted DSC's anion gap rule in cITM which partially automates the process and makes it a more efficient process.
- On March 22, RRLs began performing fluid testing for ALB, BilT, Electrolytes, CA, Gluc, Total Protein, LD, Lip, Crea, Phos, Urea, and Urate. Each of these analytes was validated on the Cobas 6000 at each site.
- Implemented alternate stool reducing substance test (Clinitest tablets no longer available) for patients in NICU's, PI-CUs and ACH GI patients.
- Implemented intersite correlations for urine microscopics.
- Implemented monthly Piccolo intersite correlations between SHC and ACH.
- Implemented new PBS protocol. MLTII reviewing referral slides. Staff using new PBS referral guidelines.
- Ergonomic monitor arms purchased and installed for two Hematology and three TM workstations.
- Initiated Secondary Back Up positions for TM and Hematology/ Chemistry.
- Supported one MLT I in participating in Understanding Yourself as a Leader (UYAAL) program offered by CLS Organizational Development.
- Participated in ABC-PICU (Age of Blood in Children in Pediatric Intensive Care) study to see the impact of transfusion specific patients with fresh or aged red cells (an on-going study).
- Primex (Remote Temperature Monitoring Devices) for satellite blood fridges in Emergency and OR, and room temperature for stock albumin to be monitored by TM. Ensures proper temperature documentation and frees up nursing staff.
- On-line requesting for portering which tracks request, pick- up and delivery times of blood products within the hospital.
- Rotary Flames House (RFH) product orders and dispense requests have been set up through SCM/Millennium for end of life patient transfusions. Portering is doing a 6 month trial to deliver blood products to RFH.
- Returning blood components back into TM inventory after dispense is now acceptable within 60 minutes, instead of 30 minutes. This leads to less wastage of products.
- PICU now has 3 new dialysis machines available for emergency use. TM is providing appropriate blood products for priming.

### Peter Lougheed Centre (PLC) RRL

- Initiated best practice from other sites to reduce amount of paper in Hematology. This resulted in a 70% decrease in paper generation.
- Assisted Calgary Zone Rural Labs (CRL) with validations of their new TOP analyzers. Samples of various ranges and ages were made available to CRLs.
- Coordinated with planning branch to facilitate moving Coulter analyzers to another location to make room for new Sysmex analyzers.
- Installed, validated and trained staff on new Sysmex Hematology analyzers. Go-live projected for Jan. 19, 2017.
- Implemented new PBS referral criteria to reduce amount of PBS for Pathologist review. Time and cost saving.
- Installed one ergonomic bench to replace the static bench for Sysmex implementation.
- Senior Hematology technologist attended two advanced microscopic reviews with FMC Pathologists.
- Continue to perform STAT coagulation testing from Sunridge, Marlborough and Chestermere PSC's. Decreased courier costs and quicker TAT.
- Continue to monitor number of clotted baby samples received from nursing units and submit RLS' for staff education.
- Installed a dedicated bone marrow printer to alleviate pencil labeling and patient misidentification.
- Implemented new Excyte instrument for ESR's and utilize plastic tubes.
- Implemented, validated, and trained staff on A20 osmometer that is fully automated and allows techs to perform other tasks.
- Validated GEM4000 venous blood gas (VBG) analyzers. Projected date to repatriate VBG to PLC RRL is June 2017.
- Discontinued fetal fibronectin testing as part of the Provincial initiative.

- Fluid Chemistry testing on the Cobas was implemented to take stress off the workload at DSC and save courier costs.
- A static bench was removed and replaced with an ergonomic bench as part of the Sysmex installation project.
- Discontinued antibody testing on the automated analyzer. Centralized to FMC as a cost saving measure.
- Reduced the number of Type & Screens from 80% to 25% from Labour and Delivery and stock 6 sequestered O Neg, Kell Neg units for L&D. This was achieved through physician and nursing education.
- Added more coagulation products to TM inventory to dispense to patients from Specialty Clinic.
- Continue to support STAT TM testing for Strathmore Hospital and stock an inventory of platelets to support their needs. Saves on courier costs and TAT.
- Put into operation a new -30 degree freezer to provide more capacity for products and replaced an aging freezer.
- Removed benches, installed and validated, and trained staff on new Tango TM analyzer.
- Implemented transport of red cells to OR's on nightshifts in temperature controlled boxes. Meets accreditation requirements
- Obtained a re-purposed newer floor centrifuge and trained staff on red cell washing procedure.
- Installed and validated a new fridge for the Vascular Hybrid OR's.
- Implemented and validated 2 new Serofuges.
- Discontinued hard copies of procedure manuals. Staff now utilize SoftTech for on-line reference.
- Shared our SBAR form with examples to Quality, who in turn rolled it out as a corporate tool for communicating at times of transition.
- Participated in a successful Quality audit. The few deficiencies that were found were corrected.
- Trained a full complement of Hematology and Chemistry SAIT MLT students.
- Continue on-going nursing tours that include Emergency, NICU, OR, Specialty clinic and Clinical educators.
- Continue 5S audits to sustain adequate space and functionality after new instruments and processes have been put in place (Sysmex and Tango installs).
- Provided team lead resource to CLS Process Excellence department for Mobile scheduling SCORE event.
- Completed competency testing in all three departments and met annual reading targets of + 80%.
- Participated in meetings with PLC Senior management to ensure that delivery of blood products to the Vascular OR are expeditious.
- Timekeeper approvers trained on ESS Go-live projected for March 2017. Performed preliminary bench timings in Hematology and Transfusion Medicine. Project is near completion.

### Hematopathology Section

The clinical section of Hematology pursued major steps in 2016 to achieve goals defined by CLS and AHS. Multiple projects in collaboration with Millennium expanded the accessibility of health care providers to more laboratory results produced by the Section.

- The proposal for the integration of CLS molecular hematology and Dr. Faisal Khan's laboratories was approved by the Executives. This integration will expand CLS access to a full range of advanced equipment without need for additional capital investment. In addition, collaboration of experienced scientific staff will enhance the CLS molecular operation to a new level.
- By Exec's approval Flow Cytometry lab has expanded the test panels for the diagnosis of immune deficiencies. This expansion not only will significantly reduced the expenses of the send-out tests but also helped CLS to be recognized as national referral center for immune deficiency testing. Currently we are receiving requests from Sick Kids in Toron-to and western Canada including Manitoba, Saskatchewan and BC.
- With the McCaig Tower project, CLS hematology laboratory has been equipped with advanced state-of-the art technologies in which the highlight of those is the fully automated SYSMEX blood analyzer with integrated CELLAVI-SION system.
- In the Research Section, multiple peer-reviewed publications and abstract presentations by divisional staff have been a great achievement in innovation. Research Committee and Journal Club were created/established to oversee the various meetings, conferences, workshops attended by the hematopathologists to be able to push through with publications. Hematology manager and supervisor were also involved for the operational impact of all research projects.
- As a result of hard work of technical and medical operation of the clinical section of hematology, the detailed accreditation process of the new laboratories and instruments were successfully completed by CPSA.
- Accreditation of Histocompatibility and Immunogenetics Laboratory (HIL) by College of American Pathologists (CAP) and American Society for Histocompatibility and Immunogenetics (ASHI) quality assurance programs has been successfully completed.

- Dr. Afshin Shameli joined the department as hematopathologist in July 2016. He was a fellow at Brigham and Women's Hospital, Harvard Medical School, Boston, Massachusetts.
- Dr. Tariq Roshan, a resident from University of Ottawa, has been accepted by the DPLM Fellowship Committee as the next fellow for the year 2017 2018.
- The following sections identify various initiatives which have been completed during 2016 by the divisional laboratories of the Clinical Section of Hematopathology.

### Hematology

- FMC Hematology compiled a new set of teaching slides to be used for staff training.
- New Urinalysis iChem100 installed at DSC Urinalysis. (Urinalysis is part of Hematology at DSC).
- Hematopathologist lead multi-head session with senior techs to review difficult cellular morphology (continuing with initiative that began last year).
- DSC Hematology implemented electronic self-scheduling.
- Hematology head preceptor reviewing slide sets with CRL, HCTL new hires, and combined lab and X-ray techs to improve competency in differentials.
- FMC Hematology senior staff facilitated review of body fluid slide set with staff to further enhance competency.
- HCTLs implemented TOP 300 coagulation analyzers at 4 sites. DDimers on TOP 300. Auto-verification of coag results now in place- significant improvement in turn-around times.
- Canmore implements TOP 300 coagulation instrument.
- One day Cellavision user group meeting held. Overview of Cellavison features as well as introduction to advanced RBC software.
- FMC: process in place for ILD DIFF requests restricted to Respirologists for the assessment of ILD/ Eosinophilic Pneumonia.
- DSC: Implementation of Sysmex XN line which consists of 4 Hematology analyzers, 2 slidemaker stainers, 2 DI60s as well as a tube sorter system for racking samples.
- DSC/ FMC/ PLC/ RGH:
  - Implementation of Sysmex WAM middleware as data interface between Sysmex and Millennium.
  - Implementation of advanced RBC morphology on the DI60s.
- PLC/ RGH: Implementation of Sysmex XN analyzers. Each site installed 2 Hematology analyzers, 1 slide maker stainer, 1 DI60.
- HCTL 4 sites implemented Sysmex XNL Hematology analyzers. (smaller analyzers than the XNs).

### **Special Coagulation**

- Established new chromogenic factor VIII test.
- Established new guideline for protein S screen test.
- Established new criteria for signing out cases by senior technologists and improvement of turn-around-time.
- Participate in a FVIII:C Field Study involving a new modified factor VII, N8-GP developed by Novo Nordisk.
- Continued involvement in general pathology and hematology resident/fellow teaching/training.
- Involvement in next-generation sequencing study of thrombophilia.

### Molecular Hematology

### Testing

- Modified multiplex PCR for detection of alpha globin gene conversion in addition to 7 common deletional variants is finished validation and expected to go live in early 2017.
- Instituted an 8 day turn-around-time for *FLT3/NPM1* gene mutation analysis, allowing targeted therapy at AML diagnosis.
- Upgraded software for two real time ABI7500 PCR machines and the ABI 3130 capillary analyzer.
- Continued collaboration with Pediatric Stroke Program, performing inherited risk factor for thrombosis testing for this patient cohort.

### Millennium

- HELIX builds for *CEBPA* mutation and Q-PCR electronic reporting nearing completion.
- Revisions to reporting including Corrected Reports in HELIX for improved access in NetCare.
- Ongoing refinement of HELIX reporting builds to reflect new testing and interpretation information.

### Education

- Hematopathology resident/fellowship training program specialized laboratory coordinator, and Molecular Hematology preceptor for trainees in the following disciplines: General and Molecular Pathology, Adult and Pediatric Hematology, Bone Marrow Transplantation, and Molecular Genetics. Several residents/fellows trained this year.
- Continued involvement in the training of new MLT students by providing seminars and department tours.

### Lab Operations and Training

- Staffing in laboratory was reduced due to temporary transfer of one staff member and one maternity leave. Staffing re-allocation and new hire were necessary to maintain service and quality.
- New staff have been trained on most testing benches. Training to be completed by mid-2017.
- Instituted an improved Molecular Hematology reporting schedule involving participation of 2 additional PhD. clinical scientists from Hematopathology and Anatomic Pathology Divisions.

### Quality Assurance

- Continued participation and success in College of American Pathologists (CAP), and American Society for Histocompatibility and Immunogenetics (ASHI) quality assurance programs.
- 100% completion of CLS Competency Assessment Program.
- Review of all SOPs and forms, completion of new SOPs for those tests utilizing with new software updates for real time PCR and capillary analyzer machines. A total of 30 major revisions were completed by the end of 2016.
- All Molecular Hematology GTS pages reviewed and updated as necessary.

### Flow Cytometry

### Research and Development

- Completed two beta testing projects for Beckman Coulter that resulted in successful 510K submissions to the FDA. Both the 5C ClearLLab reagents and the 10C ClearLLAb LS (lymphocyte screening) tube were awarded IVD status.
- Lab Scientist wrote the Case Book instructional manual for the 5C ClearLLab reagent system for diagnosis of leukemias and lymphomas.

### **Customer Focus**

- Implemented 17 new Immunodeficiency tests
  - Bruton Tyrosine Kinase (BTK) Protein Expression
  - CD57 Positive NK Cells
  - NK Cell Degranulation (CD107a)
  - CD127/CD132 SCID Screen
  - DOCK8 Protein Expression
  - Inducible Costimulatory Molecule (ICOS)
  - Invariant NK (iNKT) Cells
  - Lymphocyte Activation Markers
  - Phosphorylated STAT3
  - Phosphorylated STAT5
  - Recent Thymic Emigrants
  - T Cell Sort for Maternal Engraftment (SCID investigation)
  - TCRαβ and TCRγδ Subsets
  - Th17 Enumeration
  - SAP (XLP1) Protein Expression
  - XIAP (XLP2) Protein Expression
  - ZAP-70 Protein Expression (SCID investigation)
- New expanded Immunodeficiency test menu at CLS has been added to the Clinical Immunology Laboratory website.
- Created a promotional brochure of Flow Cytometry's Immunodeficiency tests to offer these tests to external laboratories and clinicians as a referred out test. This testing was promoted and brochure distributed at the annual Canadian Society of Allergy and Clinical Immunology meeting held in September 2016.
- Created an external Flow Cytometry requisition for samples referred to CLS for Flow Cytometry testing on a fee for service basis.
- Updated Flow Cytometry section of GTS to include detailed test descriptions, shipping/handling instructions and fee for service information.
- In consultation with Pulmonary physicians, reduced Intestinal Lung Disease testing on BAL's.

### Personnel

- MLA performing weekly and monthly duties.
- Trained two additional technologists on Sorter .
- Trained three technologists from Regina and one Pathology Resident.

### Purchasing and Inventory

- Ordering board created to track antibody combos /antibodies as a visual aid for staff to help with managing antibody combo process.
- Switched vendors to reduce antibody costs.
- Fetatrol taken off standing order, reduce number of kits used and ordered per year.

### **Process Management**

- Validated and implemented using TransFix for CSF and BAL collections to increase sample stability.
- Implemented a new Body Fluid testing protocol with Cytology. All Body fluids are sent to Cytology to be accessioned and pre-screened before testing by Flow Cytometry.
- LEAN process improvements implemented in department includes changes to workflow processes and staff schedules.
- Implemented Ultralow Freezer contingency plan and updated alarm call guidelines to ensure integrity of freezer contents.
- WBC now imported automatically into CD4 worksheet, eliminates requirements for manual retrieval and entry.
- Changed MSA procedure and testing day to eliminate requirement to cancel testing during STAT holiday weeks.
- Implemented SCM ordering of CD34 and TADD COLL samples, no longer requires accessioning by Flow technologists.

### Documents and Records

• Created CCL to identify deceased Leukemia/Lymphoma patients. Identified patient folders will be scanned and stored electronically, eliminating offsite storage costs.

### Information Management

- Updated CCL for Leukemia Lymphoma TAT, able to extract by sample type.
- Upgraded to FCS Express V5.

### Assessments

• Subscribed to UK NEQAS – AML Survey.

### Testing

- Implemented quality checks and updated process for reviewing anomalous results with CTL.
- Identified and resolved issue with one of our Quality Control Products, department notified vendor which was not aware of the problem.
- Increased efficiency of sample staining process for Leuk/Loma and CD34PB, improving TAT for these specimens.
- Increased the washing for LOMA PB samples to improve Kappa/Lambda staining and reduce repeat staining.
- Reduced LINK panel from 8 to 4 tubes.
- Introduced changes to plasma cell dyscrasia testing to improve staining, analyzing and reporting patient samples.
- HLH reference ranges updated, worksheets and report simplified.
- Updated TCR vbeta chart ranges improves the consistency and accuracy of the reference ranges.
- Consolidated setting files on analyzers, reduces maintenance time.
- Updated LOMA PB layout to detect possible Mycosis Fungoides/Sezary Syndrome patients.

### Special Hematology

### Research and Development

- Participated with DR. SM Hossein Sadrzadeh in the implementation of the new Roche instrument for hemoglobin A1C testing.
  - Assisted Prokopchuk-Gauk with the publication of the "Detection of Hemoglobin C acquired from a donor red blood cell unit following exchange transfusion".

### Customer Focus

- Improved TAT for known HBSS with management by transfusion by technologist verifying HbS level result without interpretation from hematopathologist.
- Notification to Transfusion Medicine is critical for new Sickle cell and thalassemia patients. Improved notification by generated report to a TM printer following completion of Hgbelc report by Special Hematology.

### Education

- Trained fellows/residents on Hgbelec and Bone Marrow.
- Continuing education through teleconferences, Bone Marrow survey CAP and QMP-LS survey.
- Quarterly staff meeting with case reviews.

### Personnel

- New Hematopathologist Dr. Afshin Shameli started July 1, 2016.
- Mireille Lareau completed the "understanding yourself as a leader series".
- Hematology staff has completed our team building sessions that focus on working together.
- Staff completed the Employee-self -service time entry system training.
- Annual Special Hematology competency was completed by all staff.

### Saving Initiative

- Improved new CLL program for BM label printer to use 41abels provided in a row instead of 2.
- Reduce usage of BM stain by increasing usage from 1to 2 weeks.
- Reduce number of sample sent to McMaster by not referring delta variant detected by HPLC.

### Testing

- Bone marrow collection competency completed with senior tech from Special Hematology at PLC to improve quality of BM slide.
- Reduce number of injection on HPLC by changing protocol to repeat HbF form >2% to >5 %.
- Trained Staff on BM bench to process incoming Hgbelec samples and send out samples to help with increasing work-load. (2015: 7495 Hgbelec /2016:9311 Hgbelec).
- Achieved consistently good turnaround time for BM and Hgbelec.

### Documents and Records

• Reviewed all standard operational and forms.

### New Project

- Planning for the new Cancer Center.
- Updating BM teaching set.

### Histocompatibility and Immunogenetics Laboratory

- Modified the laboratory name from Tissue Typing Laboratory (TTL) to Histocompatibility and Immunogenetics Laboratory (HIL).
- Passed 2016 interim ASHI Laboratory Accreditation (valid until 08/31/2017).
- Continued participation with the Kidney Paired Exchange National Organ Exchange program.
- Continued participation of on-call process for import and export for Highly Sensitized Patient (HSP).
- Represented CLS HIL at the ALTRA executive.
- Represented CLS HIL at the ALTRA Quality assurance meeting.
- Represented CLS HIL at the ALTRA Policy meeting.
- Worked on implementation of Histotrac Project with a go live target date of September 25 2017.
- Participated in the CBS HLA National Advisory Committee on monthly teleconferences.
- Graduated our fourth Histocompatibility Fellow and recruited a new fellow on July 2016 for a two year fellowship.
- Two new technologists trained for call-back.
- Trained two new techs in Sequence Based HLA Typing.
- Continuing Education through teleconferences, Bone Marrow, Renal Weekly Rounds, and Hematology education sessions.
- Conducted a parallel testing of Immucor HLA identification using phenotype beads compared to One Lambda Single Antigen bead to use them in cases where the antibody profile is ambiguous.
- Continue to train residents/fellows from Adult and Pediatric Hematology, Bone Marrow Transplantation, transplant surgery, and adult/ped nephrology.

### Microbiology Section

• The Human Pathogens and Toxins Regulations (HPTR) came into force on Dec 1, 2015. A new license under the Human Pathogens and Toxins Act (HPTA) was applied for and awarded in January, 2016 to conduct controlled activities (possessing, handling, using, producing, storing, permitting any person access, transferring, importing, exporting, releasing, abandoning, and disposing of a human pathogen or toxin) at CLS.

- New media (PortaGerm Pylori semi solid transport medium) for H. pylori has been implemented in all Endoscopy sites to improve stability and recovery of this fastidious organism in gastric tissue biopsies.
- Testing for sexually transmitted diseases including Chlamydia trachomatis, Neisseria gonorrheae and Trichomonas vaginalis was successfully implemented on a bank of 5 Panther instruments (Hologics), located at SHC. CLS now recommends initial collection of a single vaginal swab from females, and first-void urine from males into a new white-topped 30 mL container. As part of this implementation, extensive educational materials were developed with the assistance of CLS Communications including memos, posters, a video and a webinar. Additionally, CLS Microbiology worked with the CLS Client Interface Team (CIT) who set up face-to-face educational meetings with key user sites. This new process was very well received by end users, and will be the approach CLS Microbiology takes for all future major changes to laboratory testing.
- The EIA semi-automated procedures and culture was replaced with the automated Liason XL (Diasorin) instrument to improve throughput for testing C. difficile, H. pylori, and EHEC/STEC from stool samples.
- Stool screening for enteric parasites was transitioned back to an EIA method with real-time PCR confirmation of positive EIA tests in September. This change was necessary to address ongoing staff repetitive strains issues in performing a semi-automated molecular test on a high volume of samples. This also addressed financial concerns regarding the higher costs of using a semi-automated method. An RFP for a fully automated, cost effective multiplex molecular stool testing platform was released in December.
- CLS Microbiology completed a comprehensive Biosafety and Biosecurity audit as part of the HPTA process. This will be used to establish Pathogen Safety Data Sheets and a comprehensive mitigation/risk management strategy for CLS with regards to Biosafety throughout the organization.
- HVAC upgrades were completed in the Microbiology laboratory at DSC.
- Successful negotiations occurred with vendor to upgrade to BacT/ALERT blood culture testing platform to Virtuo.
- Protocols, process and procedures for Viral Hemorrhagic Fever were finalized and published.

### Microbiology Workload

Microbiology test volumes continue to increase. The average cost per test has not seen a significant increase, even with moving more testing platforms to molecular microbiology. See Figures 1 and 2.









### Transfusion Medicine Section

### Quality: Enhancing Quality in HealthCare

- Received Health Canada Blood Products regulations compliance following on-site inspection at the FMC site in November 2016.
- Participated in LEAN event to reduce errors in blood product provision and dispensing at FMC. Improvements included new Millennium product order notifications, changes to the dispense area layout and changes to the dispensing process.
- Introduced new blood group interpretations for neonates with grouping discrepancies to facilitate the decision making process for maternal Rh immune globulin eligibility.
- Changes were made to the process for reporting post-transplant blood groups in patients receiving ABO non-identical stem cell transplants providing needed information for facilities outside of Calgary zone when patients return home after treatment.
- Introduced screening of cryoprecipitate orders by the TM physician and recommending treatment with fibrinogen concentrate where its use would be more appropriate.
- Changed the transfusion rate field in SCM blood product orders to a mandatory field to align transfusion practice with CPSA, CSA and CTSM standards.

### Access: Support increased access to healthcare System

- Continued partnership with the Community Paramedic Program to provide home transfusions for eligible patients. CLS Transfusion Medicine and the Community Paramedic Program received a Health Quality Council of Alberta Patient Experience Award for this innovative Home Transfusion Program.
- Continued expansion of the Subcutaneous Immune Globulin Home Infusion program to allow patients to treat themselves with immune globulin via home infusion rather than monthly IV infusions at outpatient clinics.
- Implemented washing of red cells at PLC to allow for reduced turn-around times and increased access to these modified blood products for transfusion.

### Sustainability: Provide value to the healthcare system

- Expanded implementation of Primex remote temperature monitoring to all FMC OR satellite fridges and external dialysis clinics. Primex is a web based application with wireless sensors placed in the refrigerators and areas that continuously monitor temperatures. The application notifies TM when an out of temperature condition exists, with both an audible alarm and an email to designated TM staff. This has eliminated staff travel to these locations and allows for more prompt response to temperature variations.
- Implementation of TANGO analyzers at SHC, PLC, and RGH labs for routine immunohematology blood group identification and antibody screening. It has eliminated false positive antibody screens and realized significant cost savings over the previous analyzers.

- Eliminated the group AB pre-thawed plasma inventory at FMC and PLC reducing usage by 10% and saving ~200 units of AB plasma with no reports of undue delays in providing plasma in emergency situations. AB plasma is now thawed only on demand at all sites.
- Removed plasma from the inventory in Banff promoting the more appropriate treatment of urgent warfarin reversal using Prothrombin Complex Concentrates instead of plasma.
- Implemented plastics recycling at FMC TM to comply with the City of Calgary recycling bylaw significantly decreasing the amount of plastic waste going to landfill.
- Established and implemented practice guidelines for ordering pretransfusion testing on obstetrical patients. Through introduction of these guidelines and education, a significant reduction in unnecessary pretransfusion testing was realized in this patient population. This has resulted in cost savings and a reduction in stress by freeing up technologists to deal with critical tasks in the laboratories particularly at the RRL locations.
- Reduced the volume of TM reports from Millennium using Cerner Command Language (CCL) coding and printer queue set up changes; paper generation was reduced by 83%.

### Innovation: Pursue creative solutions to demands in healthcare

- Implemented RhD Bead chip platform using 35 genetic markers to perform Rh genotyping to detect up to 70 Weak D and partial D genetic variants for sickle cell patients and females of child bearing age. This allows for more effective decision making when considering Rh immune globulin prophylaxis and transfusion with Rh positive vs Rh negative blood components.
- Changed the red cell inventory at Banff and Strathmore stocking additional groups of blood and introducing remote crossmatch to Banff to reduce turn-around time and reduce the use of group O red cells at these sites.

### Relationship: Build stronger relationships with our healthcare partners

- Collaboration with the Rare Blood and Bleeding Disorders clinics to coordinate the transition of 50 patients to new brands of factor concentrates without wastage or undue stress to the patient.
- Collaboration with South Zone Transfusion Medicine to provide support for their facilities requiring modified red cell components. CLS now provides washed red cells, blood for exchange transfusion, and volume reduced platelets for the south zone.
- The CLS Transfusion Safety Nurse is collaborating with other Transfusion Nurses nationwide to advocate Transfusion and Transfusion Safety as a recognized nursing specialty and develop standards of practice and competencies for this specialty nursing area.

### Training and education

- Completed training of additional TM MLTs in CTL processes.
- Completed annual competency assessment for all TM staff.
- Provided ongoing training for residents and fellows as part of Specialized Laboratory Training Program providing a 4 week Introduction to Transfusion Medicine rotation and a 2 week Advanced Transfusion Medicine rotation. TM trained 11 Adult Hematology/Oncology fellows, 5 Pediatric Hematology/Oncology fellows, 8 Anaesthesia residents, and 3 General Pathology residents and 2 Hematopathology Fellows in 2016.
- Won the top poster for the Transforming Improvement stream at the Quality Summit in Oct 2016.
- Co-hosted the annual Alberta Vein to Vein Workshop with Canadian Blood Services in March 2016. Several CLS TM staff presented at this two day event.
- TM staff presented a poster at the 2016 Canadian Society for Transfusion Medicine conference in Vancouver.
- TM staffed attended continuing education through webinars, teleconferences and weekly rounds/educational sessions.

### Cellular Therapy Laboratory

### Quality: Enhancing Quality in HealthCare

- Completed annual report for the Foundation for Accreditation of Cellular Therapy (FACT) accreditation September 2016. Successful re-accreditation occurred September 2015.
- Received Health Canada Cells, Tissues and Organs (CTO) regulations compliance following on-site inspection November 2016.
- Fully implemented Cellular Therapy Product ISBT 128 labeling June 28, 2016.
- Collaborated with CLS Microbiology to validation sterility testing protocols for our cell therapy products.

### Access: Support increased access to healthcare System

• Continued collaboration on a novel clinical trial using liver cells to treat urea cycle disorders in infants.

- Provided specialized products for treatment of pediatric patients suffering from Sickle cell disease, immuno-deficiencies, and metabolic disorders.
- Expanded utilization of product selection protocols to provide optimal transplants products for patients with autoimmune disorders.

### Sustainability: Provide value to the healthcare system

- Reduced liquid nitrogen consumption by transition to new storage freezers & facility at McCaig Tower
- Reduced reagent and supply costs for cryopreservation of cellular therapy products by validating new sources of cryoprotectant and freezing method.
- Worked with planners to design the new Cellular Therapy Laboratory in future Cancer Care Centre.
- Obtained special access to national and local electronic record systems to increase efficiency in information transfer from different local and national partners in transplant.

### Innovation: Pursue creative solutions to demands in healthcare

- Collaborated on First Blood Stem Cell Gene Therapy Clinical Trial in Canada. Fabry patients cells were collected and genetically modified in December 2016 and re-infused into the patient in January 2017.
- Installed CliniMACS Prodigy automated cell engineering system in CTL. The CliniMACs Prodigy will allow for the precise engineering of patient specific cellular therapy products.
- Received Biospherix XVivo GMP isolator hood for clinical isolation, expansion, and modification of cellular therapy products.

### Relationship: Build stronger relationships with our healthcare partners

- Provided continuing education locally and provincial to BMT Program, CLS Staff, and AHS partners.
- Initiated partnership with AHS Bone and Joint Strategic Network for future support of orthopedic stem cell clinical trials.
- Collaborated with other researchers and labs resulting in publications, grants, and clinical trials.
- CTL Director accepted appointments on the FACT Accreditation Committee, FACT Standards Committee, and FACT Inspection Team.

### Training and education

- Completed training of additional TM MLTs in CTL processes.
- Completed annual competency assessment for all CTL staff on all processes in laboratory.
- Provided ongoing training for residents and fellows as part of Specialized Laboratory Training Program.
- CTL Director invited speaker on Quality Assurance at the 2016 North American Regional International Society for Cellular Therapy (ISCT) convention in Memphis.
- CTL Director invited speaker on Process Validation at the 2016 Canadian Blood and Marrow Transplant Group (CB-MTG) convention in Vancouver.
- All CTL staffed attended continuing education through webinars, teleconferences and weekly rounds/educational sessions.

### Education

### Educational Programs Provided by the Department of Pathology & Laboratory Medicine

The medical and scientific staff of CLS are responsible for a wide array of educational activities that include: (1) residency training programs in Anatomic Pathology, General Pathology, Neuropathology, and Microbiology (2) mandatory rotations (e.g. hematopathology) for a number of other residency programs, (3) lectures and small group sessions in a number of undergraduate courses, (4) the Medical Sciences 515/Biology 515 Course, (5) parts of the Bachelor of Health Sciences program, (6) supervision of elective rotating residents from other programs and rotating clinical clerks, (7) training of fellows, (8) graduate student supervision, (9) summer student supervision, (10) Continuing Medical Education events, and (11) the Pathologists' Assistant M.Sc. program.

### Anatomic Pathology Residency Training Program (Co-Program Directors: Drs. Amy Bromley & Carolin Teman)

This is a five-year program leading to certification in Anatomic Pathology by the Royal College of Physicians and Surgeons of Canada. The Post Graduate Year PGY-1 year is designed to provide exposure to most of the medical and surgical services that rely heavily on the pathology laboratory and to prepare the resident for the Medical Council of Canada qualifying examination part II. The PGY-2 and PGY-3 years constitute the core training with integrated rotations of autopsy and surgical pathology. During the PGY 4th and 5th year, the resident embarks upon mandatory subspecialty rotations (Pediatric Pathology, Forensic Pathology, Cytopathology, Renal Pathology/Electron Microscopy, Dermatopathology, Hematopathology,

Neuropathology, Chief Resident, Molecular Pathology and Lymph Node and Bone Marrow Pathology) as well as elective rotations (Clinical laboratory subspecialties, Subspecialty surgical pathology, research, etc.). The PGY-5 year may be spent in a variety of electives, which may include any one of the clinical laboratory subspecialties, a clinical rotation, a research rotation or one or more rotations in subspecialty pathology. The program is designed to give graded responsibility to the resident so that in the final year of training the resident will be expected to perform to the level of a junior faculty member, recognizing that faculty resident supervision is always occurring.

Involvement in research activities is an integral part of the program and starting in the PGY-3 year, the residents are expected to present their research findings at the annual pathology residents' research day. Funding is available to present their work at North American meetings.

There are numerous dedicated educational events throughout the resident schedule, in addition to one-on-one teaching. These include weekly clinical pathological correlation rounds with Internal Medicine, Departmental Continuing Medical Education rounds, resident led Gross Pathology rounds, and a dedicated weekly academic half day consisting of unknown slide rounds, autopsy rounds, and didactic teaching. The residents write the yearly American Society of Clinical Pathology exam and participate in in-training evaluations that mimic the Royal College of Physicians and Surgeons of Canada exam twice a year. A philosophy of independent self-directed learning underlies the program. The program currently has 16 residents, three of whom are writing their Royal College Exam in 2017. The program has had a significant history of successful trainees, with a 100% pass rate for more than 10 years, and a wide expanse of prestigious fellowships at premier academic facilities.

The program was given full approval by the Royal College of Physicians and Surgeons of Canada after an External Review in 2015. Work is underway in transitioning to Competency By Design, the Royal College competency-based medical education program, which will be coming online in July 2018.

### General Pathology Residency Training Program (Program Director: Dr. Davinder Sidhu)

Our program is a five-year program leading to certification in General Pathology by the Royal College of Physicians and Surgeons of Canada. The University of Calgary through co-sponsorship with Calgary Laboratory Services offer General Pathology Residency Training highlighting on laboratory management and pathology informatics. The General Pathology Residency Program is 5 years in duration (4 years of laboratory Medicine and one basic clinical year). The basic clinical year is designed to provide exposure to most of the medical and surgical services that rely heavily on the clinical and anatomical pathology laboratory and to prepare the resident for the Medical Council of Canada Qualifying Examination Part II. Upon successful completion of the education program, the residents will be competent to function as consultants in General Pathology and medical laboratory directors.

For the 5th consecutive year the General Pathology program has filled all resident positions at the CaRMS match. Part of the success of our program lays in our close association with the highly successful University of Calgary Anatomic Pathology and Neuropathology Residency Training Program and our large group of over 90 pathologists and laboratory scientists.

Three key features unique to the program that have drawn medical students and residents from across the country include General Pathology Mentorship program, Community and Rural Laboratory Management training program and the Pathology Informatics/Laboratory Utilization office.

**Research:** The general pathology faculty has great interest in basic science, pathology informatics and laboratory utilization and so research in these areas is promoted. General pathology residents are expected to complete at least one research project during their residency. In 2016 our residents have undertaken 16 approved research projects and have presented or will present findings at USCAP, CAP, ACLPS and various other conferences. The Research Committee coordinates resident research and the Resident Training Committee monitors the manpower required for the project and our department has special funds available for resident research.

**Didactic schedule:** Pathology and clinico-pathologic seminars are held weekly on Fridays during academic half-day. Clinical chemistry half-days occur weekly Wednesdays with a "case of the week" format and Medical Microbiology academic half days occur Thursdays in conjunction with Infectious Disease residency academic days. Residents are exempted from work commitments during these periods. Residents are also expected to present at clinico-pathologic rounds, held weekly in conjunction with the Department of Internal Medicine. Residents also participate in medical student teaching at the University of Calgary. Presentations at other rounds (Department of Surgery/Nephrology/TBCC) are also encouraged.

**Evaluation:** An in-training evaluation report (ITER) is completed after each rotation. The ITER is reviewed with the resident and emphasis is on continuous constructive feedback for the resident. Beginning in 2019 the new Royal College mandated Competency By Design (CBD) initiative will be implemented nationally for general pathology evaluation and

feedback. Starting in the PGY2 year, all residents take two exams (RISE Examination and Annual Xmas exam) each year mimicking the fellowship exam by the RCPSC.

**Training Sites:** Diagnostic and Scientific Centre, Foothills Medical Centre (FMC), Alberta Children's Hospital (ACH), Peter Lougheed Centre (PLC), Rockyview General Hospital (RGH), Medical Examiner's Office, Community/rural laboratories (provide extensive opportunity for management training), Community hospital rotations are taken at Red Deer General Hospital in Red Deer, AB and a new collaborative rural training rotation at White Horse Hospital, Yukon.

Our program has successfully graduated every general pathology resident that has applied to the Royal College Examination, all of whom have successfully passed the General Pathology certification exams by the Royal College of Physicians and Surgeons of Canada. Our next graduate will be writing her certification exams in the Spring of 2017 and has successfully secured a position in Cranbrook, BC, well in advance of her graduation.

Successful onsite Royal College accreditation survey/review of the University of Calgary's General Pathology Residency Training Program took place on February 24, 2015 with no deficiencies noted and the next accreditation is planned for 2019-20 academic year.

Microbiology Residency Training Program (Program Director: Dr. Julie Carson, Interim Program Director: Dr. Wilson Chan) The Medical Microbiology residency training program at the University of Calgary is a five-year program that aims to produce medical microbiologists that are competent and confident practitioners. The program's rotations are focused at developing expertise and skills in the four major spheres of medical microbiology: the medical, scientific, and administrative direction and management of a clinical diagnostic laboratory; the provision of clinical consultation in infectious diseases; infection control; and public health.

The PGY-1 year provides an experience akin to the rotating internship, with rotations in a variety of related clinical disciplines to supplement the clinical knowledge and skillset of the trainee. PGY years 2 through 5 involve a mix of rotations in the diagnostic laboratory, with particular foci in bacteriology, virology, mycology, and parasitology; clinical infectious diseases, including both adult and pediatric, inpatient and outpatient; infection control, antimicrobial stewardship, and public health. There is a healthy amount of elective time included in order to allow trainees to further develop in subspecialties of their choosing.

As a newer program, 2016-2017 is the first full academic year that the program has been operational. It has seen the effective start of our newest resident, bringing the program to two trainees. It has seen our current residents continue to develop on their clinical and laboratory rotations, with an outstanding performance in an international in-training benchmark examination for infectious diseases. Both of our residents have been tremendously active academically as well, having initiated longitudinal research projects that we expect will lead to peer-reviewed publications.

2016-2017 is also the first year the program has participated in the CaRMS match. There has been a healthy amount of interest and a higher-than-expected number of applications. At the time of this writing, the process is still ongoing and we hope that a trainee will match this spring, to start in the 2017-2018 academic year.

### Neuropathology Residency Training Program (Program Director: Dr. Leslie Hamilton and Dr. Lothar Resch, Assistant Program Director)

This is a five-year program leading to certification in Neuropathology by the Royal College of Physicians and Surgeons of Canada. The University of Calgary program includes one year of clinical medicine, one year of anatomic pathology and three years of neuropathology training, including two core years with graded responsibility in the reporting of adult and pediatric surgical and autopsy cases materials, including intraoperative consultations, and nerve and muscle biopsies. The fifth year is an elective year and may be used for further training in neuropathology and/or other pathology subspecialties; clinical rotations; or research. Ongoing participation in research activities is encouraged throughout residency training, and there are ample local research opportunities into neuro-degenerative disorders, neuro-oncology, neuro-regeneration, cerebral ischemia, and developmental disorders. Residents have also taken advantage of research opportunities in other areas of Canada and abroad. Trainees gain experience in the application of new technologies in the study of the pathogenesis of disease including immunodiagnostics, molecular pathology, cytogenetics, and electron microscopy. Medicolegal and diagnostic consultations are an integral component of this program, as is participation in undergraduate and postgraduate teaching programs. In the 2016-2017 academic year, there were three residents in the program with one new trainee slated to start the program in July 2017 through the first round CaRMS match. Within the last few years, the University of Calgary Neuropathology Residency Program has been one of the more active neuropathology training programs across Canada.

### Resident History/Growth (Figures 1 and 2) Figure 1



Figure 2



### Medical Sciences 515/Biology 515 Course (Course Director: Dr. X. Sean Gui)

The Department is responsible for the development and teaching of this course and it continues to be very well received by students. This year's enrolment was 25 students. The basis of the course is the cellular and molecular mechanisms underlying basic human disease processes and how these can be influenced by lifestyle and environmental factors and the ways in which this knowledge can be used in the laboratory diagnosis of diseases and in the biomedical research. Our faculty provided 37.5 hours of lectures in this course.

### Undergraduate Medical Education (Department Representative: Vacant)

The University of Calgary undergraduate teaching program for medical students follows an integrated approach in accordance with the requirements of the Medical Council of Canada. Pathology is part of the basic sciences component of the curriculum and is taught as part of each integrated course. Small group teaching, as an essential part of pathology teaching, requires an increased teacher-student ratio. The increasing size of the medical student classes has resulted in a significant increased demand for teaching time.

Department members are involved in teaching (lectures and small group sessions) for a number of courses including but not limited to: Cardiovascular, Respiratory System, Applied Evidence Based Medicine, Trial Advocate Course, Renal, Neurosciences, Blood, Molecular Biology of Cancer, Cancer Biology, Pathobiology, Directed Path Research Projects, Integrative Course, Pathology of Neoplasia, Pathology of Hepatobiliary Diseases, Endocrine, Gastrointestinal, Introduction to Medicine, Reproduction, Gynecological Pathology, Environmental Pathology, Upper Respiratory Tract Infections, Pneumonia and Pulmonary Infections, Human Genetics and Musculoskeletal/Skin.

In a typical year, the Department of Pathology & Laboratory Medicine faculty members provide about 1,200 hours of undergraduate medical education teaching.

### Postgraduate Clinical Trainees

Geographic Full Time (GFT) faculty members provide greater than 2,000 hours of teaching per year to support postgraduate clinical trainees, including department residency training programs, rotating residents and fellows. Clinical faculty members also make very extensive contributions to teaching residents and fellows; although this time has not been quantified, it is likely similar or greater in magnitude.

### Fellowship Programs (Interim Chair: Dr. Christopher Naugler)

Up to 6 internally (CLS) funded positions are available each year. Four of these positions are meant to fund board-certified (or board-eligible) Anatomic Pathology Fellows wanting to develop subspecialty skills in an area of Anatomic Pathology. In some years, we also train externally funded fellows.

The DPLM/CLS Fellowship Committee selects qualified applicants for internally and externally funded Fellowship positions. Positions are open to either MD or PhD applicants, depending upon the field of study. We currently offer fellowships in Breast Pathology, Cytogenetics, Dermatopathology, Gastrointestinal Pathology, Gynecological Pathology, Hematopathology, Histocompatibility, Pediatric Pathology, Pulmonary Pathology, Renal/Transplant Pathology, Uropathology and offer an AFC in Cytopathology.

### Clinical Biochemistry Fellowship Program (Co-Program Directors: Drs. Hossein Sadrzadeh & Alex Chin)

The CLS and DPLM postdoctoral fellowship training program in Clinical Biochemistry is accredited by both the Canadian Academy of Clinical Biochemistry (CACB) and the Commission on Accreditation in Clinical Chemistry (ComACC) in the United States. The Fellowship program continues to work closely with the General Pathology Residency Training program to enhance training opportunities for both residents and fellows. Fellows undergo clinical laboratory rotations at the Diagnostic and Scientific Centre (community general chemistry, immunology, endocrinology, analytical TDM & toxicology and special chemistry), acute care hospitals and urgent care centres (chemistry and core laboratories), pediatric clinical chemistry, and point-of-care testing. Clinical chemistry fellows will also have the opportunity to engage in other rotations such as newborn screening, biochemical genetics, molecular diagnostics, and rural laboratory management. Graduates of our program are eligible to work in North America and can take the Clinical Biochemistry specialist certification examination in Canada and the American Board of Clinical Chemistry examination in the United States. Our first trainee, Dr. Jessica Boyd graduated in June 2015 and is now a CACB board-certified clinical biochemist working in Analytical Toxicology at CLS. Our second trainee, Dr. Dennis Orton graduated in June 2016 and is now a clinical biochemist at Cam Coady and Associates providing clinical chemistry services at Surrey Memorial Hospital. Our third trainee, Dr. Jessica Gifford will complete her training in June 2017 and has accepted a position as a clinical biochemist at DynaLife in Edmonton. Our fourth trainee, Dr. Joshua Buse is in his first year of training. We will be accepting a fifth trainee for July 2017 commencement. The plan is to continue accepting one fellow per year for a 2 year training cycle. Seven clinical biochemists; Drs. Hossein Sadrzadeh, clinical section chief of clinical biochemistry, Alex Chin, Lawrence de Koning, Jessica Boyd, Allison Venner, Isolde Seiden Long, and Lyle Redman are the program faculty and are directly involved in teaching and training the fellows. Drs. Hossein Sadrzadeh and Alex Chin are the Program Co-Directors.

2015-2016 the following Clinical Fellows were trained at CLS:

Fellow	Specialty Area	Supervisor	Funding Source	Year
Howell, Jenika	Dermatopathology	Drs. Duane Barber/ Charlene Hunter	CLS	2015-2016
Weidenfeld, John	Hematopathology	Dr. Iwona Auer-Grzesiak	CLS	2015-2016
Gifford, Jessica	Clinical Biochemistry	Dr.s Isolde Seiden-Long/Hossein Sadrzadeh	CLS	2015-2017

### **Graduate Students**

There is currently no experimental pathology graduate program in the Faculty of Graduate Studies; however, graduate students are supervised by members of the Department.

### Pathologists' Assistant M.Sc. (Program Director, Dr. Amy Bromley: Medical Director: Dr. Jim Wright)

- Pathologists' Assistants (PAs) are "physician extenders" for anatomic pathologists. PAs perform delegated medical tasks under the supervision of a medically qualified pathologist. They perform initial examination, dissection, and gross description of surgically removed tissues, assist in dissection of bodies during autopsies, and perform intraoperative frozen sections. They possess a highly standardized skill set related to each of these procedures, allowing pathologists to spend more of their time looking at slides.
- The thesis-based Pathologists' Assistants Masters program at the University of Calgary began in 2012 as a specialization within Medical Sciences Graduate studies. The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS), an American agency that accredits training programs of allied health professionals who work in anatomic pathology or clinical pathology laboratories, visited the program in April 2014 and the program was ultimately accredited in October 2014. Accreditation of our program is a huge benefit to our students, as it makes them eligible to write their American Society of Clinical Pathology board certification exams, which substantiates their training in a standardized fashion. We are now the second NAACLS-accredited training program in Canada. The next site visit for accreditation will be in 2018.
- The program has now transitioned to a course-based model, which still includes research opportunities for students, but focuses more on hands on training and experience to allow students to be ready for the workforce upon graduation. This professional Masters degree is one of only a few programs of its type at the University of Calgary, and is being used as an example of the changing focus of graduate studies across Canada and the world. Our program boasts a 100% pass rate at the ASCP exam and 100% employment rate after graduation.

### Continuing Medical Education

CLS provides teaching for Medical Laboratory Technologists (MLT)/Medical Laboratory Assistants (MLA), Cytotechnology, Combined Laboratory and X-Ray Technologists (CLXT) Education Program. Additionally, department members provide weekly CME Rounds and participate in numerous Department of Medicine Rounds as well as presentations at National and International conferences.

### Research (CLS and Externally Funded)

Calgary Laboratory Services is committed to supporting clinical trials and research activities which enhance the delivery of pathology and laboratory medicine services, facilitate the development of new knowledge and improve patient care. There are more than 750 active studies on file with the CLS Research Department. The VP of Medical Operations and the Medical Director provide direction and leadership of Research within CLS. The CLS Research Office Team includes the Program Leader for Research and Development, Research and Development Program Coordinator, and Research Supervisor. Four Research Coordinators within the Research Office coordinate all laboratory related clinical trial and study activity that takes place within Alberta Health Services Calgary Zone and the University of Calgary. Three Research Medical Laboratory Assistants located at the Special Services Building SSB, provide support for clinical trial/ research specimen collection, processing, packaging and shipping. Laboratory Specialists at the Anatomic Pathology Research Lab (APRL) deliver Anatomic Pathology research support to researchers at CLS/ U of C. The Research Procurement Coordinator assists researchers with ordering of reagents/ supplies and setting up project accounts at the U of C.

### A summary of the initiatives undertaken by CLS Research in 2016

The Research Office continues to play a vital role in the coordination of laboratory support for clinical trials and research including high impact research and development initiatives that will translate into improved testing and patient care outcomes involving CLS Clinical Sections such as Anatomic Pathology, Hematology, Transfusion Medicine, Clinical

Biochemistry, and Microbiology. The Research Office has collaborated with CLS researchers in house to facilitate new procedure setups and machine technology to enhance the test menu offered at CLS (Active B12, HevyLite, IgE Allergen).

- The number of new Research studies opened per year, many involving increasing protocol complexity, has increased by 18% and as a result the annual research revenue continues to increase. The CLS Research Office invoiced Researchers for a total of \$929,700.00 from January to December 2016. Streamlined processes and efficient staff have aided in meeting the growth and demand for CLS Laboratory Research Services.
- Research Office continues to work collaboratively on numerous initiatives that cross-over between New Business and Research that increase potential for CLS revenue, while ensuring CLS compliance with the Health Information Act (HIA) requirements for Research Agreements. CLS Executive tasked CLS Research and New Business Development to engage CLS Leaders to encourage discussion regarding effective utilization of CLS Resources in order to facilitate Research and Third Party work.
- A new Research Workstation has been established at the DSC to accommodate demand for service requests for data entry, aliquoting, labelling and testing of banked samples for Research studies. Three new Research Revenue Generating Initiatives involving CLS testing of Biobank Samples were completed with a potential for more in this coming year.
- Research Office continues to work with the Renal Biobank, to help create the largest renal repository in Alberta.
- Research Office met with Cytogenetics and Molecular Hematology to discuss cost recovery opportunities related to CLS Clinical Trial support for studies conducted involving these two Areas.
- Completed a PE event to review SSB Research Lab/ Office Service Delivery and shared space requirements between SSB Research and SSB Outpatient lab. SSB Research provides direct support and services to all TBCC clinical trials and other research activities at the Foothills Hospital, ACH, PLC, RGH, PSC's, TRW building, and U of C. Findings indicated that the SSB Research Lab Space footprint was being utilized efficiently and SSB Research Staff would not meet service delivery demand of TBCC/ AHS/ U of C Researchers if current Research footprint space were to be reduced.
- CLS Research completed the Calgary Cancer Project (CCP) Functional Requirements (SOR) for CLS Clinical Trials and Research. Completed the CCP Mandatory SME training session. The request for proposal phase is at a point where participation and expertise is required at set meeting times. This CCP planning is an on-going initiative.
- CLS Research met with the TBCC Manager and the TBCC Audit and Regulatory Coordinator to create guidelines to ensure the Regulatory Requirements are being met for TBCC Clinical Trials.
- CLS Research is participating as a stakeholder in focus groups related to the Hub Lab planning in Edmonton.
- CLS Research met with CLS Planning and Special Projects regarding the Calgary Zone Laboratory Space Planning Exercise.
- CLS Research is working with the Provincial Utilization office to ensure HIA compliance with research projects. The Research Office is also a stakeholder in the Provincial Utilization Steering Committee meetings.
- CLS Research met with Amira stakeholders to discuss the Alzheimer study progress to date. An MOU was completed.
- CLS Research is working in collaboration with the Montreal Heart Institute (MHI) and is exploring the possibility of CLS becoming a "Central Research Laboratory" for Clinical Trials in a similar capacity as Covance, Mayo Clinic and PPD.
- Research Office created a process for handling Provincial Lab research data requests to ensure HIA compliance.
- Research Office continues to streamline and educate staff on risk minimization initiatives such as the use of research materials, patient information and HIA compliance.
- CLS Research provides feedback regarding the annual Provincial Laboratory Service and Test List for Clinical Trials and Research Studies and participates in regular monthly provincial research meetings to review and revise associated Provincial Research documents.
- CLS Research participates in "Provincial Tissue to Researchers -Working Group" meetings to review current processes, the provincial policy and discuss potential for standardization at a provincial level.
- All laboratory research requests for data continue to be received and processed through the CLS Research Office. The Research Office is working with the Lab Analytics team to determine how to increase TAT's for research data requests involving Sunquest (Edmonton) and Meditech Lab Information Systems (LIS's).
- The Research Office continues to coordinate CLS Anatomic Pathology and Anatomic Pathology Research Lab (APRL) support for Dr. Jeff Joseph to develop new autopsy tissue testing for the neurodegenerative autopsy tissue bank.
- Research Office created Guiding Principles in collaboration with Operational Services to create an efficient process for after hour research patient collections.

### CLS Research Department:

### 2016 CLS Research Summer Studentship Competitions

The CLS Research Department offers two research summer studentship award programs: Master of Biomedical Technology (MBT) Program and the CLS Undergraduate Competition.

### Master of Biomedical Technology Competition

No student applications were received.

### Calgary Laboratory Services Undergraduate Competition

Supervisor	Student	Project
Dr. Tarek Bismar	Tina Sarker	Identification of potential driver genes in prostate cancer
Dr. Jennifer Chan	Wazaira Khan	Inflammation in hypermutated gliomas
Dr. Faisal Khan	Kosha Kantharia	Role of Natural Killer Cell Receptor Genes in prognosis of different type of Lymphomas
Dr. Isolde Seiden Long	William Nguyen	Improving Specimen Stability for Ammonia testing

### 2016 CLS Health Services Research Competition

The CLS Research Department announced award results for the nineteenth annual CLS Health Services Research Funding Competition. A total of \$287,413.52 was awarded by CLS to researchers in 2016. One hundred and thirty four projects have received funding through the Research Competition since it began in 1998.

### Anatomic Pathology Research Lab (APRL)

- The Anatomic Pathology Research Laboratory (APRL) located at the HMRB, FMC continues to provide quality service to accommodate an increasing number of research projects for both internal and external principle investigators. Some of the tests and services offered in support of research at the Anatomic Pathology Research Laboratory include immunohistochemistry (IHC) for method development of new antibodies, creation of tissue microarrays (TMA), and curls/ scrolls or core punches for molecular testing. Since the implementation of the new automatic staining platform: Dako Omnis has been set up and is functional at the APRL, the lab specialists are preparing to extend the existing APRL services by investigating the development of a double stain and FISH/CISH testing.
- Dr. Young Ou was successfully recruited to the CLS Research Team in September, 2016. There are two Lab Specialists sharing a 1.0 FTE to provide exceptional service at the APRL. Dr. Young has extensive research experience and APRL customers will benefit from his research background and expertise.
- The APRL was very productive for 2016. Lab specialists at the APRL provided laboratory support to 8 pathologists, for 7 individual projects and completed a total of 193 research requests. A total of forty-two new antibodies (method development) were set up on the Dako Omnis and 17 previously tested antibodies are being transferred. A total of 1723 slides were stained and the construction of 16 TMA was completed. The Lab Specialists provided TMA training to CLS employees and outside researchers on both the manual and semi-automatic TMA machines.

### **Publications**

Department members with a primary appointment in the DPLM and whose primary remuneration is derived from either CLS

or UofC DPLM (i.e., list excludes cross-appointments) published 160 peer-reviewed papers in 2016

It should also be noted that the DPLM is a purely clinical department; all primary faculty members have clinical roles to fulfill and no one in the Department is a fulltime basic scientist. Our overall percentage of academic protected time (i.e., teaching and research) within the Department (i.e., GFT & Clinical Faculty) is < 20%. The following figure shows that the Department has produced a steady, long-term increase in publications despite no increase in overall GFT Faculty members.



The Cumming School of Medicine Research Office provided every department a "Research Report Card". The data they provided relates only to GFT faculty members and is for the year 2013. According to the data provided, our GFT faculty members' overall average job profile is 48% clinical, 28% research, 14% education, and 10% administration. When the Research Office adjusts our publication output into "research equivalents" (RE), our productivity is at least several-fold higher than average for the Cumming School of Medicine (CME).

When the Research Office adjusts our publication citations into "research equivalents" (RE), our productivity is likewise several-fold higher than average for the Cumming School of Medicine.



Citations10

Average #Citations per RE



### Presentations

Members of the DPLM also presented many scientific papers at prestigious national or international meetings in 2016. While such presentations generally represent the generation of new knowledge, these are not listed here as the assumption is that the important presentations will be turned into peer-reviewed publications and will appear in a subsequent DPLM Annual Report.

### Book Chapters and Books

There were no books or book chapters for 2016.

### **Research Grants**

Another measure of research productivity is peer-reviewed grant funding. For a complete list of Departmental research grant holdings, both as principle investigator, co-investigator and collaborator, please refer to Appendix 1.4.

### Promotions

### Faculty of Medicine Faculty-Wide Award Recipients:

Each year, Thomson Reuters compiles a list of highly cited researchers which captures the top one per cent of researchers with global influence and impact. Six researchers from the Cumming School of Medicine have been named to the 2016 list, including one of our CLS Microbiologists.

Dr. Johann Pitout is a medical microbiologist and professor at the University of Calgary. He studies resistance to antimicrobial agents among gram-negative bacteria. The focus of his laboratory is on detection, characterization and molecular epidemiology of bacteria. His current research interests are in developing next generation sequencing techniques to investigate different clones of globally successful bacteria.

### Medical Leadership and Administration

- Dr. Marie Dvorakova was appointed Specialty Group Leader, Cytopathology.
- Dr. Charlene Hunter was appointed Specialty Group Leader, Dermatopathology.
- Dr. Paul Klonowski was appointed Laboratory Director, Immunohistochemistry.
- Dr. Ethan Flynn was appointed Clinical Section Chief, General Pathology.

### Challenges

As a laboratory system that performs >30,000,000 tests per year, CLS does have challenges including:

- Providing excellent laboratory service with accurate and timely results to our patients and their physicians.
- Ensuring that CLS operates as efficiently and economically as possible in a time of substantial financial constraint.
- Replacing aging analyzers and other laboratory equipment along with deployment of new technologies when capital funds are scarce.
- Making efficiencies, gains and savings, through process excellence, especially lean sigma, durable and transformative.
- Accommodating for IT resource constraints.
- Training, recruiting and retaining enough competent and qualified medical/scientific, technical and support staff.
- Maximizing throughput and efficiency at our Patient Service Centres by increasing percentages of patient appointments.
- Expand services at SHC to meet expanding needs as clinical services grow and evolve.
- Planning for laboratory services surrounding cancer center needs in the context of changing plans related to the New Cancer Care Centre (NCCC).
- Space constraints including identifying office space for new pathologists at most sites.
- Discerning and meeting the changing local and provincial service needs of our owner and primary customer, AHS.
- Exploring possibilities to generate new business and hopefully use these funds to subsidize purchase of new capital equipment and development of new technologies.
- Possible expansion of Transfusion Medicine services.
- Improving services provided to Rural Calgary Zone and South Zone.

### Responses to Issues, Ongoing Matters and Plan of Action

### Future Risks

There are longstanding and ongoing challenges with workforce availability in pathology; which necessitates planning and forecasting of future needs as recruiting may take up to a year or more. We are also facing uncertainty regarding the anticipated provincial laboratory services plan and the impact this will have on CLS>

### Workforce Planning

Summary of Recruitment - 2016

Medical Staff - Recruitment				
Medical Staff	Start Date	GFT/Clinical	Primary Division	
Berenger, Byron	2016 July	Clinical Assistant Professor	Microbiology	
Howell, Jenika	2016 October	Clinical Assistant Professor	Anatomic Pathology/Cytopathology	
Ng, Denise	2016 August	Clinical Assistant Professor	Anatomic Pathology/Cytopathology	
Schneider, Michelle	2016 July	Clinical Assistant Professor	Anatomic Pathology/Cytopathology	
Shameli, Afshin	2016 July	Clinical Assistant Professor	Hematopathology	
Medical Staff - Depar	tures			
Barber, Duane	2016 June	Clinical Assistant Professor	Anatomic Pathology/Cytopathology	
Green, Frances	2016 June	Professor	Anatomic Pathology/Cytopathology	
Krause, Richard	2016 October	Clinical Assistant Professor	Clinical Biochemistry	
Schinstine, Malcolm	2016 May	Clinical Assistant Professor	Anatomic Pathology/Cytopathology	

### Appendices

### 1.1 Membership Lists

Clinical Section of Anatomic Pathology/Cytopathology					
Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise	
Abi Daoud, Marie	Clinical	Assistant Professor	DSC	Dermatopathology	
Anders, Karl	Clinical	Associate Professor	SHC	Surgical Pathology	
Benediktsson, Hallgrimur	GFT	Professor	FMC	Renal Pathology, Transplantation	
Bismar, Tarek	GFT	Professor	RGH	Genitourinary Pathology	
Bromley, Amy	Clinical	Assistant Professor	FMC	Autopsy Pathology	
Brown, Holly	Clinical	Assistant Professor	RGH	Dermatopathology	
Brundler, Marie-Anne	GFT	Professor	ACH	Pediatric Pathology	
Bures, Nicole	Clinical	Assistant Professor	DSC	Cytopathology, Breast Pathology	
Caragea, Mara	Clinical	Assistant Professor	FMC	Bone & Soft Tissue Pathology	
Chan, Elaine	Clinical	Assistant Professor	ACH	Pediatric Pathology	
Chan, Jennifer	GFT	Associate Professor	FMC	Neuropathology	
Demetrick, Douglas	GFT	Associate Professor	HSC	Molecular Pathology	
DiFrancesco, Lisa	GFT	Associate Professor	FMC	Soft Tissue & Bone Pathology	
Duggan, Maire	GFT	Professor	FMC	Cytopathology, Gynecological Pathology	

Dvorakova, Marie	Clinical	Assistant Professor	DSC	Cytopathology
Eidus, Leslie	Clinical	Associate Professor	RGH	Gastrointestinal Pathology
Falck, Vincent	Clinical	Associate Professor	FMC	Gastointestinal Pathology, Surgical Pathology
Galman, Lanie	Clinical	Assistant Professor	SHC	Breast Pathology, Oncologic Surgical Pathology
George, David	Clinical	Associate Professor	FMC	Renal Pathology
Gorecki, Margaret	Clinical	Assistant Professor	DSC	Surgical Pathology, Cytopathology
Gottipati, Srinivas	Clinical	Assistant Professor	FMC	Renal Pathology, Surgical Pathology
Gough, James	Clinical	Professor	FMC	Renal Pathology, Cytopathology
Guggisberg, Kelly	Clinical	Assistant Professor	RGH	ENT Pathology, Dermatopathology
Gui, Xianyong (Sean)	Clinical	Associate Professor	FMC	Gastrointestinal Pathology
Hamilton, Leslie	Clinical	Assistant Professor	FMC	Neuropathology
Howell, Jenika	Clinical	Assistant Professor	PLC	Surgical Pathology
Hunter, Charlene	Clinical	Assistant Professor	DSC	Surgical Pathology, Dermatopathology
Itani, Doha	Clinical	Assistant Professor	FMC	Molecular Genetic Pathology, Hematopathology
Joseph, Jeffrey	GFT	Professor	FMC	Neuropathology
Kelly, Margaret	GFT	Assistant Professor	FMC	Surgical Pathology, Pulmonary Pathology
Khalil, Moosa	Clinical	Associate Professor	FMC	Cytopathology, Surgical Pathology, Endocrine Pathology
Kim, Byung	Clinical	Assistant Professor	PLC	Cytopathology, Surgical Pathology
Klonowski, Paul	Clinical	Assistant Professor	DSC	Surgical Pathology, Lab Informatics
Koebel, Martin	GFT	Associate Professor	FMC	Gynecological Pathology, Autopsy
Kulaga, Andrew	Clinical	Associate Professor	RGH	Genitourinary Pathology, Surgical Pathology
Kurek, Kyle	GFT	Assistant Professor	ACH	Pediatric Pathology
Lee, Sandra	Clinical	Assistant Professor	SHC	Gynecological Pathology
Luedtke, Chad	Clinical	Assistant Professor	SHC	Breast Pathology
Medlicott, Shaun	Clinical	Associate Professor	RGH	Gastrointestinal Pathology
Minoo, Parham	Clinical	Assistant Professor	FMC	Surgical Pathology, Hematopathology
Morava-Protzner, Izabella	Clinical	Associate Professor	PLC	Surgical Pathology
Naert, Karen	Clinical	Assistant Professor	DSC	Dermatopathology
Ng, Denise	Clinical	Assistant Professor	FMC	Surgical Pathology, Neuropathology
Ogilvie, Travis	GFT	Associate Professor	FMC	Breast Pathology, Gynecological Pathology, Molecular Pathology
Oryschak, Allan	Clinical	Associate Professor	RGH	Ophthalmic Pathology, Surgical Pathology
Paslawski, Doreen	Clinical	Assistant Professor	RGH	Breast Pathology, Surgical Pathology
Pinto-Rojas, Alfredo	GFT	Associate Professor	ACH	Pediatric Pathology
Rashid-Kolvear, Fariborz	Clinical	Assistant Professor	DSC	Cytogenetics
Resch, Lothar	GFT	Associate Professor	FMC	Neuropatholgy
Schell, Andrew	Clinical	Assistant Professor	PLC	Gastrointestinal Pathology
Schneider, Michelle	Clinical	Assistant Professor	DSC	Dermatopathology
Sienko, Anna	Clinical	Professor	PLC	Surgical Pathology, Cytopathology
Simpson, Roderick	GFT	Professor	FMC	Head & Neck Pathology

Swanson, Paul	Clinical	Full Professor	FMC	Bone and Soft Tissue, Gastrointestinal Pathology, Breast Path, Lung & Thoracic, ENT
Teman, Carolin	Clinical	Assistant Professor	FMC	Surgical Pathology, Hematopathology
Trpkov, Kiril	GFT	Professor	RGH	Genitourinary Pathology, Renal Pathology
Urbanski, Stefan	Clinical	Professor	FMC	Gastrointestinal Pathology, Liver Pathology, Pulmonary Neoplasia
Waghray, Ranjit	Clinical	Associate Professor	PLC	Surgical Pathology, Cytopathology
Wang, Yinong	Clinical	Assistant Professor	DSC	Surgical Pathology, Cardiac Pathology
Whitcomb, Emma	Clinical	Assistant Professor	SHC	GI/Liver Pathology
Wright, James	GFT	Professor	ACH	Pediatric and Perinatal Pathology, Experimental Pathology
Yang, Hua	Clinical	Assistant Professor	FMC	Breast Pathology
Yilmaz, Asli	GFT	Associate Professor	RGH	Genitourinary Pathology, Surgical Pathology
Yu, Weiming	Clinical	Associate Professor	ACH	Pediatric Pathology, Cardiac Pathology
Clinical Section of Clinica	Il Biochemistry			
Medical/Scientific Staff	GFT/ Clinical	Rank	Site	Special Expertise
Boyd, Jessica	Clinical	Lecturer	DSC	Analytical and Environmental Toxicology
Chin, Alex	Clinical	Assistant Professor	DSC	Immunochemisty, Clinical Chemistry
de Koning, Lawrence	Clinical	Associate Professor	ACH	General Pathology, Pediatric Clinical Chemistry
Sadrzadeh, Hossein	Clinical	Professor	DSC	Endocrinology, Nutrition, Pharmacogenomics, Clinical Biochemistry
Seiden Long, Isolde	Clinical	Associate Professor	FMC	Clinical Biochemistry
Clinical Section of Gener	al Pathology			
Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Abdullah, Amid	Clinical	Assistant Professor	DSC	General Pathology
Flynn, Ethan	Clinical	Associate Professor	DSC	General Pathology
Gorombey, Steve	Clinical	Assistant Professor	DSC	Cytopathology, General Pathology
Larsen, Erik	Clinical	Assistant Professor	RGH	Surgical Pathology, Clinical Chemistry
Mourad, Walid	Clinical	Professor	DSC	General Pathology, Hematopathology, Cytopathology
Naugler, Christopher	GFT	Associate Professor	DSC	Lab Informatics, General Pathology
Redman, Lyle	Clinical		DSC	Point of Care, Clinical Chemistry
Clinical Section of Hemat	opathology			
Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Auer-Grzesiak, Iwona	Clinical	Associate Professor	FMC	Flow Cytometry, Lymphoma
Berka, Noureddine	Clinical	Assistant Professor	DSC	Tissue Typing
Fourie, Thomas	Clinical	Assistant Professor	FMC	Hematological Pathology, Flow Cytometry
Jiang, Xiu Yan (Sue)	Clinical	Assistant Professor	DSC	Hematopathology
Khan, Faisal	GFT	Associate Professor	HMRB	Tissue Typing
Mahe, Etienne	Clinical	Assistant Professor	FMC	Hematopathology & Transfusion Medicine
Mansoor, Adnan	GFT	Professor	FMC	Hematopathology

Prokopishyn, Nicole	Clinical	Assistant Professor	FMC	Stem Cell Lab
Shabani-Rad, Meer-Taher	Clinical	Associate Professor	FMC	Hematopathology
Shameli, Afshin	Clinical	Assistant Professor	FMC	Hematopathology
Sinclair, Gary	Clinical	Adjunct Associate Professor	DSC	Molecular Hematology
Clinical Section of Microb	biology			
Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Berenger, Byron	Clinical	Assistant Professor	DSC	Medical Microbiology
Carson, Julie	Clinical	Associate Professor	DSC	Mycology, Enterics, Wounds
Chan, Wilson	Clinical	Assistant Professor	DSC	Telediagnostics, Mycology, Parasitology
Church, Deirdre	GFT	Professor	DSC	Medical Microbiology, HIV Diagnostics, STDs, Anaerobes, Mycology
Gregson, Daniel	GFT	Associate Professor	DSC	Virology, Sirology, General Microbiology
Pillai, Dylan	GFT	Associate Professor	DSC	Molecular Diagnostics, Parasitology
Pitout, Johann	GFT	Professor	DSC	Anitbiotic susceptibility/ARO Bacteriology, Parasitology
Clinical Section of Transfu	usion Medicine			
Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Baskin, Leland	Clinical	Associate Professor	DSC	Chemical Pathology, General Pathology
Sidhu, Davinder	Clinical	Assistant Professor	FMC	General Pathology, Transfusion Medicine

### 1.2 Current Workforce Plan (see Workforce Planning)

### 1.3 Scholarly Publications

### Publications in Peer-Reviewed Journals

### Abdullah, Amid

Thommasen A, Clement F, Kinniburgh DW, Lau CK, Guo M, Viczko J, Guggisberg K, Thomas RE, Turin TC, Wesenberg JC, **Abdullah A**, Hnydyk WS, Naugler C. Canadian family physician knowledge and attitudes toward laboratory utilization management. Clin Biochem. 2016 49(1-2):4-7, 2016

### Auer-Grzesiak, Iwona

Podgorny PJ, Pratt LM, Liu Y, Dharmani-Khan P, Luider J, **Auer-Grzesiak I**, Mansoor A, Williamson TS, Ugarte-Torres A, Hoegh-Petersen M, Khan FM, Larratt L, Jimenez-Zepeda VH, Stewart DA, Russell JA, Daly A, Storek J. Low Counts of B Cells, Natural Killer Cells, Monocytes, Dendritic Cells, Basophils, and Eosinophils are Associated with Postengraftment Infections after Allogeneic Hematopoietic Cell Transplantation. Biol Blood Marrow Transplant. 22(1):37-46, 2016

### Benediktsson, Hallgrimur

Chun J, Chung H, Wang X, Barry R, Taheri ZM, Platnich JM, Ahmed SB, Trpkov K, Hemmelgarn B, **Benediktsson H**, James MT, Muruve DA. NLRP3 Localizes to the Tubular Epithelium in Human Kidney and Correlates with Outcome in IgA Nephropathy. Sci Rep. 6:24667, 2016

### Berenger, Byron

**Berenger B**, Chen J, Bernier AM, Bernard K. Draft Whole-Genome Sequence of a Catalase-Negative Staphylococcus Aureus Subsp. Aureus (Sequence Type 25) Strain Isolated From A Patient With Endocarditis and Septic Arthritis. Genome Announc. 4(6), 2016

### Berka, Noureddine

Turin TC, Ahmed S, Shommu NS, Afzal AR, Al Mamun M, Qasqas M, Rumana N, Vaska M, **Berka N**. Ramadan Fasting Is Not Usually Associated with The Risk Of Cardiovascular Events: A Systematic Review And Meta-Analysis. J Family Community Med. (2):73-81. Review, 2016

Abbas M, **Berka N**, Khraiwesh M, Ramadan A, Apprey V, Furbert-Harris P, Quinn T, Brim H, Dunston G. Genetic Polymorphisms of TLR4 and MICA are Associated with Severity of Trachoma Disease in Tanzania. Autoimmune Infect Dis. 2(3), 2016

Sidahmed AM, Anderson J, Stamm L, Khan F, **Berka N**. HLA-A\*23:01:19, a novel variant of HLA-A\*23:01, discovered in a West African stem cell transplantation patient. HLA. 88(3):120-121, 2016

Faridi RM, Kemp TJ, Dharmani-Khan P, Lewis V, Tripathi G, Rajalingam R, Daly A, **Berka N**, Storek J, Masood Khan F. Donor-Recipient Matching for KIR Genotypes Reduces Chronic GVHD and Missing Inhibitory KIR Ligands Protect Against Relapse after Myeloablative, HLA Matched Hematopoietic Cell Transplantation. PLoS One. 11(6):e0158242, 2016

Aggarwal R, Gupta A, Naru J, **Berka N**, Nanda N, Suri D, Singh S. HLA-DRB1 in Henoch-Schönlein purpura: A Susceptibility Study from North India. Hum Immunol. 77(7):555-558, 2016

### Bismar, Tarek

Wang T, Abou-Ouf H, Hegazy SA, Alshalalfa M, Stoletov K, Lewis J, Donnelly B, **Bismar TA**. Ankyrin G expression is associated with androgen receptor stability, invasiveness, and lethal outcome in prostate cancer patients. J Mol Med (Berl.) 94(12):1411-1422, 2016

Box A, Alshalalfa M, Hegazy SA, Donnelly B, **Bismar TA**. High alpha-methylacyl-CoA racemase (AMACR) is associated with ERG expression and with adverse clinical outcome in patients with localized prostate cancer. Tumour Biol. 37(9):12287-12299, 2016

Bakkar A, Alshalalfa M, Petersen LF, Abou-Ouf H, Al-Mami A, Hegazy SA, Feng F, Alhajj R, Bijian K, Alaoui-Jamali MA, **Bismar TA**. microRNA 338-3p exhibits tumor suppressor role and its down-regulation is associated with adverse clinical outcome in prostate cancer patients. Mod Biol Rep. 43(4):229-240, 2016

Almami A, Hegazy SA, Nabbi A, Alshalalfa M, Salman A, Abou-Ouf H, Riabowol K, **Bismar TA**. ING3 is associated with increased cell invasion and lethal outcome in ERG-negative prostate cancer patients. Tumour Biol. 142(8):1781-1793, 2016

Yan J, Ojo D, Kapoor A, Lin X, Pinthus JH, Aziz T, **Bismar TA**, Wei F, Wong N, De Melo J, Cutz JC, Major P, Wood G, Peng H, Tang D. Neural cell adhesion protein CNTN1 promotes the metastatic progression of prostate cancer. Cancer Res. 76(6) 1603-1614, 2016

Huang KC, Bègin LR, Palanisamy N, Donnelly B, **Bismar TA**. SPINK1 expression in relation to PTEN and ERG in matched primary and lymph node metastatic prostate cancer: Implications for biomarker development. Urol. Oncol. 34(5):235, 2016

Abou-Ouf H, Zhao L, **Bismar TA**. ERG expression in prostate cancer: biological relevance and clinical implication. J Cancer Res Clin Oncol. 142(8):1781-1793, 2016

### Boyd, Jessica

Orton DJ, **Boyd JM**, Affleck D, Duce D, Walsh W, Seiden-Long I. One-step extraction and quantitation of toxic alcohols and ethylene glycol in plasma by capillary gas chromatography (GC) with flame ionization detection (FID). Clin Biochem. 49(1-2):132-138, 2016

### Brundler, Marie-Anne

Brodehl A, Ferrier RA, Hamilton SJ, Greenway SC, **Brundler MA**, Yu W, Gibson WT, McKinnon ML, McGillivray B, Alvarez N, Giuffre M, Schwartzentruber J; FORGE Canada Consortium, Gerull B. Mutations in FLNC are Associated with Familial Restrictive Cardiomyopathy. Hum Mutat. 37(3):269-279, 2016

Ghandourah H, Bhandal S, **Brundler MA**, Noseworthy M. Bronchiolitis obliterans organising pneumonia associated with anticonvulsant hypersensitivity syndrome induced by lamotrigine. BMJ Case Rep. 29; 2016

Scholfield DW, **Brundler MA**, McDermott AL, Mussai F, Kearns P. Adjunctive Treatment in Juvenile Nasopharyngeal Angiofibroma: How Should We Approach Recurrence? J Pediatr Hematol Oncol. 38(3):235-239, 2016

Khong TY, Mooney EE, Ariel I, Balmus NC, Boyd TK, **Brundler MA**, Derricott H, Evans MJ, Faye-Petersen OM, Gillan JE, Heazell AE, Heller DS, Jacques SM, Keating S, Kelehan P, Maes A, McKay EM, Morgan TK, Nikkels PG, Parks WT, Redline RW, Scheimberg I, Schoots MH, Sebire NJ, Timmer A, Turowski G, van der Voorn JP, van Lijnschoten I, Gordijn SJ. Sampling and Definitions of Placental Lesions: Amsterdam Placental Workshop Group Consensus Statement. Arch Pathol Lab Med. 140(7):698-713, 2016

### Chan, Jennifer

D'Asti E, Huang A, Kool M, Meehan B, **Chan JA**, Jabado N, Korshunov A, Pfister SM, Rak J. Tissue Factor Regulation by miR-520g in Primitive Neuronal Brain Tumor Cells: A Possible Link between Oncomirs and the Vascular Tumor Microenvironment. Am J Pathol. 186(2):446-459, 2016

Thompson EM, Hielscher T, Bouffet E, Remke M, Luu B, Gururangan S, McLendon RE, Bigner DD, Lipp ES, Perreault S, Cho YJ, Grant G, Kim SK, Lee JY, Rao AA, Giannini C, Li KK, Ng HK, Yao Y, Kumabe T, Tominaga T, Grajkowska WA, Perek-Polnik M, Low DC, Seow WT, Chang KT, Mora J, Pollack IF, Hamilton RL, Leary S, Moore AS, Ingram WJ, Hallahan AR, Jouvet A, Fèvre-Montange M, Vasiljevic A, Faure-Conter C, Shofuda T, Kagawa N, Hashimoto N, Jabado N, Weil AG, Gayden T, Wataya T, Shalaby T, Grotzer M, Zitterbart K, Sterba J, Kren L, Hortobágyi T, Klekner A, László B, Pócza T, Hauser P, Schüller U, Jung S, Jang WY, French PJ, Kros JM, van Veelen ML, Massimi L, Leonard JR, Rubin JB, Vibhakar R, Chambless LB, Cooper MK, Thompson RC, Faria CC, Carvalho A, Nunes S, Pimentel J, Fan X, Muraszko KM, López-Aguilar E, Lyden D, Garzia L, Shih DJ, Kijima N, Schneider C, Adamski J, Northcott PA, Kool M, Jones DT, **Chan JA**, Nikolic A, Garre ML, Van Meir EG, Osuka S, Olson JJ, Jahangiri A, Castro BA, Gupta N, Weiss WA, Moxon-Emre I, Mabbott DJ, Lassaletta A, Hawkins CE, Tabori U, Drake J, Kulkarni A, Dirks P, Rutka JT, Korshunov A, Pfister SM, Packer RJ, Ramaswamy V, Taylor MD. Prognostic value of medulloblastoma extent of resection after accounting for molecular subgroup: a retrospective integrated clinical and molecular analysis. Lancet Oncol. 17(4):484-495, 2016

Ramaswamy V, Hielscher T, Mack SC, Lassaletta A, Lin T, Pajtler KW, Jones DT, Luu B, Cavalli FM, Aldape K, Remke M, Mynarek M, Rutkowski S, Gururangan S, McLendon RE, Lipp ES, Dunham C, Hukin J, Eisenstat DD, Fulton D, van Landeghem FK, Santi M, van Veelen ML, Van Meir EG, Osuka S, Fan X, Muraszko KM, Tirapelli DP, Oba-Shinjo SM, Marie SK, Carlotti CG, Lee JY, Rao AA, Giannini C, Faria CC, Nunes S, Mora J, Hamilton RL, Hauser P, Jabado N, Petrecca K, Jung S, Massimi L, Zollo M, Cinalli G, Bognár L, Klekner A, Hortobágyi T, Leary S, Ermoian RP, Olson JM, Leonard JR, Gardner C, Grajkowska WA, Chambless LB, Cain J, Eberhart CG, Ahsan S, Massimino M, Giangaspero F, Buttarelli FR, Packer RJ, Emery L, Yong WH, Soto H, Liau LM, Everson R, Grossbach A, Shalaby T, Grotzer M, Karajannis MA, Zagzag D, Wheeler H, von Hoff K, Alonso MM, Tuñon T, Schüller U, Zitterbart K, Sterba J, **Chan JA**, Guzman M, Elbabaa SK, Colman H, Dhall G, Fisher PG, Fouladi M, Gajjar A, Goldman S, Hwang E, Kool M, Ladha H, Vera-Bolanos E, Wani K, Lieberman F, Mikkelsen T, Omuro AM, Pollack IF, Prados M, Robins HI, Soffietti R, Wu J, Metellus P, Tabori U, Bartels U, Bouffet E, Hawkins CE, Rutka JT, Dirks P, Pfister SM, Merchant TE, Gilbert MR, Armstrong TS, Korshunov A, Ellison DW, Taylor MD. Therapeutic Impact of Cytoreductive Surgery and Irradiation of Posterior Fossa Ependymoma in the Molecular Era: A Retrospective Multicohort Analysis. J Clin Oncol. 34(21):2468-2477, 2016

Agamez NR, Lu M, Chan TS, Picard D, de Antonellis P, Khuong-Quang DA, Planello AC, Zeller C, Barsyte-Lovejoy D, Lafay-Cousin L, Letourneau L, Bourgey M, Yu M, Gendoo DM, Dzamba M, Barszczyk M, Medina T, Riemenschneider AN, Morrissy AS, Ra YS, Ramaswamy V, Remke M, Dunham CP, Yip S, Ng HK, Lu JQ, Mehta V, Albrecht S, Pimentel J, **Chan JA**, Somers GR, Faria CC, Roque L, Fouladi M, Hoffman LM, Moore AS, Wang Y, Choi SA, Hansford JR, Catchpoole D, Birks DK, Foreman NK, Strother D, Klekner A, Bognár L, Garami M, Hauser P, Hortobágyi T, Wilson B, Hukin J, Carret AS, Van Meter TE, Hwang EI, Gajjar A, Chiou SH, Nakamura H, Toledano H, Fried I, Fults D, Wataya T, Fryer C, Eisenstat DD, Scheinemann K, Fleming AJ, Johnston DL, Michaud J, Zelcer S, Hammond R, Afzal S, Ramsay DA, Sirachainan N, Hongeng S, Larbcharoensub N, Grundy RG, Lulla RR, Fangusaro JR, Druker H, Bartels U, Grant R, Malkin D, McGlade CJ, Nicolaides T, Tihan T, Phillips J, Majewski J, Montpetit A, Bourque G, Bader GD, Reddy AT, Gillespie GY, Warmuth-Metz M, Rutkowski S, Tabori U, Lupien M, Brudno M, Schüller U, Pietsch T, Judkins AR, Hawkins CE, Bouffet E, Kim SK, Dirks PB, Taylor MD, Erdreich-Epstein A, Arrowsmith CH, De Carvalho DD, Rutka JT, Jabado N, Huang A. Integrated (epi)-Genomic Analyses Identify Subgroup-Specific Therapeutic Targets in CNS Rhabdoid Tumors. Cancer Cell. 30(6):891-908, 2016

Davis B, Shen Y, Poon CC, Luchman HA, Stechishin OD, Pontifex CS, Wu W, Kelly JJ, Blough MD; Terry Fox Research Institute Glioblastoma Consortium (**Chan J**). Neuro Oncol. 18(3):350-360, 2016

### Chan, Wilson

Mohon AN, Lee LD, Bayih AG, Folefoc A, Guelig D, Burton RA, LaBarre P, **Chan WW**, Meatherall B, Pillai DR. NI-NA-LAMP compared to microscopy, RDT, and nested PCR for the detection of imported malaria. Diagn Microbiol Infect Dis. 85(2):149-153, 2016

Pitout JD, **Chan WW**, Church DL. Tackling antimicrobial resistance in lower urinary tract infections: treatment options. Expert Rev Anti Infect Ther. 14(7):621-632, 2016

Mosli MH, **Chan WW**, Morava-Protzner I, Kuhn SM. Schistosomiasis Presenting as a Case of Acute Appendicitis with Chronic Mesenteric Thrombosis. Can J Infect Dis Med Microbiol. 5863219, 2016

### Church, Deirdre

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Somayaji R, Rubin JE, Priyantha MA, Church D. Exploring Staphylococcus pseudintermedius: an emerging zoonotic pathogen? Future Microbiol. 11:1371-1374, 2016

Leal JR, Gregson DB, **Church DL**, Henderson EA, Ross T, Laupland KB. The Validation of a Novel Surveillance System for Monitoring Bloodstream Infections in the Calgary Zone. Can J Infect Dis Med Microbiol. 2935870, 2016

Ballard MS, Schønheyder HC, Knudsen JD, Lyytikäinen O, Dryden M, Kennedy KJ, Valiquette L, Pinholt M, Jacobsson G, Laupland KB; International Bacteremia Surveillance Collaborative (**Church DL**, Gregson DB). The changing epidemiology of group B streptococcus bloodstream infection: a multi-national population-based assessment. Infect Dis (Lond). 48(5):386-391, 2016

Lynch T, Gregson D, **Church DL**. Species-Level Identification of Actinomyces Isolates Causing Invasive Infections: Multiyear Comparison of Vitek MS (Matrix-Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry) to Partial Sequencing of the 16S rRNA Gene. J Clin Microbiol. 54(3):712-717, 2016

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### 1.4 Research Grants

2016 CLS Health Services Research Funding Competition Projects Awarded Funding

Principal Investigator/Co- Investigators	Торіс	Budget
<b>Dr. Noureddine Berka</b> , Dr. Abubaker Sidahmed	The effects of Donor-Specific anti-HLA Antibodies characteristics and C3d binding on kidney transplantation outcomes and predic- tions of prognosis	\$14,961
<b>Dr. Faisal Khan</b> , Dr. Adnan Mansoor, Dr. Douglas Stewart	Crosslinking Immunogenetics to Pharmacogenetics: Stratification of response to Rituximab therapy against different types of B-cell Lymphoma	\$14,750
Dr. Dylan Pillai	LAMP-based SNP genotyping method to detect resistant malaria	\$15,000
Dr. Nicole Prokopishyn, Joanne Luider	Improving the recovery of stem cells following cryopreservation of Allogeneic cellular therapy products by elucidating what key factors determine successful post-thaw recovery	\$14,276
<b>Dr. Lyle Redman</b> , Brenda Adams, Su- zanne Snozyk, Monica Phillips	Development of Quality Control material for the Transcutaneous Bilirubin (TcB) Meter	\$14,139
Phase I Total		\$73,126

Principal Investigator/Co- Investigators	Торіс	Budget
<b>Dr. Etienne Mahe</b> , Dr. Gwynivere Davies, Dr. Adnan Mansoor, Dr. Meer-Taher Shabani-Rad, Dr. Gary Sinclair, Dr. Fariborz Rashid-Kolvear, Dr. Faisal Khan, Dr. Carolyn Owen, Dr. Douglas Stewart	Development of a Tissue-based & Cell-Free DNA (cfDNA) Next-Generation Sequencing (NGS) Workflow	\$45,368
Dr. Jessica Boyd, Dr. Hossein Sadrzadeh	Development of an extraction method to analyze 4 immunosup- pressants drugs in dried blood spots using 96 well plate technology	\$33,523
<b>Dr. Deirdre Church</b> , Dr. Ian Lewis, Dr. Dan Gregson, Dr. Amir Sanati-Nezhad	Rapid Differentiation of Bloodstream Infections (BSIs) and Detec- tion of Antibiotic Resistance (AR) Through Metabolic Analysis	\$45,475
<b>Dr. Johann Pitout</b> , Dr. Deirdre Church, Dr. Gisele Peirano, Dr. Tarah Lynch, Dr. Chris Naugler	Population structure of Extra-intestinal Escherichia coli (ExPEC) in the Calgary Region	\$44,967
<b>Dr. Doha Itani</b> , Dr. Pinaki Bose	Development and Validation of MicroRNA-Based Prognostic Sig- natures for Oral Squamous Cell Carcinoma (OSCC)	\$44,953
Phase II Total		\$214,286
Competition Total		\$287,413

### 2016 External Research Grants and Awards

(held by DPLM Faculty) Does not include those of cross-appointments.

Medical Staff	Year	Funding Source	Total Award	*PI/Co-Inv
Benediktsson, Hallgrimur				
Renal Biobank	2013-16	Canadian Foundation for Inno- vation; Alberta Health Services; Calgary Laboratory Services	\$768,771	Co-PI
Berka, Noureddine				
Genetic Profiling of Killer Immunoglobu- lin-Like Receptors (KIRs) of Natural Killer Cells as Predictors of ATG-Conditioned HLA-matched Pediatric Allogeneic Cell Transplantation (HTC) Outcomes	2015-17	The Childhood Cancer Cana- da Foundation C17 Research Network	\$115,000	Co-Inv
Role of Natural Killer Cells Receptor genes in the immunopathogenesis and prognosis of different types of Lymphoma	2015-17	Alberta Cancer Foundation	\$97,125	Co-Inv
Innovative diagnostics to improve the man- agement of urothelial carcinoma"	2014-17	Collaborative Research and In- novation Opportunities	\$750,000	Co-Inv
Gene Variants Influencing Comple- ment-Dependent Cytotoxicity (CDC) and Antibody-Dependent Cellular Cytotoxicity (ADCC) as Predictors of Antibody Mediated Rejection (AMR) after Kidney Transplanta- tion	2017-18	Canadian National Transplant Research Program	\$25,000	Co-Inv
Chan, Jennifer				
MicroRNA functions in cerebellar develop- ment and disease	2010-17	Alberta Heritage Foundation Clinical Investigator Award	\$770,000	PI
Modeling and therapeutic targeting of the clinical and genetic diversity of glioblastoma	2012-17	Terry Fox Research Institute (with multiple co-funding sourc- es)	\$512,500	Co-PI

Medical Staff	Year	Funding Source	Total Award	*PI/Co-Inv
The role of CIC in oligodendroglioma	2014-19	Canadian Institutes of Health Research	\$656,900	PI
Dissecting the role of Etv5 and Asc11 in oli- godendrogliomagenesis	2015-17	Cancer Research Society	\$120,000	PI
Investigating the role of Lin28 in the patho- genesis and maintenance of stem cell proper- ties in ETMR	2015-17	Charbonneau Cancer Research Institute, University of Calgary	\$25,000	PI
Church, Deirdre				
Microscale Metabolomics for Rapid Detec- tion of Infections and Identification of Drug Resistance	2016-19	Biomedical Engineering, Univer- sity of Calgary	\$150,000	Co-Inv
Device for the rapid detection of seven com- mon bloodstream infections and assessment of antibiotic susceptibility	2017-20	Geomic Applications Partner- ship Program (GAPP)/Genome Canada	\$2,080,891	PI
de Koning, Lawrence				
Improving Blood Collection in Calgary Zone Nursing Units Through Electronic Surveil- lance of the Hemolysis Index and Education	2014-16	Alberta Health Services Chief Medical Officer Quality Im- provement Initiative Grant	\$12,379	PI
Refined prognostication in coronary artery disease using routine laboratory test data	2014-17	MSI Foundation Research Grant	\$98,000	PI
Duggan, Maire				
Fallopian tube pathology and clinico-patho- logical correlates amongst specimens exam- ined by the SEE_FIM technique	2016	National Cancer Institute-Divi- sion of Cancer Epidemiology and Genetics-Hormonal	\$46,600	Co-Inv
Automated TMEN evaluation in breast can- cer patients	2016	National Cancer Institute-Divi- sion of Cancer Prevention-Breast and Gynecologic Cancer Branch	\$50,000	Co-Inv
Green, Francis				
High resolution microscopy of living human cells using Richardson Technology Micros- copy	2004-18	Anonymous Foundations	\$509,145	Ы
Cholesterol-mediated surfactant dysfunction – mechanisms and treatment	2013-16	Alberta Innovates – Health Solutions	\$700,000	Co-Inv
Gregson, Daniel				
Clinical Validation of the Molecular-Based Automated BD MAX Enteric Extended Bac- terial Panel	2015-17	Becton Dickinson	\$85,000	Co-Inv
Kelly, Margaret				
The innate immune response in the patho- genesis of hypersensitivity pneumonitis	2009-16	Alberta Heritage Foundation for Medical Research	\$1,170,000	Ы
Smooth Muscle-Myofibroblast Transition in Asthma	2015-16	CIHR OOG Bridge Fund	\$100,000	PI
Investigating the phenotype and role of mast cells in idiopathic pulmonary fibrosis	2015-17	Medimmune Investigator Initiat- ed Grant	\$207,126	PI

Medical Staff	Year	Funding Source	Total Award	*PI/Co-Inv
Khan, Faisal				
Development of a novel kidney biopsy tissue based molecular genetics approach to identify donors' HLA type from transplanted organs	2014-16	National Plan for Science and Technology; King Abdulaziz City for Science and Technology	\$533,032	Co-Inv
Genetic Profiling of Killer Immunoglobu- lin-Like Receptors (KIRs) of Natural Killer Cells as Predictors of ATG-Conditioned HLA-matched Pediatric Allogeneic Hema- topoietic Cell Transplantation (HCT) Out- comes.	2015-17	C17 Research Network	\$115,000	PI
Non-HLA Immunogenetic Biomarkers Important for Pathogenesis and Therapy of Complications of Paediatric Hematopoietic Cell Transplantation	2011-18	Alberta Children Hospital Foun- dation	\$500,000	PI
5+14=0: A new Maths based on KIR genes to reduce Graft versus host disease after allogeneic HCT	2014-18	Buckley Family Cancer Research Excel Award	\$168,000	PI
Role of Natural Killer Cells Receptor genes in the immunopathogenesis and prognosis of different types of Lymphoma	2015-18	Alberta Cancer Foundation	\$97,125	PI
Role of Natural Killer Cells in Blood and Marrow Transplantation	2015-18	Anonymous Award for HCT research	\$150,000	PI
Gene Variants Influencing Comple- ment-Dependent Cytotoxicity (CDC) and Antibody-Dependent Cellular Cytotoxicity (ADCC) as Predictors of Antibody Mediated Rejection (AMR) after Kidney Transplanta- tion	2016-18	Canadian National Transplant Research Program	\$25,000	PI
Barb Ibbotson ACHF Chair Award	2017-18	Alberta Children Hospital Foun- dation	\$500,000	PI
Kurek, Kyle				
Non-heritable genetic diseases of the skeletal system: pathogenesis and treatment	2014-19	NIH-NIAMS	\$500,000	Co-PI
Mansoor, Adnan				
Predict benefit and improve outcomes of con- ventional high dose therapy/stem cell trans- plantation for lymphoma patients through molecular biomarkers	2014-16	Alberta Cancer Foundation/Ste- phure Directed Donation	\$200,000	Co-PI
Follicular lymphoma: identifying Prolifer- ative Molecular Signature as a predictor of aggressive clinical disease and its validation through routine immunohistochemistry techniques	2014-16	Calgary Health Trust Hematolo- gy Education and Research Fund	\$15,000	Co-Inv
Metabolomics profiling of follicular lympho- ma	2014-16	Calgary Health Trust Hematolo- gy Education and Research Fund	\$15,000	Co-Inv

Medical Staff	Year	Funding Source	Total Award	*PI/Co-Inv
Acute Myeloid Leukemia (AML): Improving current clinical risk stratification, through identification of novel molecular markers of prognostic significance by gene expression	2015-17	Calgary Health Trust Hematolo- gy Education and Research Fund	\$30,000	Co-PI
profiling				
Naugler, Chrisotpher				
Refined prognostication in coronary artery disease using routine laboratory test data	2014-16	M.S.I. Foundation	\$98,000	Co-Inv
Clinical and technical performance of Active B12 against total B12	2014-16	Abbott Pharmaceuticals	\$27,250	Co-Inv
Family integrated care (FiCare) in level II NICUs: An innovative program in Alberta	2015-18	AB Innovates Health Solutions Partnership for Research & In- novation in the Health System	\$750,000	Co-Inv
Implementation and evaluation of a clinical pathway for chronic kidney disease in prima- ry care	2013-19	Canadian Institutes of Health Research	\$524,421	Co-Inv
Improving the efficient and equitable care of patients with chronic medical conditions	2014-19	Alberta Innovates Health Solu- tions, CRIO Team Grant	\$5,000,000	Collabora- tor
Misutilization of laboratory tests: pathways to correction.	2015-20	University of Calgary & AB In- novates Health Solutions	\$25,000	PI
Misutilization of laboratory tests: pathways to correction	2016-20	CIHR Foundation Scheme	\$1,056,420	PI
Using novel population-based datasets to produce and implement clinical prediction models for preterm preeclampsia stillbirth, maternal ICU and long-term cardiovascular disease among Canadian women	2016-20	CIHR Project Scheme	\$336,380	Co-Inv
Pillai, Dylan				
Canada-UK Team in Bacterial Resistance to Beta-Lactam Antibiotics	2013-16	CIHR	\$3,565,700	Co-Inv
Clinical Validation of the Molecular-Based Automated BD MAX Enteric Extended Bacterial Panel	2015-17	Becton Dickinson	\$85,000	Co-Inv
Clinical trial: Point of care testing for C. difficile	2016-17	CIHR	\$10,000	PI
Prevention and treatment of chronic intracel- lular infectious diseases (PT-CIID)	2016-18	University of Calgary VPR Matching Funds	\$200,000	Co-Inv
LAMP diagnostic for malaria in pregnancy	2017-19	Grand Challenges Canada	\$100,000	PI
Pitout, Johann				
The importance of international travel in the spread of extended-spectrum B-lact- amase-producing Escherichia coli	2012-16	Merck Frosst Canada Ltd	\$75,000	PI
Escherichia coli ST131: a model for high- risk transmission dynamics of antimicrobial resistance	2017-20	JPIAMR/CHIR	\$599,00	PI

Medical Staff	Year	Funding Source	Total Award	*Pl/Co-Inv
Zhang, Kunyan				
Molecular assay development and their applications in the Centre for Antimicrobial Resistance (CAR) Program	2012-17	Alberta Health Services – CAR Program Laboratory Operating Grant	\$300,000	PI
Development of a New Multiplex PCR (M-PCR) Assay for Rapid Detection of Methicillin-Resistant Staphylococcus aureus (MRSA). Directly from clinical samples	2016-18	Canadian Institute of Health Research (CIHR)	\$9,961	PI

### 1.5 Banff Pathology Course

2016 Banff Pathology Course Program Head & Neck/Thyroid Pathology Update Rimrock Resort Hotel, Banff National Park September 7 – 10, 2016

### Guest Faculty / Keynote Speakers

<ul> <li>17:00-18:30 Registration - Wildrose Prefunction</li> <li>Thursdoy, September 8, 2016 - Solon BC</li> <li>06:30-07:30 Registration &amp; Full Breakfast - Wildrose Prefunction/Salon A</li> <li>07:30-07:40 Dr. Hallgrimur Benediktsson - Introductory Remarks &amp; Welcome</li> <li>07:40-08:25 Dr. Susan Muller - "Common odontogenic cysts and tumours"</li> <li>08:25-08:35 Question &amp; Answer</li> <li>09:20-9:30 Question &amp; Answer</li> <li>09:30-07:40 Break - Wildrose Prefunction</li> <li>10:51-10:25 Question &amp; Answer</li> <li>10:25-10:40 Break - Wildrose Prefunction</li> <li>10:40-11:25 Dr. Alena Skalova - "Emerging entities in salivary pathology, and their differential diagnosis"</li> <li>11:25-11:35 Question &amp; Answer</li> <li>11:25-11:36 Question &amp; Answer</li> <li>11:25-11:37 Question &amp; Answer</li> <li>11:25-11:30 Question &amp; Answer</li> <li>11:35-11:30 Dr. Bruce Wenig - "Minimal criteria for diagnosing thyroid carcinoma"</li> <li>12:20-12:30 Question &amp; Answer</li> <li>12:20-12:30 Question &amp; Answer</li> <li>12:30-14:00 Lunch Break</li> <li>14:00-15:15 Dr. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of C), Dr. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of A), Drs. Lakshmi Puttagunta, Mark Lee &amp; Julinor Bacani</li> <li>17:30 Wine &amp; Cheese Reception</li> <li>Friday, September 9, 2016 - Solon BC</li> <li>06:30-07:30 Registration &amp; Full Breakfast - Wildrose Prefunction/Salon A</li> <li>07:40-08:25 Dr. Bruce Wenig - "Pseudo-neoplastic lesions of the head and neck"</li> <li>08:25-08:35 Question &amp; Answer</li> <li>08:35-09:20 Dr. Suan Muller - "Grathic Bone Pathology, including important fibro-osseous lesions"</li> <li>09:30-10:15 Dr. Ann Sandison - "Soft tissue tumours of t</li></ul>	Wednesday, S	September 7, 2016
Thursday, September 8, 2016 - Solon BC           06:30-07:30         Registration & Full Breakfast - Wildrose Prefunction/Salon A           07:30-07:40         Dr. Hallgrimur Benediktsson - Introductory Remarks & Welcome           07:40-08:25         Dr. Susan Muller - "Common odontogenic cysts and tumours"           08:35-09:20         Dr. Ilan Weinreb - "Sinonasal hamartomas and low-grade glandular lesions and adenocarcinoma"           09:30-10:15         Dr. Ann Sandison - "Pathology of the ear"           10:15-10:25         Question & Answer           09:30-10:15         Dr. Alena Skalova - "Emerging entities in salivary pathology, and their differential diagnosis"           11:25-11:35         Question & Answer           11:35-12:20         Dr. Bruce Wenig - "Minimal criteria for diagnosing thyroid carcinoma"           12:30-14:00         Lunch Break           14:00-15:15         Dr. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of C), Drs. Vincent Falk, Kelly Guggisberg & Karl Anders           15:15-16:30         Dr. Vincent Falk, Kelly Guggisberg & Karl Anders           17:30         Wine & Cheese Reception           Friday, September 9, 2016 - Solon BC         Oci30-07:30           06:30-07:30         Registration & Full Breakfast - Wildrose Prefunction/Salon A           07:30-07:40         Introductory Remarks - Dr. Hallgrimur Benediktsson           07:40-08:25 <th>17:00-18:30</th> <th>Registration - Wildrose Prefunction</th>	17:00-18:30	Registration - Wildrose Prefunction
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08:25-08:35       Question & Answer         09:30-10:15       Dr. Ilan Weinreb - "Sinonasal hamartomas and low-grade glandular lesions and adenocarcinoma"         09:20-9:30       Question & Answer         09:30-10:15       Dr. Ann Sandison - "Pathology of the ear"         10:15-10:25       Question & Answer         10:25-10:40       Break - Wildrose Prefunction         10:40-11:25       Dr. Alena Skalova - "Emerging entities in salivary pathology, and their differential diagnosis"         11:25-11:35       Question & Answer         11:35-12:20       Dr. Bruce Wenig - "Minimal criteria for diagnosing thyroid carcinoma"         12:20-12:30       Question & Answer         12:30-14:00       Lunch Break         14:00-15:15       Dr. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of C), Drs. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of A), Drs. Lakshmi Puttagunta, Mark Lee & Julinor Bacani         17:30       Wine & Cheese Reception <b>Friday, September 9, 2016 - Solon BC</b> 06:30-07:30         07:30-07:40       Registration & Full Breakfast - Wildrose Prefunction/Salon A         07:30-07:40       Registration & Four Hallgrimur Benediktsson         07:40-08:25       Dr. Bruce Wenig - "Pseudo-neoplastic lesions of the head and neck"         08:35-09:20       Question & Answer	07:40-08:25	Dr. Susan Muller - "Common odontogenic cysts and tumours"
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09:20-9:30       Question & Answer         09:30-10:15       Dr. Ann Sandison - "Pathology of the ear"         10:15-10:25       Question & Answer         10:25-10:40       Break - Wildrose Prefunction         10:40-11:25       Dr. Alena Skalova - "Emerging entities in salivary pathology, and their differential diagnosis"         11:25-11:35       Question & Answer         11:35-12:20       Dr. Bruce Wenig - "Minimal criteria for diagnosing thyroid carcinoma"         11:32-12:30       Question & Answer         12:20-12:30       Question & Answer         12:30-14:00       Lunch Break         14:00-15:15       Dr. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of C), Drs. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of A), Drs. Lakshmi Puttagunta, Mark Lee & Julinor Bacani         17:30       Wine & Cheese Reception         Friday, September 9, 2016 - Solon BC       Oci30-07:40         06:30-07:40       Introductory Remarks - Dr. Hallgrimur Benediktsson         07:30-07:40       Introductory Remarks - Dr. Hallgrimur Benediktsson         07:30-07:40       Dr. Suan Muller - "Gnathic Bone Pathology, including important fibro-osseous lesions"         09:20-9:30       Question & Answer         09:20-9:30       Question & Answer         09:20-9:30       Question & Answer     <	08:35-09:20	Dr. Ilan Weinreb - "Sinonasal hamartomas and low-grade glandular lesions and adenocarcinoma"
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10:15-10:25       Question & Answer         10:25-10:40       Break - Wildrose Prefunction         10:40-11:25       Dr. Alena Skalova - "Emerging entities in salivary pathology, and their differential diagnosis"         11:25-11:35       Question & Answer         11:25-11:35       Question & Answer         11:25-11:35       Question & Answer         12:20-12:30       Question & Answer         12:30-14:00       Lunch Break         14:00-15:15       Dr. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of C), Drs. Vincent Falck (Moderator) - Interactive Session with Interesting Case Presentations (U of A), Drs. Lakshmi Puttagunta, Mark Lee & Julinor Bacani         17:30       Wine & Cheese Reception         Friday, September 9, 2016 - Solon BC       06:30-07:30         06:30-07:30       Registration & Full Breakfast - Wildrose Prefunction/Salon A         07:40-08:25       Dr. Bruce Wenig - "Pseudo-neoplastic lesions of the head and neck"         08:35-09:20       Dr. Suas Muller - "Gnathic Bone Pathology, including important fibro-osseous lesions"         09:20-9:30       Question & Answer         09:20-9:30       Question & Answer         09:20-9:30       Question & Answer         01:25-10:25       Question & Answer         01:25-10:25       Question & Answer         01:15-10:25 <t< td=""><td>09:30-10:15</td><td>Dr. Ann Sandison - "Pathology of the ear"</td></t<>	09:30-10:15	Dr. Ann Sandison - "Pathology of the ear"
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	11:25-11:35	Question & Answer



11:35-12:20	Drs. Moosa Khalil & Ralf Paschke - "Morphologic and molecular aspects of Thyroid FNA Cytology: Pos-
	sibilities and standards, why and how to integrate them"
12:20-12:30	Question & Answer
12:30-14:30	ASLP Annual Meeting - Lunch - Salon A (members only)
	Afternoon Free
18:30-19:30	Cocktails (Cash Bar) - Salon AB
19:30	Banquet
Saturday, Sep	otember 10, 2016 - Salon BC
06:30-07:15	Registration & Breakfast - Wildrose Prefunction/Salon A
07:15-07:25	Introductory Remarks & Welcome
07:25-08:10	Dr. Ann Sandison - "Skull base tumours"
08:10-08:20	Question & Answer
08:20-9:05	Dr. Ilan Weinreb - "Sinonasal small round cell malignancies and related neoplasms"
09:05-09:15	Question & Answer
09:15-09:55	Dr. Susan Muller - "Lichenoid Lesions of the Oral Mucosa: diagnostic pitfalls, including verrucous le- sions"
09:55-10:05	Question & Answer
10:05-10:20	Break - Wildrose Prefunction
10:20-11:05	Dr. Bruce Wenig - "Premalignant lesions of the upper aerodigestive tract and select variants of squamous
	cell carcinoma"
11:05-11:15	Question & Answer
11:15-12:00	Dr. Roderick Simpson - "The new WHO classification of salivary tumours"
12:00-12:10	Question & Answer
12:10	Dr. Hallgrimur Benediktsson - Closing Remarks

### Guest Faculty / Keynote Speakers Susan Muller, DMD, MS

Susan Muller, DMD, MS Professor Emeritus Emory University School of Medicine Atlanta, GA

### Anna Sandison, MD, FRCPath

Consultant, Histopathologist Lead Pathologist, Head & Neck Imperial College Healthcare London, UK

### Ilan Weinreb, MD, FRCPC

Assistant Professor Pathology University of Toronto Toronto, ON

### Bruce M Wenig, MD, FRCPath

Professor Pathology & Chairman Dept of Pathology & Laboratory Medicine Mount Sinai Beth Israel New York, NY

