Department of Pathology and Laboratory Medicine

Annual Report

2020

CUMMING SCHOOL
OF MEDICINE

UNIVERSITY OF
CALGARY

Alberta Health
Services

This report is a publication of the Department of Pathology and Laboratory Medicine
Cumming School of Medicine, University of Calgary.

Submitted by:
Dr. Dylan Pillai
Professor and Head
Department of Pathology & Laboratory Medicine
University of Calgary, Cumming School of Medicine
South Sector Medical Director, Alberta Precision Laboratories (APL)

Acknowledgements:
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Dr. Margaret Kelly
Dr. Dylan Pillai

Submissions from: Division/Section Heads Managers, Program Directors

We wish to thank all DPLM staff, administrators, and other
team members whose efforts made this report possible.

A copy of this document is available at:
W: cumming.ucalgary.ca/departments/pathology/home

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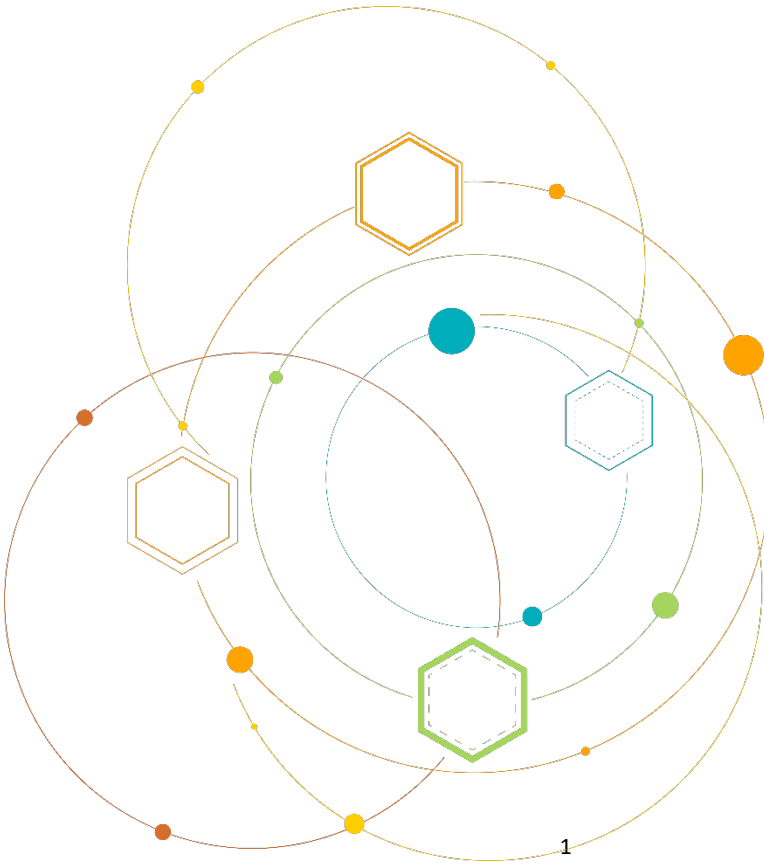
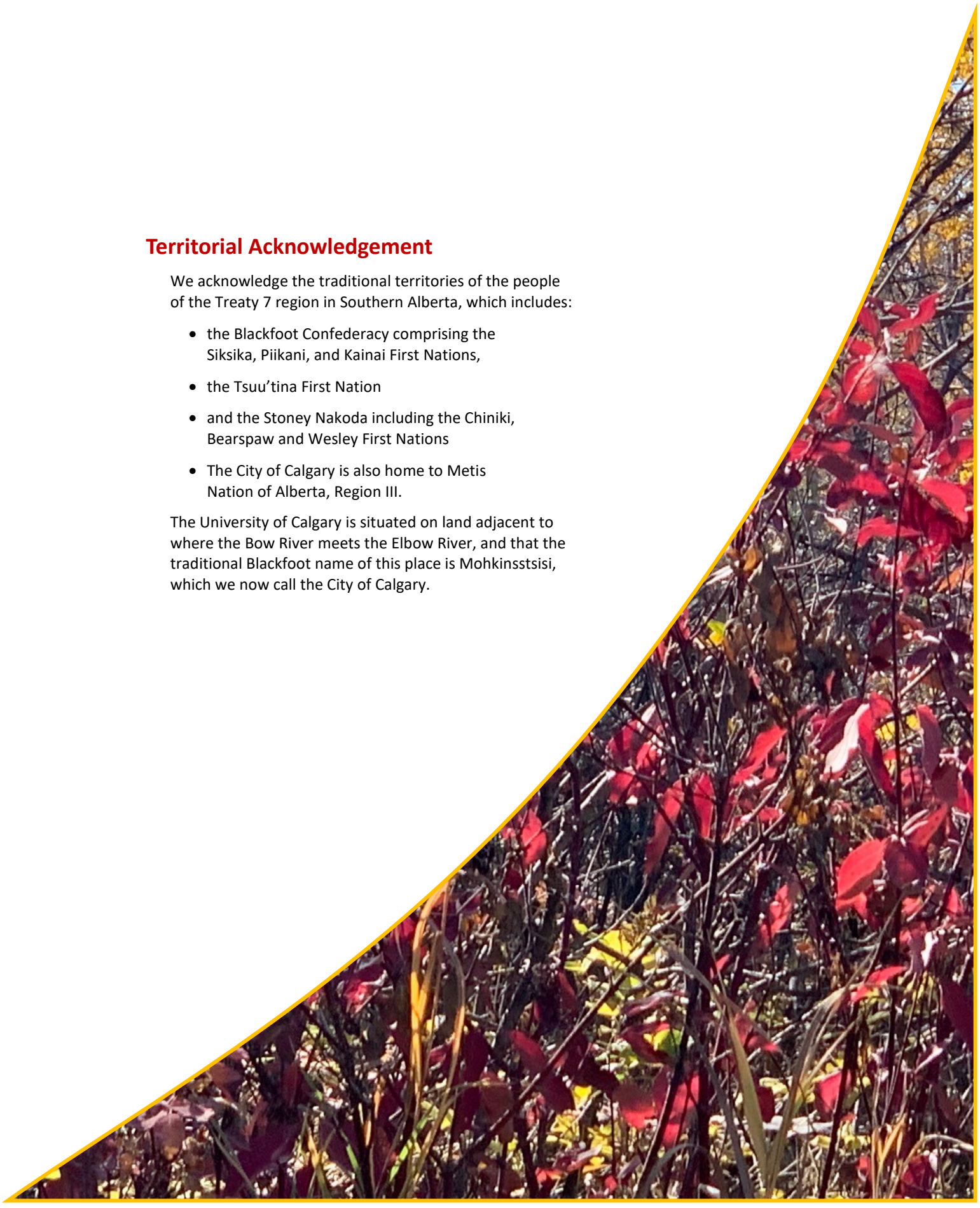


Territorial Acknowledgement

We acknowledge the traditional territories of the people of the Treaty 7 region in Southern Alberta, which includes:

- the Blackfoot Confederacy comprising the Siksika, Piikani, and Kainai First Nations,
- the Tsuu'tina First Nation
- and the Stoney Nakoda including the Chiniki, Bearspaw and Wesley First Nations
- The City of Calgary is also home to Metis Nation of Alberta, Region III.

The University of Calgary is situated on land adjacent to where the Bow River meets the Elbow River, and that the traditional Blackfoot name of this place is Mohkinsstsisi, which we now call the City of Calgary.



Executive Summary

Department Structure and Organization
The Department of Pathology and Laboratory Medicine (DPLM) comprises the medical and scientific staff for Alberta Precision Laboratories (APL) (formerly Alberta Public Labs). It is composed of six Divisions with 115 primary clinical MD appointees and 14 clinical PhD scientists. Twenty-four members have a geographic full-time (GFT) appointment with the Cumming School of Medicine (CSM), University of Calgary and 91 have Clinical Faculty appointments. The Medical/Scientific staff are located at all five acute-care hospital sites, at the APL central laboratory facility located at the Diagnostic & Scientific Centre, the APL Public Health Laboratory South, the University of Calgary Health Sciences Centre, Heritage Medical Research Building, and Health Research Innovation Centre.

Accomplishments and Highlights
Accomplishments of individual sections are described in this report. The year 2020 was most notable for the impact of COVID-19 on the laboratory. A special feature on this is provided in the report. Based on CSM statistics, our Department published 302 research papers, obtained $6.8m in funding, and supervised 33 graduate students in 2020. In parallel, we have vibrant residency and fellowship training programs in Anatomic Pathology, General Pathology, Medical Microbiology, NeuroPathology, and associated sub-specialties.

Workforce Planning
Certain areas of the laboratory have seen a high turnover of medical staff and the Department has aggressively pursued recruitment and retention of specialists in these areas. Shortfalls in staffing affect turn around times and keeping apace with clinical needs. We foresee that this situation will improve in the post-pandemic era and as the service model lands on a new paradigm in the laboratory sector.

Challenges
Several challenges were faced by the Department in 2020 in addition to COVID-19 counter measures. First, the Calgary Zone and the South Sector in general is adapting to change within a provincial service model while maintaining the academic function of CSM. Budget constraints remain a prime feature. The laboratory also continues to migrate to a new laboratory information system which essentially requires a complete overhaul. Further, the laboratory may soon, in part, be operating in a privatized model in the South Sector and this has required considerable planning and preparation. A ripple effect is expected on academic functions including research and residency education.

Appropriateness and Laboratory Testing
APL has initiated critical conversations dealing with appropriateness and laboratory testing. Important areas have been noted related to urine cultures, ANA testing for rheumatoid disease, biopsies for skin lesions and other areas where improved utilization may reduce cost and improve patient outcomes. This initiative dovetails with the Choosing Wisely Canada program and the Improving Health Outcomes Together (IHOT) mandate of Alberta Health Services.

Future Directions and Initiatives
Challenging times are ahead but therein lies the opportunity to contribute. Service is central to our philosophy whether clinical, education, or research. The laboratory aims to provide excellent quality, state-of-the-art, and timely results to our stakeholders. While the service model moving forward is in flux, the commitment to the aforementioned philosophy remains undeterred and patients remain central to our mission.

Dylan Pillai, MD, PhD
Professor and Head, Department of Pathology and Laboratory Medicine, University of Calgary, Cumming School of Medicine; Medical Director, Alberta Precision Laboratories, South Sector

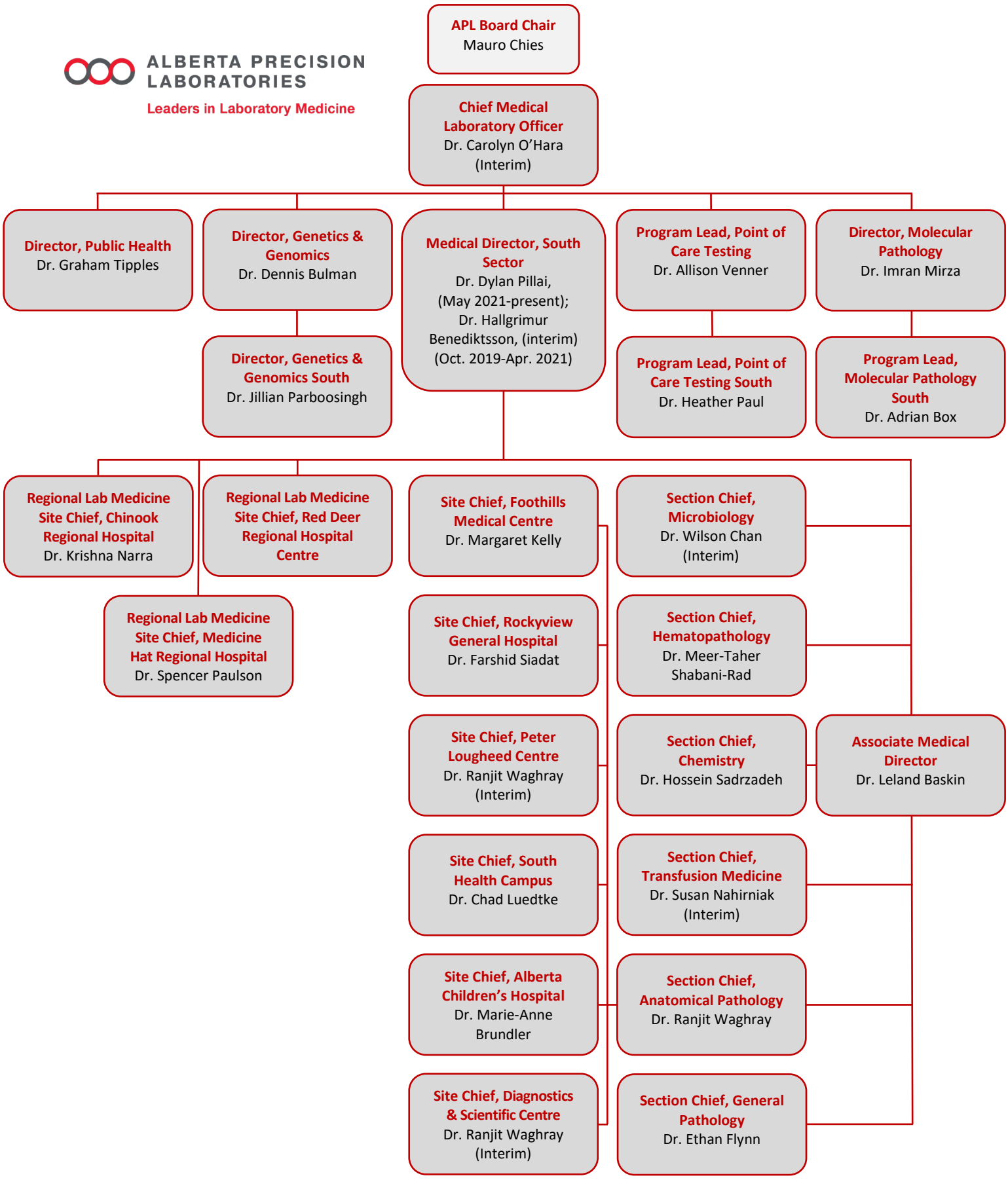
Departmental Structure and Organization

Departmental Structure and Organization

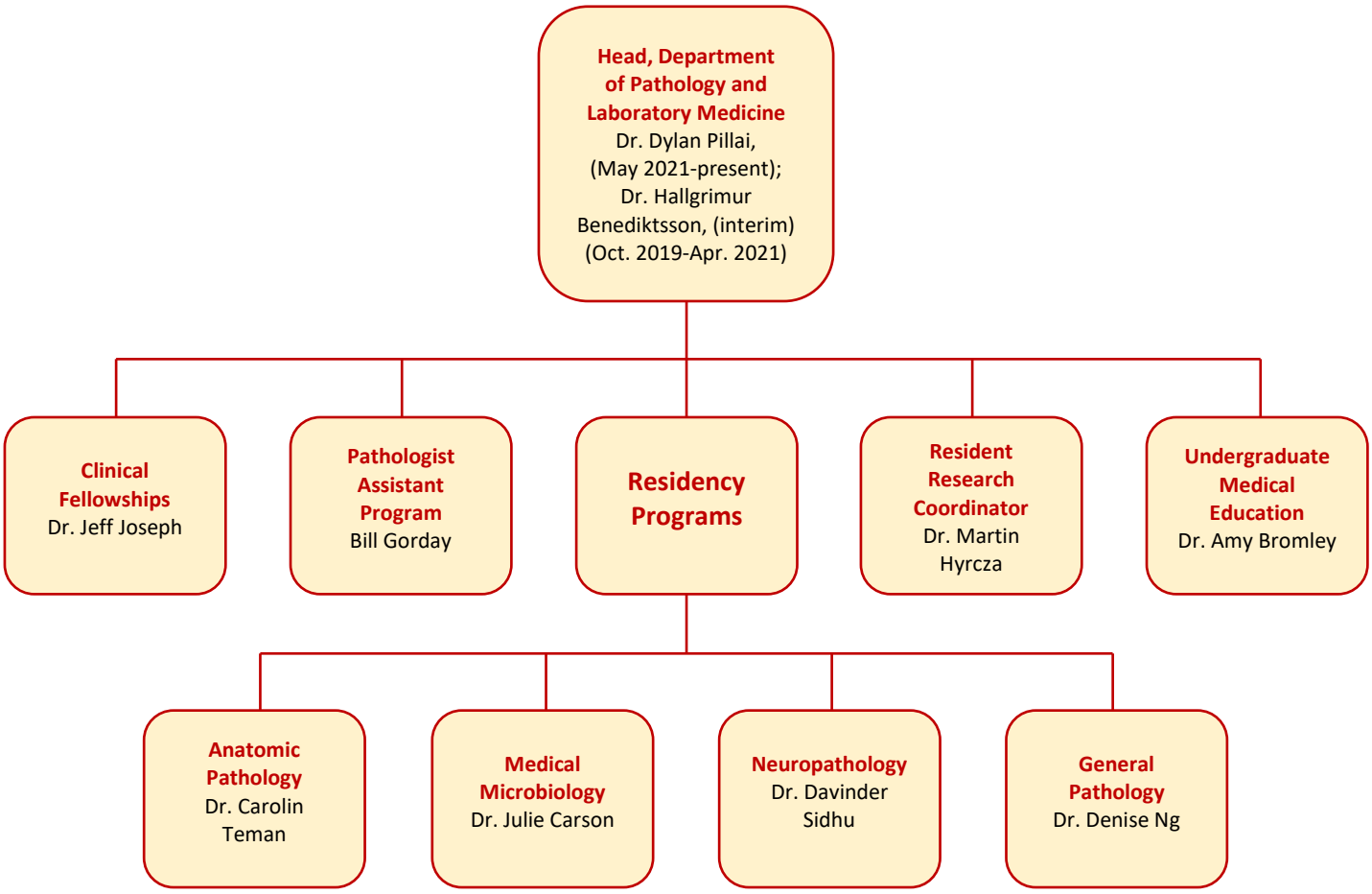
Divisions/Sections and/or Programs

Section	Clinical Section Chief
Anatomic Pathology	Dr. Ranjit Waghray
Clinical Biochemistry	Dr. Hossein Sadrzadeh
General Pathology	Dr. Ethan Flynn
Hematopathology	Dr. Meer-Taher Shabani-Rad
Microbiology	Dr. Wilson Chan (interim)
Transfusion Medicine	Dr. Susan Nahirniak (Interim)

ALBERTA PRECISION LABORATORIES
Leaders in Laboratory Medicine



UNIVERSITY OF CALGARY



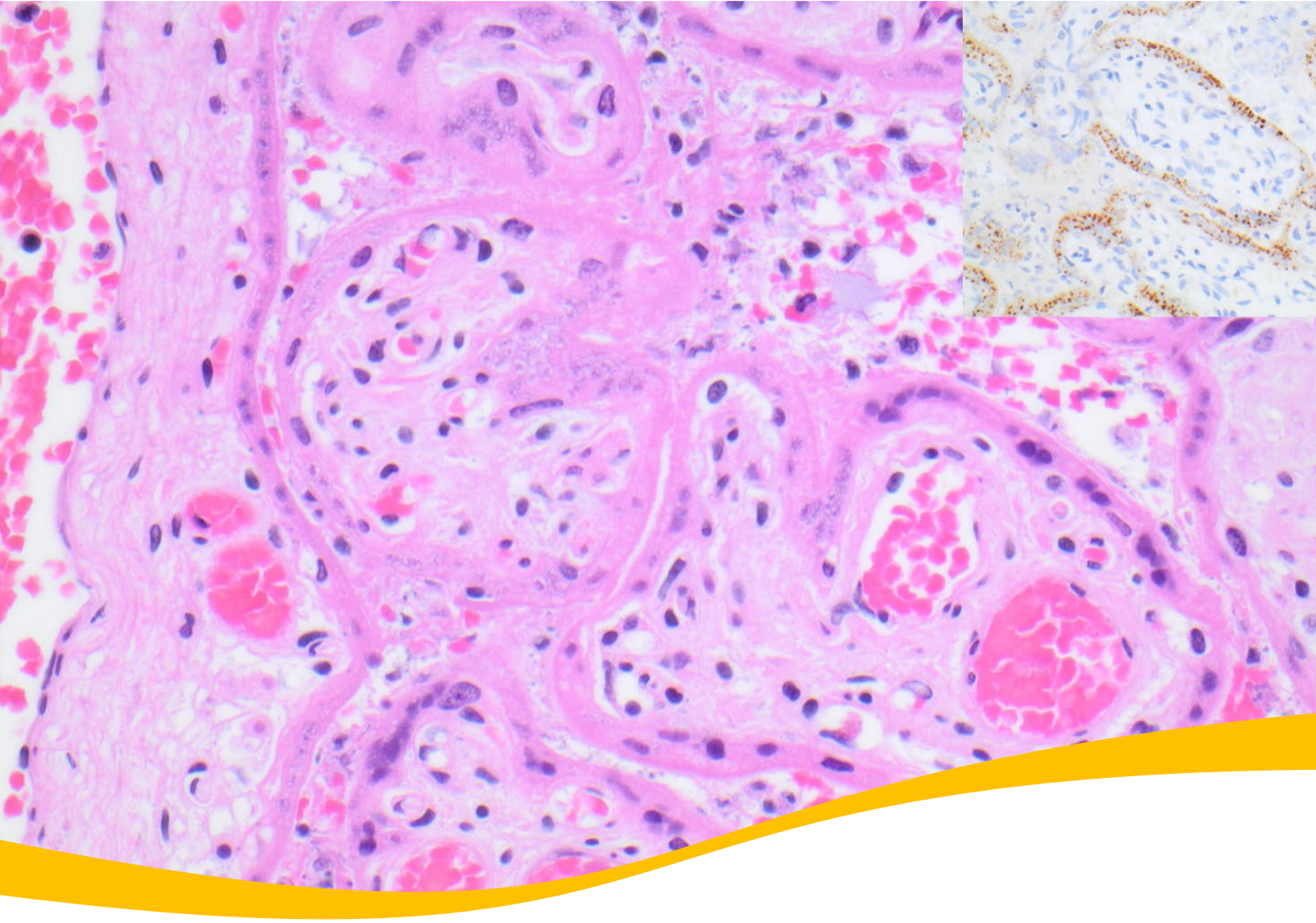
Anatomic Pathology Residency Training Committee	
Dr. Carolin Teman	Program Director
Dr. Adrian Box	
Dr. Amy Bromley	CBME Lead
Dr. Asli Yilmaz	
Dr. Charlene Hunter	
Dr. Eric Bol	
Dr. Jenika Howell	
Dr. Karen Naert	
Dr. Karim Khetani	
Dr. Kate O'Connor	July 1, 2021 onwards
Dr. Konstantin Koro	
Dr. Kyle Kurek	
Dr. Mara Caragea	
Dr. Martin Hyrcza	
Dr. Marie Dvorakova	
Dr. Nicole Bures	
Dr. Margaret Kelly	
Dr. Sandra Lee	
Dr. Tariq Roshan	July 1, 2021 onwards
Dr. Travis Ogilvie	
Dr. Davinder Sidhu	
Dr. Amy Thommasen	
Dr. Denise Ng	
Dr. Hallgrimur Benediktsson	(Dept Head corresponding)
Dr. Dylan Pillai	(Dept Head corresponding, May 1, 2021 onwards)
AP Junior Resident	(rotates)
AP Chief Resident	(rotates)
GP Chief Resident	(rotates)
GP Junior Resident	(rotates)

General Pathology Residency Training Committee	
Dr. Davinder Sidhu	Program Director
Dr. Hallgrimur Benediktsson	(Corresponding)
Dr. Christopher Naugler	(Corresponding)
Dr. Amy Thommasen	Asst. Program Director
Dr. Amid Abdullah	(Dr. Marie Dvorakova – from July 2020)
Dr. Carolin Teman	
Dr. Iwona Auer	
Dr. Alex Chin	
Dr. Julie Carson	
Dr. Heidi Paulin	
Dr. Ryan Lenz	(corresponding)
GP Chief Resident	
Junior Resident Representative	

Microbiology Residency Training Committee	
Dr. Julie Carson	Program Director
Dr. Wilson Chan	
Dr. Stephen Vaughan	
Dr. Michael Groesche	
Dr. Dan Gregson	
Dr. Joseph Kim	
Dr. Hong Yuan Zhou	
Dr. Taj Jadavji	
Dr. Nathan McCartney	resident (PGY2)
Dr. Alexander Kipp	resident (PGY1)
Dr. Helen Bibby	Chief Resident PGY4

Neuropathology Residency Training Committee	
Dr. Denise Ng	Program Director
Dr. Kristopher Langdon	
Dr. Jeffrey Joseph	
Dr. Jennifer Chan	
Dr. Ana Nikolic	
Dr. Erik Bol	
Dr. Marie-Anne Brundler	
Dr. Carolin Teman	(ex-officio)
Dr. Amy Bromley	(ex-officio)
Dr. Davinder Sidhu	(ex-officio)
Dr. Hallgrimur Benediktsson	(corresponding)
Chief Resident	(residents' representative)

Fellowship Committee	
Dr. Jeff Joseph	(Chair)
Dr. Amy Thommasen	(for Dr. Davinder Sidhu)
Dr. Erik Nohr	
Dr. Etienne Mahe	
Dr. Carolin Teman	
Dr. Jessica Boyd	
Dr. Hallgrimur Benediktsson	(Ex officio)

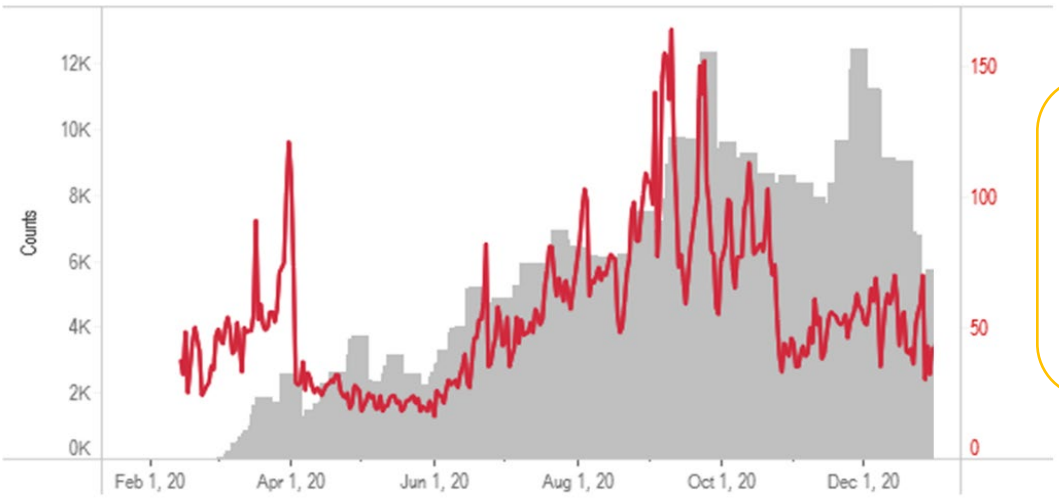


DPLM and Response to the COVID-19 Pandemic

Highlights:
Throughout the pandemic DPLM faculty members have implemented a variety of COVID-19 testing options to support COVID-19 counter measures.

Test Locations and test types in Southern Alberta:

- Diagnostic Scientific Centre in Calgary: Rapid molecular testing for inpatient units, emergency, and urgent care centers in the Calgary Zone
- Public Health Laboratory South in Calgary: COVID-19 PCR (lab-developed test); variant of concern testing
- Hematology Transfusion Laboratory at University of Calgary: COVID-19 LAMP laboratory-developed tests made by DPLM members and next generation sequencing testing technology implemented as part of the Alberta Border Testing Pilot Program
- Regional Rural Hubs in Southern Alberta (Red Deer, Medicine Hat, and Lethbridge): Rapid PCR testing for hospital, emergency and urgent care in South and Central Zone
- Small rural hospitals (various): COVID-19 point of care test (Abbott ID NOW)
- Partnered with Canadian Food Inspection Agency to do COVID-19 PCR in Southern Alberta
- COVID-19 Assessment Centres and implementation of mobile testing: COVID-19 point of care tests (rapid antigen tests and commercial LAMP assays)

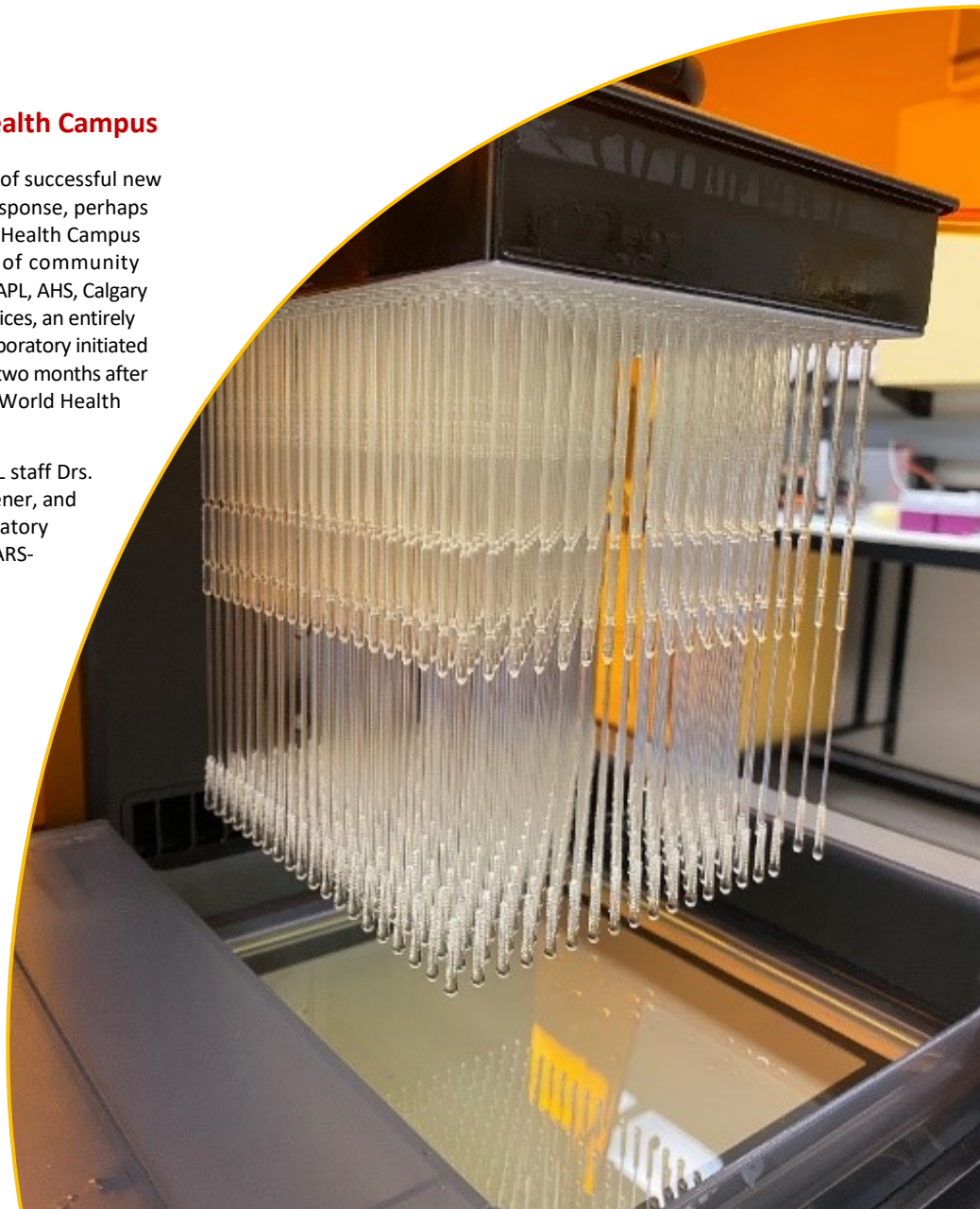


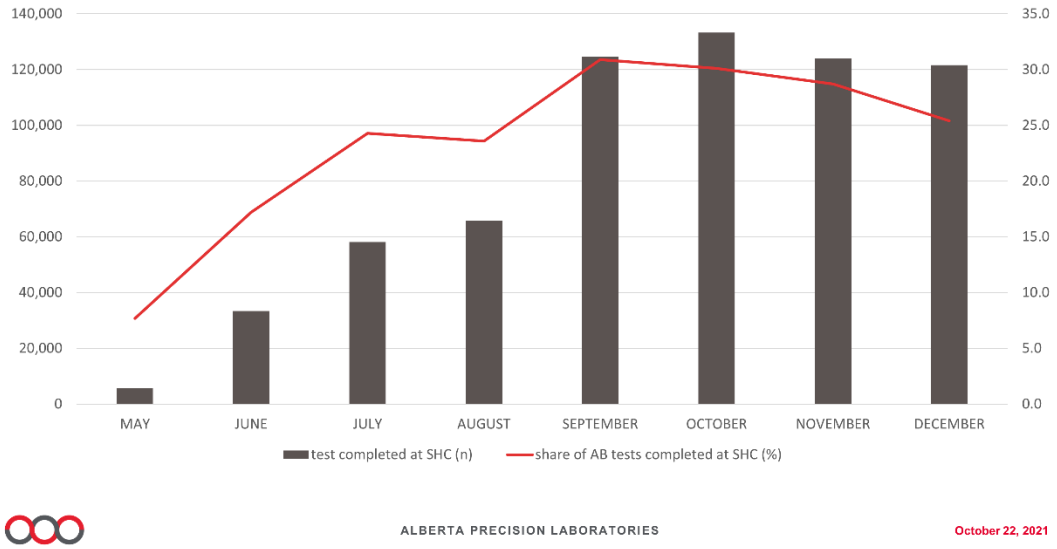
COVID testing in Calgary Zone during 2020. The grey bars indicate testing volume counts by day performed at the South Health Campus and Public Health Laboratory, South sites. The red line indicates turn around time from collection to result in hours.

COVID-19 testing at South Health Campus

2020 was marked by the establishment of successful new partnerships as part of the pandemic response, perhaps best illustrated by the role of the South Health Campus Microbiology Laboratory in the offer of community diagnostic SARS-CoV-2 testing. Thanks to APL, AHS, Calgary Health Foundation and Equity Health Services, an entirely new high throughput molecular testing laboratory initiated clinical operations in record time, merely two months after the declaration of the pandemic by the World Health Organization, on May 11, 2020.

Lead by Microbiology section DPLM/APL staff Drs. Deirdre Church, Dylan Pillai, Thomas Griener, and Luiz Lisboa, the SHC Microbiology Laboratory responded in 2020 for up to 30% of all SARS-CoV-2 monthly in-lab testing volumes in the whole province. Innovative pre-analytical solutions, automation and diversification of supply chain have allowed for the uninterrupted offer of community SARS-CoV-2 testing by the SHC Microbiology to Alberta's Central, Calgary and South health zones during 2020, and beyond.





SARS-CoV-2 testing volumes at South Health Campus in 2020

COVID-19 testing at Hematology Translational Lab (HTL)

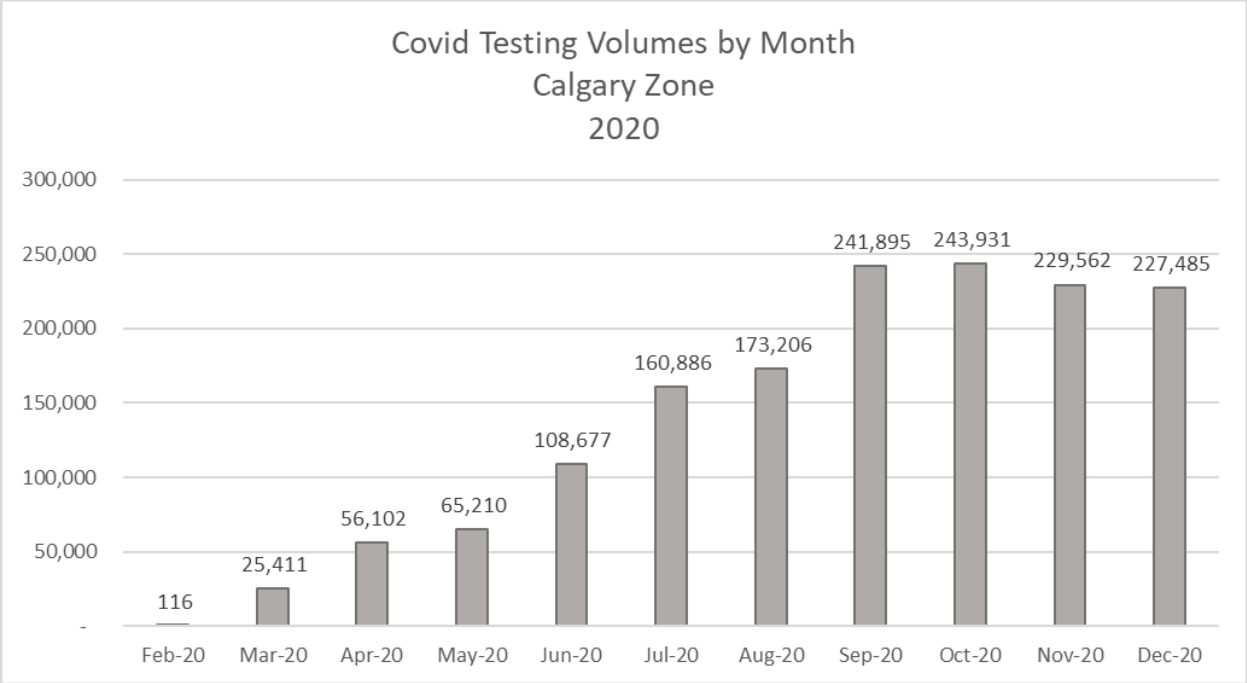
In the year 2020-21, the Hematology Translational Lab (HTL) continued to live up to its reputation for being a leader in translational research and clinical services at the University of Calgary. In partnership with the Governments of Alberta and Canada, Alberta Health Services and Alberta Precision Labs, HTL was chosen to lead the COVID-19 Border Pilot Project, which later evolved into International Traveller Testing Program implemented nationwide.

A timely COVID-19 test information provided an alternative to the mandatory 14-day quarantine requirements for those who tested negative, a move envisioned to help "re-open" the province and the country.

In the process, HTL became the first lab in Canada to establish clinical grade next generation sequencing of SARS-CoV-2 genome for COVID-19 diagnosis, and when the "variants of concern" hit us during the holidays of 2020, HTL was ready to provide the critical variants and lineage information to the public health authorities in real time. HTL has so far completed COVID-19 testing for over 300,000 inbound travellers as part of these initiatives.

On the translational research front, as the global pandemic of COVID-19 reached us, HTL's research team contributed one of the earliest pieces of research data to the rapidly evolving information surrounding the novel SARS-CoV-2 virus. HTL's research team has shown that critical components of innate immunity – the Natural Killer cells were impaired in their numbers and function in severe cases of COVID-19 (Osman et al., Blood Adv 2020).

HTL, lead by Dr. Faisal M. Khan, is part of the Arnie Charbonneau Cancer Institute at the Cumming School of Medicine. At present, 35 individuals, including lab scientists, analysists, technologist, postdoc fellows and graduate and undergraduate students work in HTL. In addition to serving the community in supporting innovative COVID-19 testing initiatives, HTL continues to partner with Alberta Health Services and Alberta Precision Labs in routine clinical testing since 2017. HTL's clinical services include comprehensive genomic assessment of myeloid malignancies, flow-sorting for chimerism, evaluation for measurable residual disease and comprehensive cytokine profiling for various immunological conditions.



Publications

1. Mohon AN, Oberding L, Hundt J, van Marle G, Pabbaraju K, Berenger BM, Lisboa L, Griener T, Czub M, Doolan C, Servellita V, Chiu CY, Greninger AL, Jerome KR, Pillai DR. Optimization and clinical validation of dual-target RT-LAMP for SARS-CoV-2. J Virol Methods. 2020 Dec;286:113972. doi: 10.1016/j.jviromet.2020.113972. Epub 2020 Sep 15.
2. Berenger BM, Kevin Fonseca, Angela R. Schneider, Jia Hu, Nathan Zelyas. Sensitivity of Nasopharyngeal, Nasal and Throat Swab for the Detection of SARS-CoV-2. https://www.medrxiv.org/content/10.1101/2020.05.05.20084889v1
3. Charlton CL, Kanji JN, Johal K, Bailey A, Plitt SS, MacDonald C, Kunst A, Buss E, Burnes LE, Fonseca K, Berenger BM, Schnabl K, Hu J, Stokes W, Zelyas N, Tipples G. Evaluation of Six Commercial Mid- to High-Volume Antibody and Six Point-of-Care Lateral Flow Assays for Detection of SARS-CoV-2 Antibodies. J Clin Microbiol. 2020 Sep 22;58(10):e01361-20. doi: 10.1128/JCM.01361-20. Print 2020 Sep 22.
4. Osman M, Faridi RM, Sligl W, Shabani-Rad MT, Dharmani-Khan P, Parker A, Kalra A, Tripathi MB, Storek J, Cohen Tervaert JW, Khan FM. Impaired natural killer cell counts and cytolytic activity in patients with severe COVID-19. Blood Adv. 2020 Oct 27;4(20):5035-5039

DPLM and Global Health

Grants

Dr. Dylan Pillai

- Grand Challenges Canada, 2020, C$500,000, LAMPREG Trial: Active case detection of malaria in pregnancy (Ethiopia)
- Foundation for Innovative New Diagnostics (FIND), 2020, US$100,00 LAMPREG Trial: Active case detection of malaria in pregnancy (Ethiopia)

Mentorship

Dr. Daniel Gregson
Dr. Anagabriela Duarte, a recipient of the Emerging Latin American Physicians Grant from ***University of Managua, Nicaragua***, is spending months in the MIcrobiology Laboratory at the DSC upgrading her microbiology skills with the intention of initiating a peripartum group B Streptococcus screening program in Managua to reduce the incidence of perinatal GBS in that city.

Dr. Johann Pitout
Antimicrobial resistance projects and co-funding applications with Prof Jeremiah Seni from ***Tanzania*** (Catholic University of Health Sciences Mwanza) and co-supervising graduate students with Prof. Marleen Kock from ***South Africa*** (University of Pretoria, Gauteng).

Dr. Martin Köbel
Supervised Peter's PhD thesis entitled *"Tailoring Ovarian Cancer Strategies to a Sub-Saharan Region: Testing the Developed Country Experience"* within a Cotutelle program. Peter graduated 2018, Peter Rambau, MD, PhD Department of Pathology, Catholic University of Health and Allied Sciences (CUHAS), Box 1464, Mwanza, ***Tanzania.***

DPLM and Global Health

Publications:

Dr. Tarek Bismar

- Abdelsalam RA, Khalifeh I, Box A, Kalantarian M, Ghosh S, Abou-Ouf H, Lotfi T, Shahait M, Palanisamy N, Bismar TA. Molecular characterization of prostate cancer in Middle Eastern population highlights differences with Western populations with prognostic implication.J Cancer Res Clin Oncol. 2020 Jul;146(7):1701-1709. doi: 10.1007/s00432-020-03221-x. Epub 2020 Apr 30.PMID: 32350606.

Dr. Adnan Mansoor

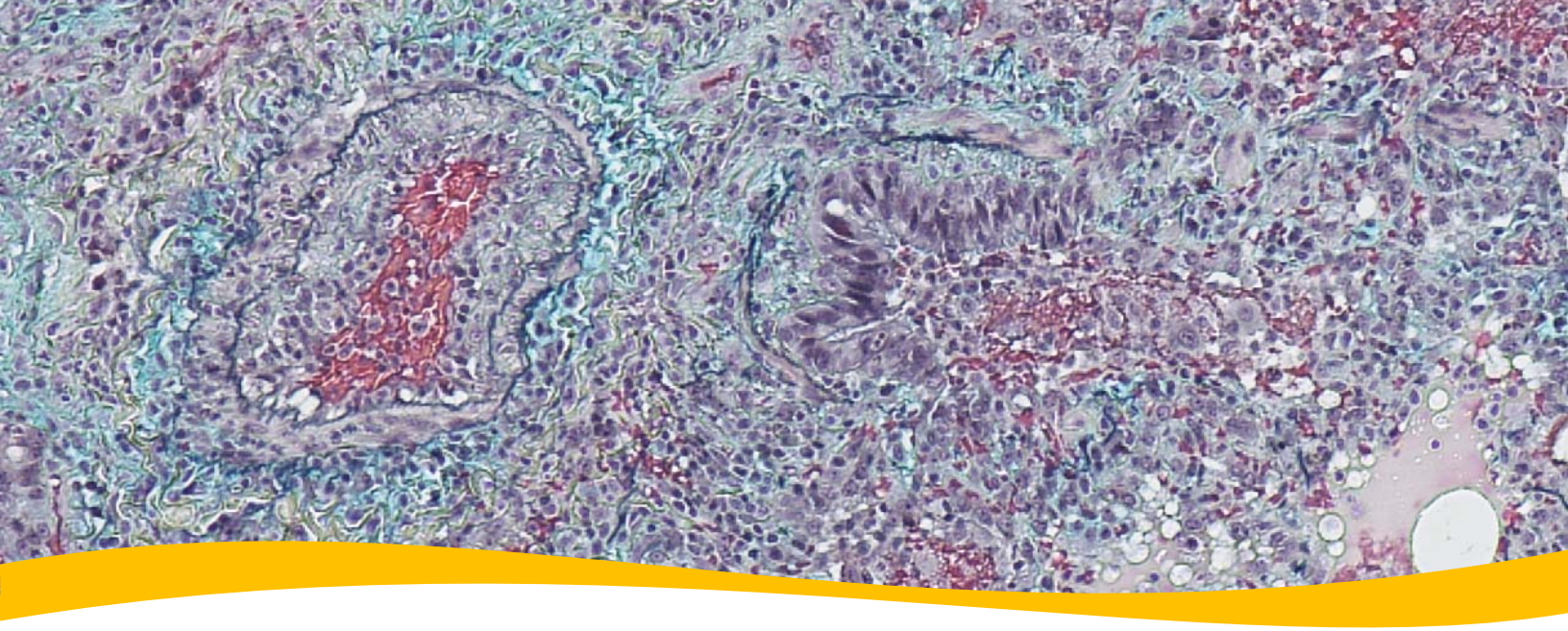
- Kean Chang Phang, Noor Hamidah Hussin, Faridah Abdul Rahman, Nur Maya Sabrina Tizen, Adnan Mansoor, Moraidah Masir. Characterisation of immunogenotypes of diffuse large B-cell lymphoma. Malaysian H. Pathol 2019, 41(2) 101 – 124.
- Masir N, Akhter A, Roshan TM, Florence CS, Abdul-Rahman F, Tumian NR, Kean-Change P, Elyamany G, shabani-Rad MT, Mansoor A. Diffuse Large B-cell Lymphoma in Southeast Asian cohort: expression patterns of B-cell receptor (BCR) repertoire and its linkage with molecular subtypes and response to R-CHOP therapy. J Clin Pathol. 2019 Sep:72(9): 630-635. doi: 10-1136/jclinpath-2019-205837. Epub 2019 Jun 12.

Dr. Martin Köbel

- Peter F Rambau, Martin Köbel, Derek Tilley, Alex Mremi, Robert Lukande, William Muller. Diagn Pathol. Ovarian cancer: diagnostic accuracy and tumor types distribution in East Africa compared to North America 2020 Jul16;15 (1):86. doi: 10.1186/s13000-020-01000-3.

Dr. Dylan Pillai

- Tadesse G, Kamaliddin C, Doolan C, Amarasekara R, Legese R, Mohon AN, Cheaveau J, Yewhalaw D, Pillai DR. Active case detection of malaria in pregnancy using loop-mediated amplification (LAMP): a pilot outcomes study in South West Ethiopia. Malar J. 2020 Aug 27;19 (1):305. doi: 10.1186/ s12936-020-03380-9.
- Marasinghe DH, Cheaveau J, Meatherall B, Kuhn S, Vaughan S, Zimmer R, Pillai DR. Risk of malaria associated with travel to malaria-endemic areas to visit friends and relatives: a population-based case-control study. CMAJ Open. 2020 Jan 28;8(1)



Anatomical Pathology Section

The Section of Anatomical Pathology spans across five Acute Care sites as well as the community work and outlying hospital work that is received at the Diagnostic & Scientific Centre.

The Covid-19 Pandemic has affected Surgical Pathology work being received at all sites including the Community biopsies. However, some of the Acute Care Hospital sites have been mobilizing patients in need of cancer resections wherever operating rooms are available.

Pathologists have opted to take some time off work while workload is low. However, uncertainly of the situation and inability to go away limited many.

Working from home has been approved, however, non-availability of microscopes at home and the need to transfer slides etc. on a daily basis to pathologists had limited the option. Working with IT, all pathologists have been able to secure remote access.

Connect Care:
Successful implementation of Connect Care Waves 1-3 completed. Working towards completion of task/protocol testing for Waves 4-6. Wave 4 scheduled for November 2021. Implementation of EPIC Beaker is going as planned but targeted for later in Calgary Zone.

Digital Cytology:
Cytology has completed review and restructuring of Accessioning processes implementing one piece flow, improving specimen ID processes. In discussions to provide Beta Testing support for cytology vendor for digital Cytology platform.

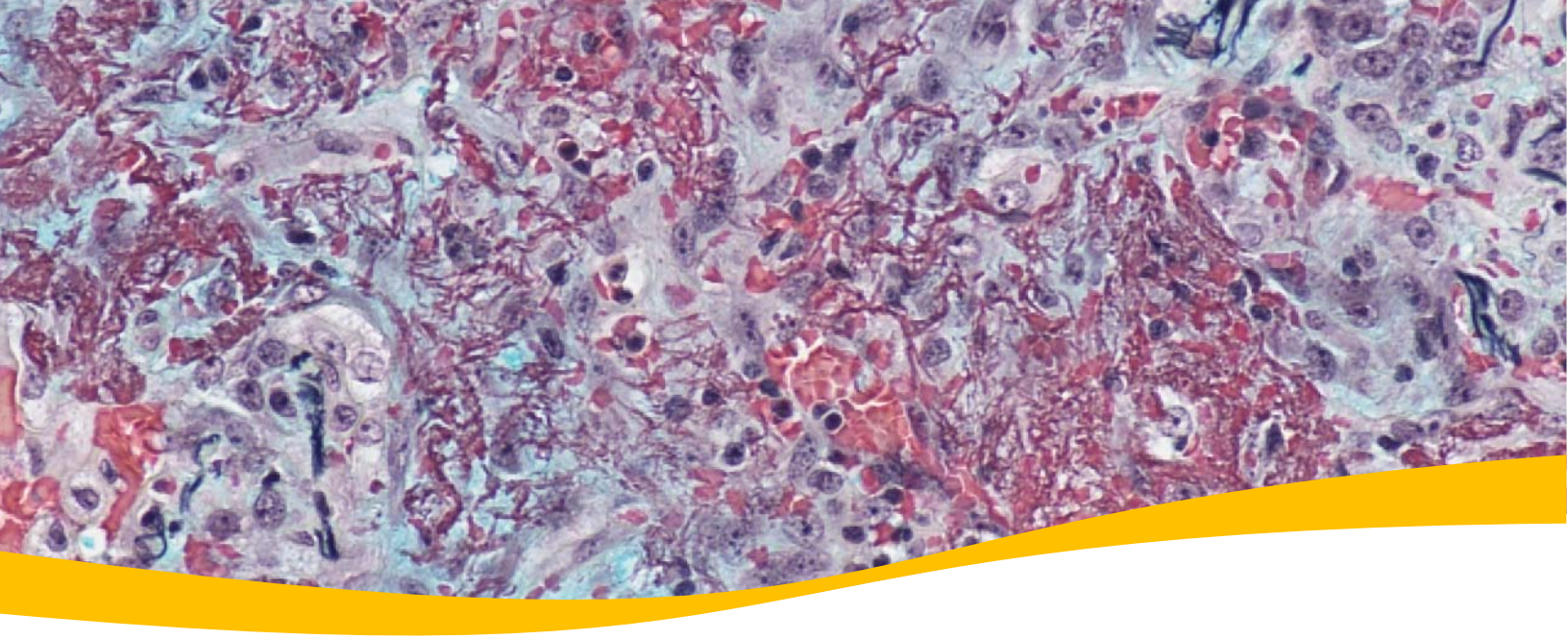
The EDMH
(Emergency Department and Mental health Upgrade) project at the Peter Lougheed Centre was first announced by the Premier and the Minister of Health in December 2019. This upgrade in construction includes the long awaited and much needed major move of the Rapid Response Laboratory and the AP Lab from the ground floor to the 6th floor of the East wing. Regular meetings are held planning the space, furnishings and equipment with a target move date in June 2022.

Equipment Upgrade:
Immunohistochemistry Immunostainers transition to digital server to provide better data security and to align with Connect Care implementation. Acquisition of two new H&E staining platforms.

Staffing:
Five positions approved for Alberta Surgical Initiative uplift. Three permanent Histology Assistants and two Temporary MLT I. Interviews are completed and some planned for vacant pathologist positions but restrictions on travel due to the pandemic have halted recruitment.

Turn around times (TAT):
Meeting the targets of TAT in Anatomic Pathology have been a challenge mostly due to staff shortages. Most acute care sites were caught up when the workload dropped. However, the community work continues to go up. A recent data review indicated the number of Dermatologists in Calgary increased three-fold between 2017 and 2020. The corresponding increase in biopsies was also realized with no increase in pathologist numbers.

Submitted by:
Dr. Ranjit Waghray,
Section Chief Anatomic Pathology



Hematopathology Section

In 2020-2021, most of our clinical and operational resources have been allocated for handling COVID19 related matters; prioritization of essential laboratory services; the Connect Care project and establishment of infrastructure for remote performance of clinical services.

- Hematopathology (HP) and HTL lab have completed a COVID-19 related pilot project which was funded by APL. This study was completed in collaboration with Edmonton's critical care and immunology clinical groups. The outcome of this study was published in Journal of Blood Advanced.
- Our flow cytometry group has published a peer-reviewed article in Journal of clinical cytometry about the distinctive immunophenotypic features in myelodysplasia and myeloid blasts by application of a new panel of flow cytometric markers.
- In addition, due to the approval of MRD (Minimal residual disease) as provincial standard of practice for the follow-up of AML and myeloma patients by Provincial Hematology/Oncology group, APL provided additional positions for hiring a Lab Scientist and two Lab Tech specialists to support these clinical initiatives.
- HIL lab has processed a high number of haplomatching protocols for HSTC. In addition, HIL lab handled the most deceased donors in the last 15 years by taking organs from other transplant programs in the country which were closed during Covid19 pandemic.
- The transition of molecular hematology lab as part of provincial molecular pathology program has been completed in fourth quarter of 2020. HP group will continue to work and collaborate closely with molecular pathology program.
- On the Connect care side, the HP medical and operational staff have worked with APL's connect care team and Beaker Lab modules for the different specialized labs and general hematology are being built. Standardization of most of provincial hematology lab services has been completed.
- We have experienced a significant increase in the workload of HP services especially in the areas of bone marrows and flow cytometry services after pandemic phase of COVID-19, with pressure on clinical staff and technical operation.
- HP group has closely worked with clinical lymphoma group and implemented the Lymphoma Pathway Diagnosis program across the south of province. This program has facilitated the early diagnosis of lymphoma patients through a priority system composed of Hematology Triage Clinic, Diagnostic Imaging and Pathology Laboratory Services.
- HTL (Hematology translational Lab): HTL lab has continued to provide myeloid NGS service, Cytokine profiling and HLH biomarkers for APL. In addition, due to critical provincial demand for COVID-19 testing, HTL lab has established a laboratory infrastructure including RT-PCR and NGS based testing for the diagnosis of COVID-19 through service agreement with APL.

Submitted by:
Dr. Meer-Taher Shabani-Rad,
Section Chief Hematopathology

Clinical Biochemistry Section

Research update:

- Canadian Longitudinal Study on Aging (CLSA) continues smoothly.
- Thyrotropin receptor antibody (TSI) project (PI, Dr. Sadrzadeh) received more funding from Siemens to start a new phase of the study with pregnant patients with hyperthyroidism. The ethics application has been approved. Drs. Greg Kline and Lois Donovan are co-investigators. This study continues.
- Defining an optimal IGF-1 concentration in children undergoing Treatment of Growth Hormone Deficiency (PI, Dennis Orton). To repatriate testing for Insulin-Like Growth Factor 1 by LC-MS (currently sent to Quest Labs). The project will focus on IGF-1 in the context of patients being treated for Growth Hormone Deficiency, and is a collaborative effort between Dennis Orton and Carol Huang, a Pediatric Endocrinologist

Clinical Service and Accomplishments:

- Isolde Seiden Long has been actively involved with ISO and CLSI:
  - ISO TC212 Working group 1 - ISO standard on Laboratory Developed tests –Promoted to co-project lead for this document – this project will take 2-3 years to complete
  - CLSI EP26 - User Evaluation of Between-Reagent Lot Variation, Clinical Laboratory Standards Institute. Anticipated publication Nov 2021
- Dennis Orton has been very active as an educator at MASCL and giving lectures on MS
  - Invited Speaker: “Significant updates or changes in practice in Clinical Mass spectrometry” – CSCC, 2020. Winnipeg, MB
  - Accepted Podium Presentation: “No Middleware? No Problem. Using R and Shiny for Routine Review of QC Data and Other Quality Metrics” – MSACL, 2020. Palm Springs, CA

DSC Chemistry (Hossein Sadrzadeh, Jessica Gifford, Allison Venner)

- Roche wet chemistry analyzers were chosen for all general chemistry labs at APL.
- Validation started for four Roche COBAS lines in DSC chemistry as well as two lines in RGH.
- A new middleware, Infinity, will replace the current CITM middleware for Roche analyzers.
- In response to the COVID-19 pandemic, DSC Chemistry implemented both semi-qualitative and quantitative COVID serology testing on the Roche Diagnostics COBAS systems for CLSA, other clinical trials and third-party requests.

DSC Endocrinology/Immunochemistry Lab (Alex Chin)

- MitogenDx transfers:
  - anti-ssDNA and anti-DFS70
- Placenta growth factor (PlGF) testing implemented for research use
- ANA standardization and utilization within the province will be a challenge due to the uncertainty with the impending RF

Submitted by:
Dr. Hossein Sadrzadeh,
Section Chief Clinical Biochemistry

General Pathology Section

Pre/Post Analytics:

Good News

- Provincial standardization and roll out of Order of Draw/Order of Transfer and Skin Puncture: Order of Collection occurred. Imminent roll out of two new standard provincial procedures: Isolation and Infectious Patient Collection and Isolation and Infectious Home Patient Collection.
- Continued standardization of Commitment to Comfort (CTC) training and supporting documents, along with updates to reflect CTC branding changes and APL website updates. APL was also asked to share our experience with CTC roll out with BC Children's Hospital and Canadian Foundation for HealthCare Improvement.
- Many activities this past year surrounding Epic and Connect Care wave roll outs affecting province wide pre analytics workflows/systems and DSC PrePost Analytics. Often the work spans across activities affecting AHS Finance/Billing, Patient Access and Registration and Health Information Management, and thus collaboration and stakeholder feedback are key. Optimization and standardization activities at each roll out occur to address various pre analytics past practices.
- Considerable effort and time spent with I.T. system testing and interim state workflows in preparation for Epic to Millennium interface Wave 4 Epic go live.
- Activities around Beaker to Millennium interface testing, roll out and stabilization also occurred.
- Ongoing work being spent on External Send Outs standardization across the province using the capabilities of Epic system for medical approval processes and scanning of results. This work is on-going into next year.
- CLSA study expanded to include Covid Serology testing.

New Things

- Continued work in repatriating tests to APL.
- Outreach has facilitated the roll out of more 'non-APL, non-AHS' blood and urine collections, to circumvent these patients having to access the PSC's and instead the blood/urines are collected by the clinic or a third party provider.

Challenges

- Activities surrounding COVID-19 pandemic, business continuity and employee support stretched our resources however, retrospectively our areas coped well with the challenges.
- Challenges surrounding testing of Epic/Beaker to Millennium systems and working through the various interim states in preparedness for upcoming waves has also stretched our resources thin.
- Capillarys (CAPI) instrument in Lethbridge for HbA1C testing has had many challenges with downtime. This challenge affects DSC Accession as when the testing is re-routed to DSC Chemistry, each has to be entered into the Millennium LIS system. Recent solution involved Lethbridge performing the data entry into Millennium and sending samples to DSC test ready. This is predicted as the permanent solution until the Lethbridge Roche instrument workup is completed.

Rural Laboratories:

Good News/New Things

- We have maintained services for community lab work with existing staffing despite the challenges faced with upholding public health guidelines of distancing, masking, etc. which can be difficult in smaller rural settings.
- Implemented centralized online and telephone appointment booking for community laboratory collections in May 2020. Patients are able to book appointments up to nine weeks in advance and can change or cancel appointments as necessary.
  - Urgent appointment spots can be accessed on an as-needed basis provided criteria for access has been met.
  - Dedicated collection hours blocked for immune compromised patients.
  - Patients are routinely collected within 0-30 minutes of their appointment time. This reduces in-facility wait time and helps manage efficient patient flow.
- Generic site emails were implemented at many sites to assist with accessing requisitions patients may have in their email accounts to reduce faxed requisition volume and handling of paper.
- HIV Viral Load collections were expanded to additional rural sites in South Sector to improve access for patients of vulnerable populations.
- New provincial procedure for semen analysis has been implemented, aligning testing to WHO guidelines.
- Discontinuation of Digoxin and Phenytoin at High River Hospital and Strathmore District Health Services Laboratories due to low utilization; centralization to Calgary.
- Implementation of high sensitivity troponin I testing at Canmore General and High River Hospital laboratories.
- Drayton Valley and Strathmore staffing model changed from Combined Laboratory and Diagnostic Imaging to separate laboratory and Diagnostic Imaging departments. The laboratory is staffed with a combination of Medical Laboratory Technologists, Combined Laboratory & X-Ray Technologists and Medical Laboratory Assistants. This is improving turnaround time results through the day and into the evening.
- Ortho XT3400 chemistry testing platforms were delivered in several sites in the Central Zone portfolio as well as Brooks. This is a technological change from wet to dry chemistry aligning with the provincial standardization initiative for rural hospital labs.

Challenges

- Staff recruitment and retention of qualified Medical Laboratory Technologists, Medical Laboratory Assistants and Combined Laboratory & X-Ray Technologists remains a challenge.
- Collection labs in Breton and Eckville Health Centres were closed on a temporary basis during the COVID-19 pandemic as they are co-located within Long Term Care facilities. These sites remain closed at this time.
- Staff quarantine requirements resulted in additional staffing pressures throughout the year.
- The appointment system in some rural communities has presented challenges with extended wait times on the phone booking system. The online booking option does not appear well utilized by the aging rural population.
- Virtual physician/client visits have increased pressures on the laboratory to maintain fax files for requisitions that are transmitted via facsimile directly to the laboratory.

Mobile Collection Services (MCS)

Good News

- Worked with staff across the province to consolidate the fAHS and fCLS Mobile Collection Services Patient brochure to one APL version which is applicable to the Mobile program across the province.
- Worked with Peter Lougheed Centre (PLC) Anticoagulation Management Services to streamline and standardize their ordering process with the goal of reducing errors and improving the service Mobile provides to this patient group. They are now sending one requisition per patient throughout the day as they work with each patient instead of sending a consolidated 'list of requests' once or twice a day.
- Worked with staff across the province to update and standardize the information on the APL external website Mobile Collection Services pages to be applicable for the Mobile program across the province.
- Calgary MCS worked with Calgary Patient Service Centre (PSC) team to consolidate supply orders and streamline the ordering process in September 2020. This has simplified the ordering process and reduced the amount of time Mobile spends managing supplies and moving them across the Calgary area, without significantly affecting the PSC team.

New Things

- Changed the cut off time for same day requests for Mobile Service from 1330 to 1200 to better control the workload and decrease departmental overtime.
- Mobile Calgary started providing service to 75 net new Long-Term Care/Supportive Living residents at Cambridge Manor which opened in July 2020.

Challenges

- Much of the focus of 2020 was on our COVID-19 response. The COVID-19 pandemic led to increased requests for Mobile services, along with increased staff absences and reduced efficiency due to extra personal protective equipment (PPE) and this has been challenging for Mobile in all areas of the province. This has led to increased up front screening of requests for service, to ensure Mobile resources are available to the patients who are truly homebound and are unable to attend a collection site for their blood collection or are quarantined/ self isolating due to COVID-19 and should not be attending a collection location. Feedback from some healthcare providers indicates they are frustrated as they have perceived these requests for additional clarifying information as a reduction in service level for their patients.
- In the Calgary area, TeleMED electrocardiogram (ECG) equipment was updated to Windows 10; this caused significant Bluetooth communication problems between the Schiller ECG devices and the interfaced laptops. This led to extensive troubleshooting to identify the problem and to develop a stable solution.
- It's still an ongoing challenge to provide Mobile Collections to the patients who are eligible, and not be providing this specialized service as a convenience for people who would like the convenience of an at-home service.
- Preparation for the implementation of Connect Care is starting and there is currently no module which will replace the Millennium Scheduling module used by Mobile Collection Services – Calgary.

Patient Service Centers (PSC)

Good News

- The Market Mall PSC location moved into a newly renovated larger space within the Market Mall Professional Building, which provides additional capacity for collections and ECG procedures and improved patient flow.
- Presentations regarding Lab Access during COVID were given at the Calgary Primary Care Network monthly webinar for physicians in October 2020.
- Formation of a Collaborative Working Group with Calgary Zone physicians to address challenges with lab access during COVID in early October 2020 with ongoing biweekly meetings.
- Data Entry support was provided by the PSCs for COVID swabs collected at South Calgary Health Centre (SCHC) and Richmond Road Diagnostic and Treatment Centre (RRDTC) assessment centers for several months.
- PSC staff underwent additional training for pediatric collections.

New Things

- An online form for physician referral for appointments for time sensitive lab work was developed and piloted for the Calgary PSCs.
- Shared email inboxes set up to allow patients to email electronic copies of requisition to accommodate the shift to virtual health care delivery and reduce the volumes of faxed requisitions received.

Logistics — The Logistics department had to primarily focus on supporting APL and AHS in the COVID response.

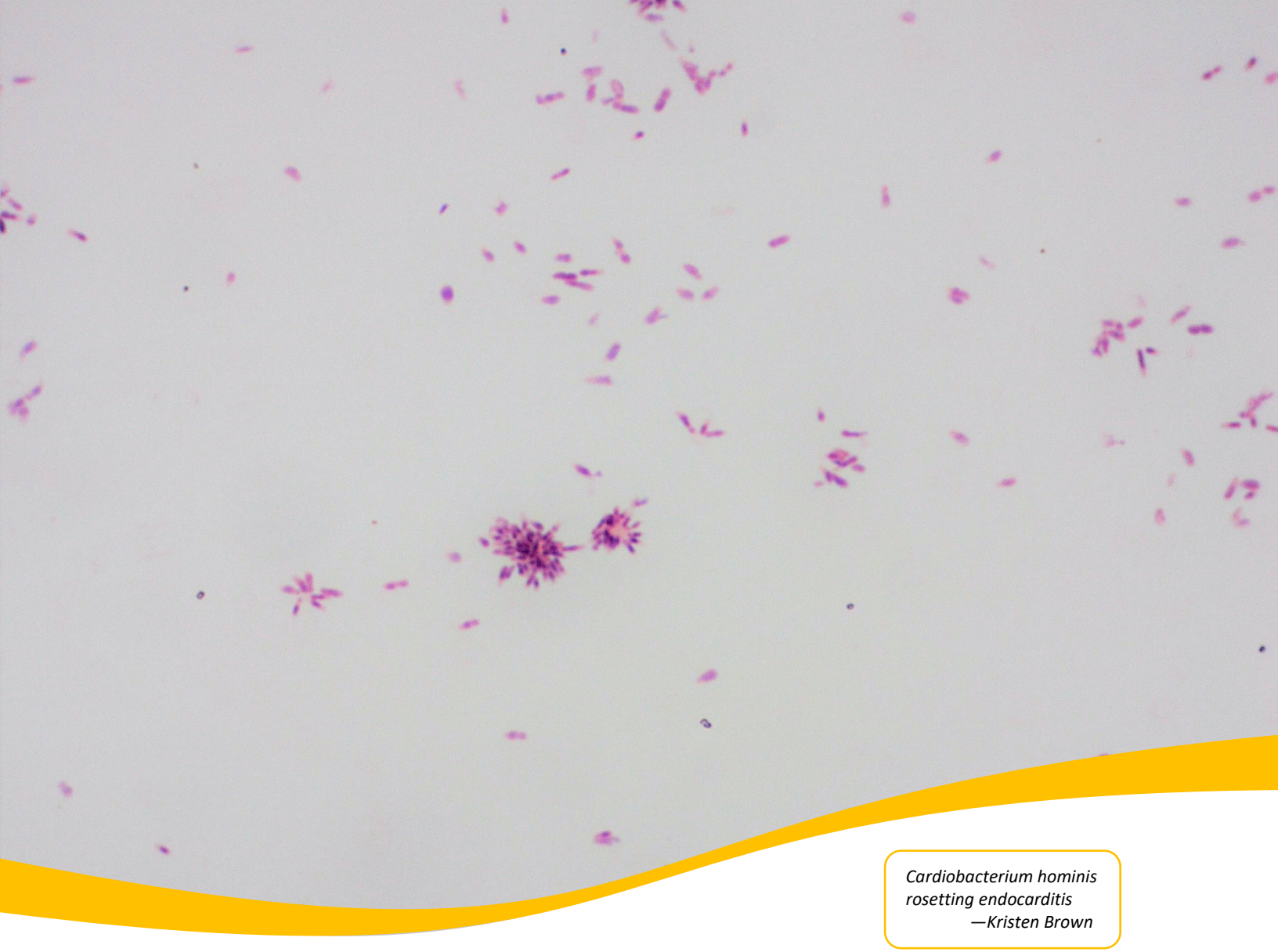
Good News

- APL logistics worked with a number of AHS departments in providing transport of COVID specimens from AHS Assessment Centres to testing locations.
- APL logistics was also involved in a number of pop up COVID collection locations that at times only ran for a few days; examples including the communities of Brooks and Okotoks, and the Amazon distribution centre located in Calgary.
- Large volumes of supplies needed to be moved between testing locations primarily between Edmonton and Calgary; APL was able to help out with those transport requests.
- Logistics service in Central Zone needed to be expanded for the COVID response, so APL hired staff and moved equipment to Red Deer, Lethbridge and Medicine Hat; as well, these sites also received additional vehicles and staffing to enhance Logistics service delivery.
- Third party transport vendors were also engaged to fill transportation gaps.

Challenges

- An expedited onboarding process was developed to get staff hired and working as quickly as possible, but this process was short-lived and quickly reverted to the normal way of hiring. Hiring and on-boarding process timelines continued to be an obstacle in terms of hiring quickly; there were times when new potential hires simply gave up and took other jobs due to the long hiring and on-boarding process.
- Logistics needed to be able to respond quickly to changes in hours of operation, as well as openings and closures of assessment centres in Calgary and rural towns during the pandemic. Oftentimes very little notice was provided to Logistics about these changes - a day or even same-day notifications were given. Access to facilities was also a challenge and caused delays in transport of samples to the testing locations.
- Load balancing of COVID specimens between collection and testing locations within Alberta was a challenge. Samples often needed to flow between Edmonton and Calgary and additional routes needed to be implemented.

Submitted by:
Dr. Ethan Flynn,
Section Chief General Pathology



Cardiobacterium hominis rosetting endocarditis
—Kristen Brown

Microbiology Section

Good News

Despite the formidable nature of COVID-19, APL has met the challenge of scaling up COVID-19 testing to meet demand, provide it widely throughout the province, and to return results in a quick turnaround time. APL has continued to lead the testing effort into 2021.

Meanwhile, routine microbiology testing at the DSC, despite stresses from shortages of staff that were shared with SHC, was able to offer almost all of its test menu and continued to achieve key performance metrics (e.g. turnaround times) throughout 2020. Supply shortages were managed pre-emptively where possible, with procurement in advance of shortages, and where not possible, was proactive in engagement of clinical stakeholders to mitigate the impact.

Throughout the pandemic, the response has been a testament to the provincial integration of APL, fostering close communication throughout the province, including centralized urban and disseminated regional and rural sites. Close interactions between different laboratories and departments allowed more effective coordination than would otherwise be possible. While COVID-19 remains a challenge to be met on a daily basis, the response so far should make Alberta proud.

New Things

To respond to COVID-19, APL Microbiology worked to scale up and provide testing in a variety of locales, in conjunction and collaboration with the APL Public Health Laboratory.

- **South Health Campus (SHC):** The largest of these sites was SHC, whose microbiology space was completely reconfigured into a COVID-19 testing laboratory. Beginning testing in May 2020, this site eventually provided most of the COVID-19 Assessment Centre testing for Calgary and surrounding areas. Through implementation of innovative pre-analytic and analytic approaches (e.g. automated orderables to reduce data entry), plus the incorporation of automated fluid handling, SHC became capable of testing a volume of up to 10,000 specimens each day using the Allplex SARS-CoV-2 assay (Seegene). The site was really a joint success of the Calgary Health Foundation, Alberta Health Services, and APL.
- **Diagnostic & Scientific Centre (DSC):** Building off the foundation of rapid influenza & RSV testing conducted at DSC in prior years, DSC served as a focal point for rapid inpatient COVID-19 testing for hospitalized patients in Calgary Zone. By using a combination of the BD MAX (BD), Simplexa (Diasorin), and GeneXpert (Cepheid) assays, the site was able to provide rapid testing to acute care patients for COVID-19, influenza and RSV while being versatile enough to respond to supply issues and varying volume demands.
- **Regional Hospital Laboratories:** Again on the background of previous rapid influenza & RSV testing, these sites (in the South Sector, these included Red Deer Regional Hospital, Chinook Regional Hospital, and Medicine Hat Regional Hospital) were able to implement rapid on-site testing with Simplexa and GeneXpert assays to provide rapid testing for hospital patients both locally and catchment areas.

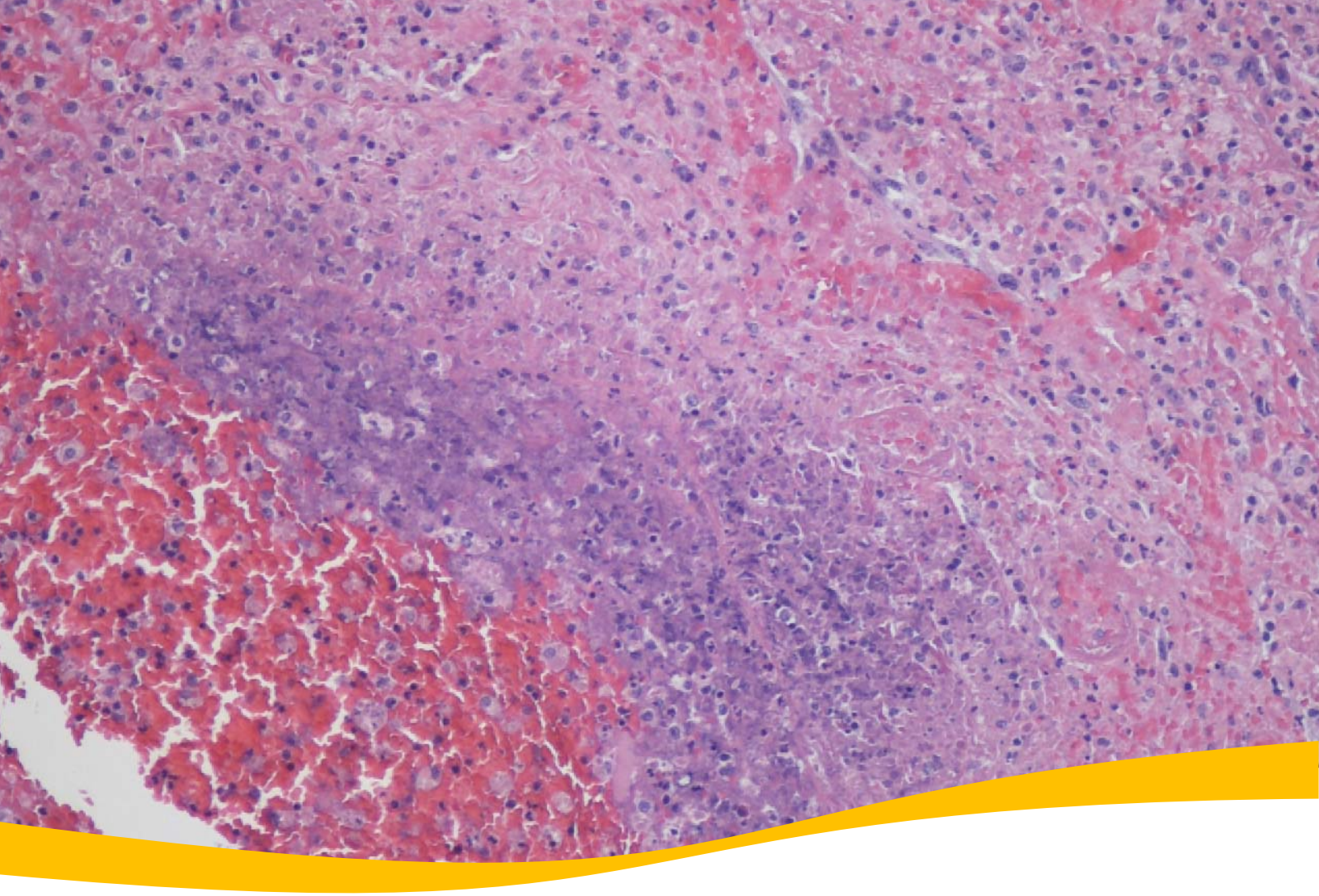
Implementing and maintaining testing in five centralized sites, over four assays on a host of different instruments and platforms was only possible through a team effort of medical and technical staff, and related services such as IT, data entry and maintenance, logistics, CPSM, and others.

Challenges

COVID-19 posed year-long challenges in many ways:

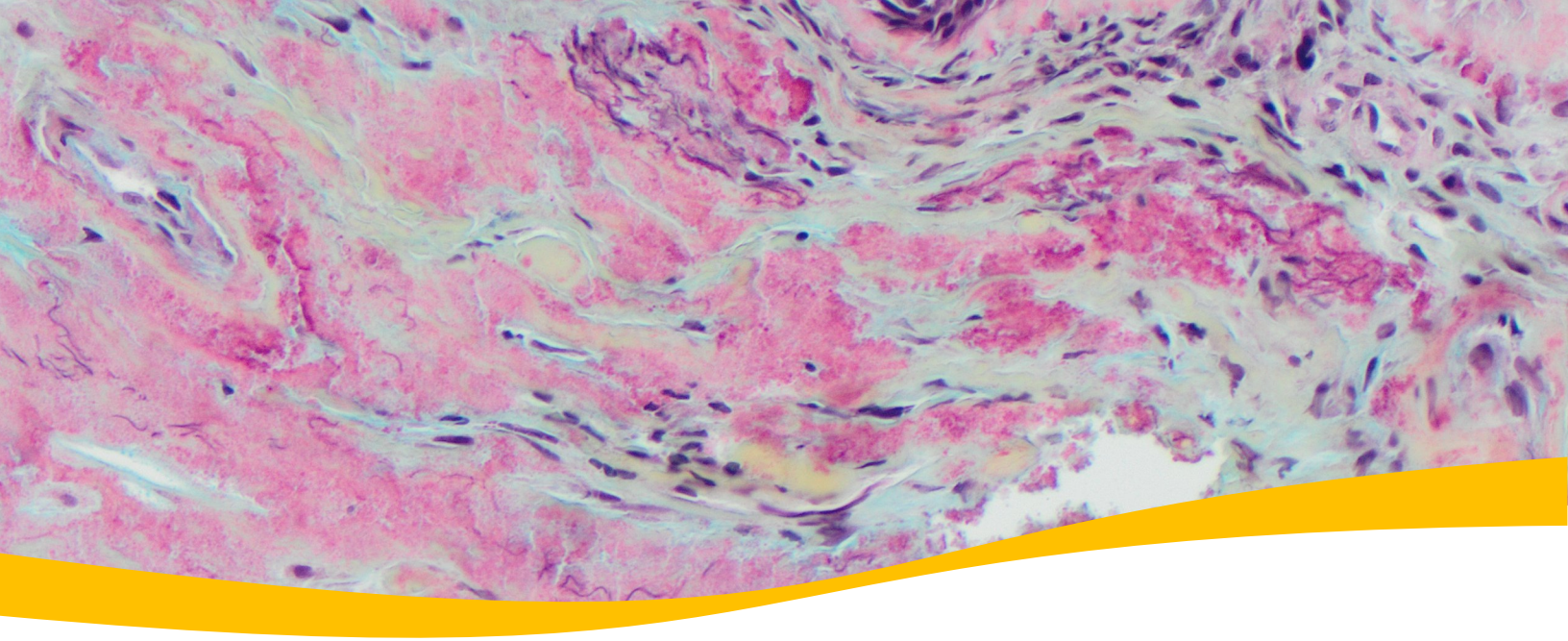
- **Unprecedented nature:** at the beginning of the year, only a small amount was known about a novel respiratory illness in Wuhan, China. Within a month, diagnostic testing became available; within two months, Alberta had identified its first cases; within three months, closures and business lockdowns became commonplace. Its impact on microbiology testing cannot be understated.
- **Testing demand:** testing for COVID-19 went from a highly specialized test for returning travellers the most widely available microbiology test and one that was available through patient self-referral. In December 2020 at the height of the second wave, >20,000 specimens were submitted and tested by APL and partner laboratories in a single day: more than any other microbiology test in our laboratory's history
- **Speed of changes:** the acuity of the pandemic and the rapidly changing testing landscape made it difficult to plan for testing strategically. Ensuring that testing was concordant with policies in continuing care, acute care, and public health guidelines in the community was a constant challenge, especially when the changes in those policies and guidelines often took place overnight by necessity.
- **Inventory shortages**: as global supply chains were strained, so too were supplies for the lab
  - COVID-19 testing supplies were under stress for much of the year. At one point, it was swabs and collection kits; at others, it was testing reagents, instruments, consumables. Time and effort were needed to find new vendors and ensure redundancy of supplies.
  - Routine microbiology testing supplies suffered shortages as manufacturers diverted their efforts to the COVID-19 response. For example, collection kits, consumables and reagents required for STI testing province-wide were in short supply, requiring rapid stakeholder consultation and adjustment of testing recommendations.
- **Labour shortages:** hiring and training of new staff needed to provide high-volume COVID-19 testing in addition to routine microbiology testing volumes was a substantial undertaking. Staff shortages resulting from high rates of COVID-19 community transmission were felt across APL and AHS; responding to them was particularly difficult in microbiology as they often coincided with periods of increased COVID-19 testing demand.

Submitted by:
Dr. Wilson Chan,
Section Chief (Interim) Microbiology



Transfusion Medicine Section

- Late Fall 2020, there was an announcement that Connect Care activities would be paused as they looked at a new sequencing strategy. COVID 19 had exhausted resources in the clinical areas. This delayed the Nov. 3, 2020 go-live of Calgary Rural sites.
- In November 2020, a multidisciplinary provincial group was convened to re-evaluate the necessity of universal irradiation of blood components in neonates in the Calgary zone now that newborn screening for immune deficiency is available.
- Implementation of the Provincial standard of care for special populations (Sickle Cell, Thalassemia, etc) document suite (currently out for stakeholder feedback)
- Ongoing rollout of Connect Care Waves
- SCIG Clinic – Transfusion Medicine continues support and administration of the Sub-cutaneous Immune Globulin (SCIG) which was very busy during the COVID pandemic with new referrals.
- Continued work to decommission blood satellite fridges to address the Health Canada citation received in March 2018. SHC satellite fridge was decommissioned on November 23, 2020. All blood components/products would be sent to the Operating Rooms (OR) via pneumatic tube system (PTS).
- IVIG screening as per the Prairie Collaborative guidelines (Mandated by Alberta Health)
- Implementation of changed neonatal irradiation guideline

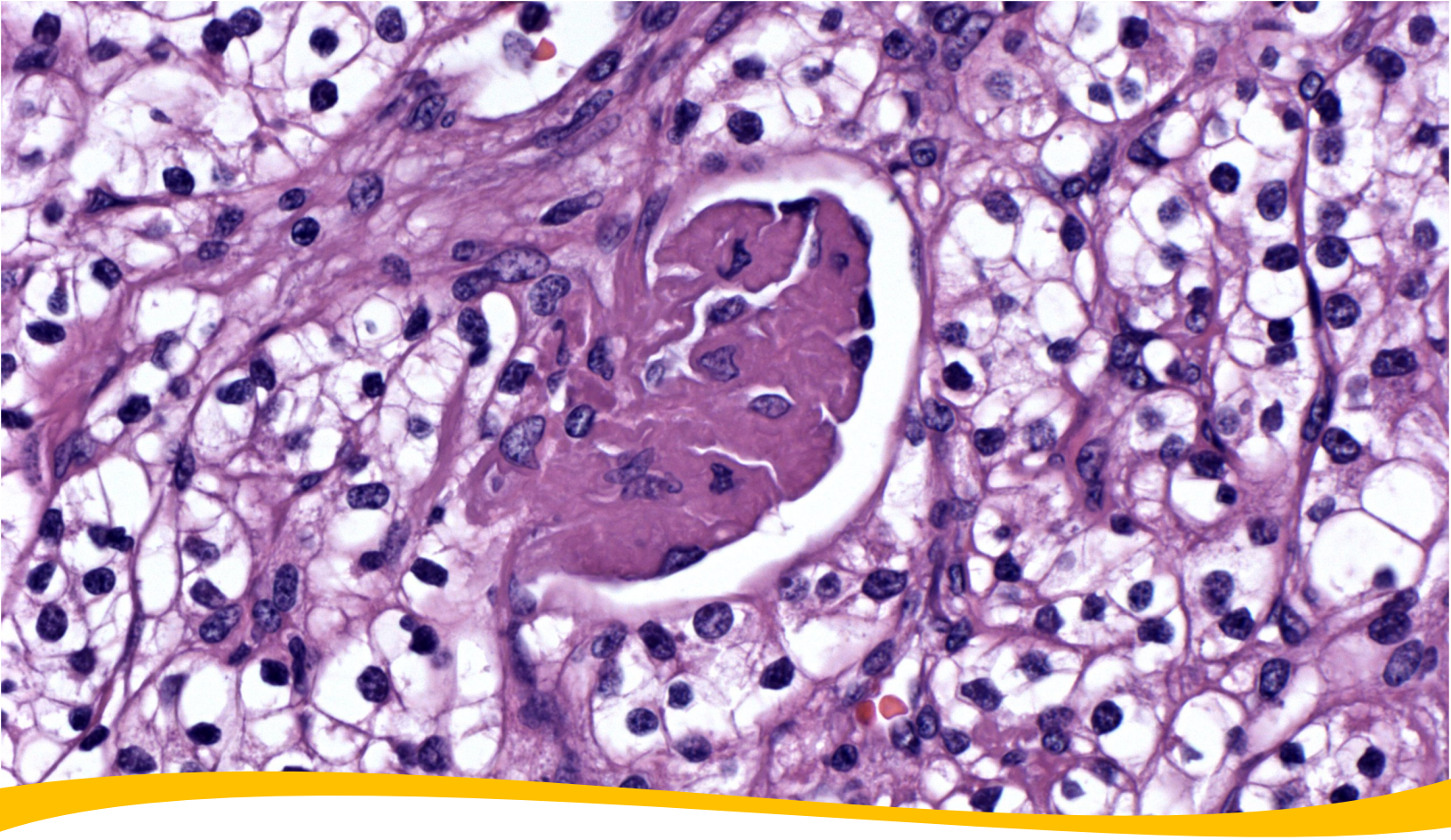


Cellular Therapy Lab Update

- CTL experienced significant increase in processing services in 2020. The global pandemic resulted in a need for additional processing to ensure safe delivery of these timely life-saving products. All CTL staff worked tirelessly to ensure no interruptions in services. The increase in services performed by CTL continues into 2021.
  - CTL successfully completed audits and site initiations for Standard of Care CAR-T therapies from Novartis (KymriahTM) for both adult and pediatric patients and Gilead/Kite (YescartaTM) for adult patients.
  - CTL continues to expand participation in several corporate sponsored clinical trials:
  - Utilization of autologous CAR-T cellular therapy products for the treatment of hematological malignancies. These cellular therapies utilize a patient's own T cells that are modified to search out and destroy tumour cells. The clinical trials include treatment of Multiple Myeloma, Lymphoma, and Leukemia.
  - Utilization of virus specific T cells for the treatment of post -transplant viral complications. Pediatric clinical trial using EBV-specific T cells in treat of EBV disease post-transplant.
  - Utilization of gene modified autologous endothelial progenitor cells for treatment of pulmonary arterial hypertension.
  - Treatment of Gaucher Disease using blood stem cell gene therapy.
  - Successful completion of Fabry gene therapy clinical trial with treatment of 5 patients. Results published Feb. 2021 in Nature Communications with Dr. Prokopishyn as co-author.
- CTL continues to lead cellular therapy initiatives in Alberta. CTL is validating manufacturing for the first clinical trial that will use in-Alberta manufactured CD19 CAR-T cells for treatment of patients. Patient enrollment in Calgary planned for Winter 2021.
- CTL is providing + T cell/CD19+ B cell depletion of a haplo-identical product and CD34+ cells enrichments of products for Alberta transplant patients and other transplant facilities in Canada that do not have the expertise to perform these manipulations.
- CTL continued to see an increased number of requests for processing of unrelated blood and marrow transplant products for send-out to other transplant centres (national and international). Calgary is the only unrelated collection facility in Alberta and Saskatchewan currently. This work is in addition to all the processing performed for the adult and pediatric patients in Alberta.
- CTL continues to finalize laboratory design at the New Calgary Cancer Centre.
- CTL is upgrading it lab information system, Stemsoft to the newest version StemSoft LAB allowing for integration with Connect Care. Go Live of StemSoft Lab scheduled for winter 2021.

Submitted by:
Dr. Susan Nahirniak
Section Chief (Interim)
Transfusion Medicine

Training Programs



Anatomic Pathology Residency Training Program

Program Director: Dr. Carolin Teman

Program Structure:
This is a five-year program leading to certification in Anatomical Pathology by the Royal College of Physicians and Surgeons of Canada. Our program transitioned to Competency By Design (CBD) in July 2019, and we currently have a mix of CBD residents and traditional stream residents. The curriculum includes orientation, clinical rotations, core adult surgical and autopsy pathology rotations, subspecialty rotations, elective rotations, research, and 3-4 months of chief resident service. The program is designed to give graded responsibility to residents. In the final year of training, residents are expected to perform at the level of a fellow or junior faculty member, recognizing that faculty-resident supervision is always occurring. In 2020 we accepted four new residents three Canadian medical graduates and one international medical graduate. We currently have 20 residents in our program. Administrative support and training facilities are provided by the University of Calgary's Department of Pathology and Laboratory Medicine.

Teaching:
A philosophy of independent self-directed learning underlies the program. Teaching takes place via a combination of dedicated educational events, group learning and one-on-one teaching.

Structured educational events include weekly clinical-pathological correlation rounds with Internal Medicine, Departmental Continuing Medical Education rounds, resident-led Gross Pathology rounds, optional evening slide sessions, and a dedicated weekly academic half day consisting of unknown slide rounds, autopsy rounds, and didactic teaching. Due to the COVID-19 pandemic, most of our educational activities are now offered virtually via Zoom, which has made it easier for trainees to attend even when they are rotating off-site. Residents are also expected to read and study independently.

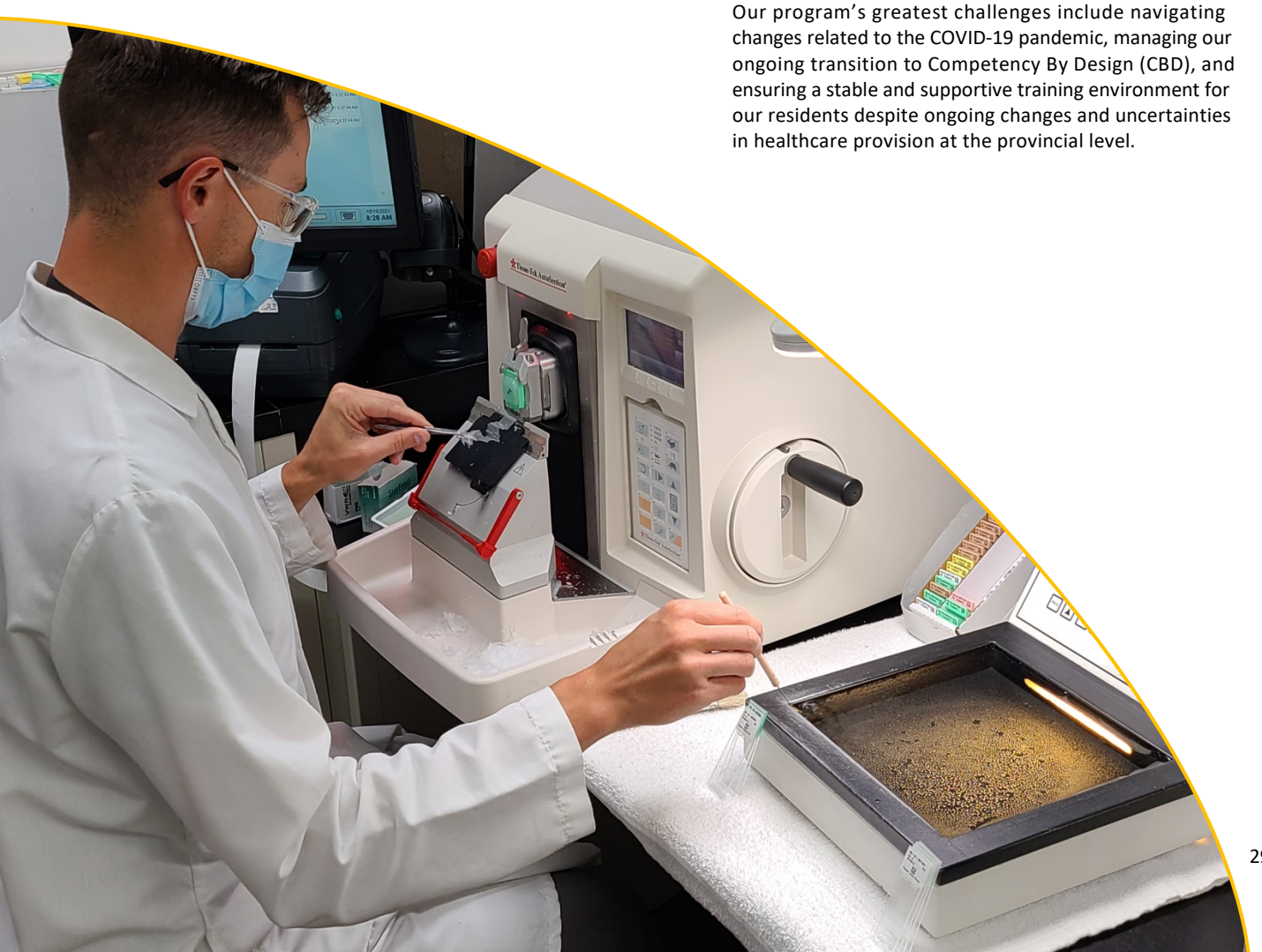
Evaluation:
Traditional stream residents are assessed via in-training evaluation reports (ITERs) completed for each rotation. CBD residents are assessed longitudinally based on their completion of Entrustable Professional Activities (EPAs). Several rotations incorporate end-of-rotation slide exams or presentations into their assessments. PGY2-PGY5 residents are also assessed via biannual exams, including a full RCPSC-style examination each winter and spring, and the American Society of Clinical Pathology Resident In–Service Exam (RISE) each spring. Additional examinations are offered for residents in difficulty and for senior residents preparing for the Royal College examination. The program director meets with each resident at least twice yearly to discuss the resident's academic progress, research projects, subspecialty interests, and fellowship/career plans.

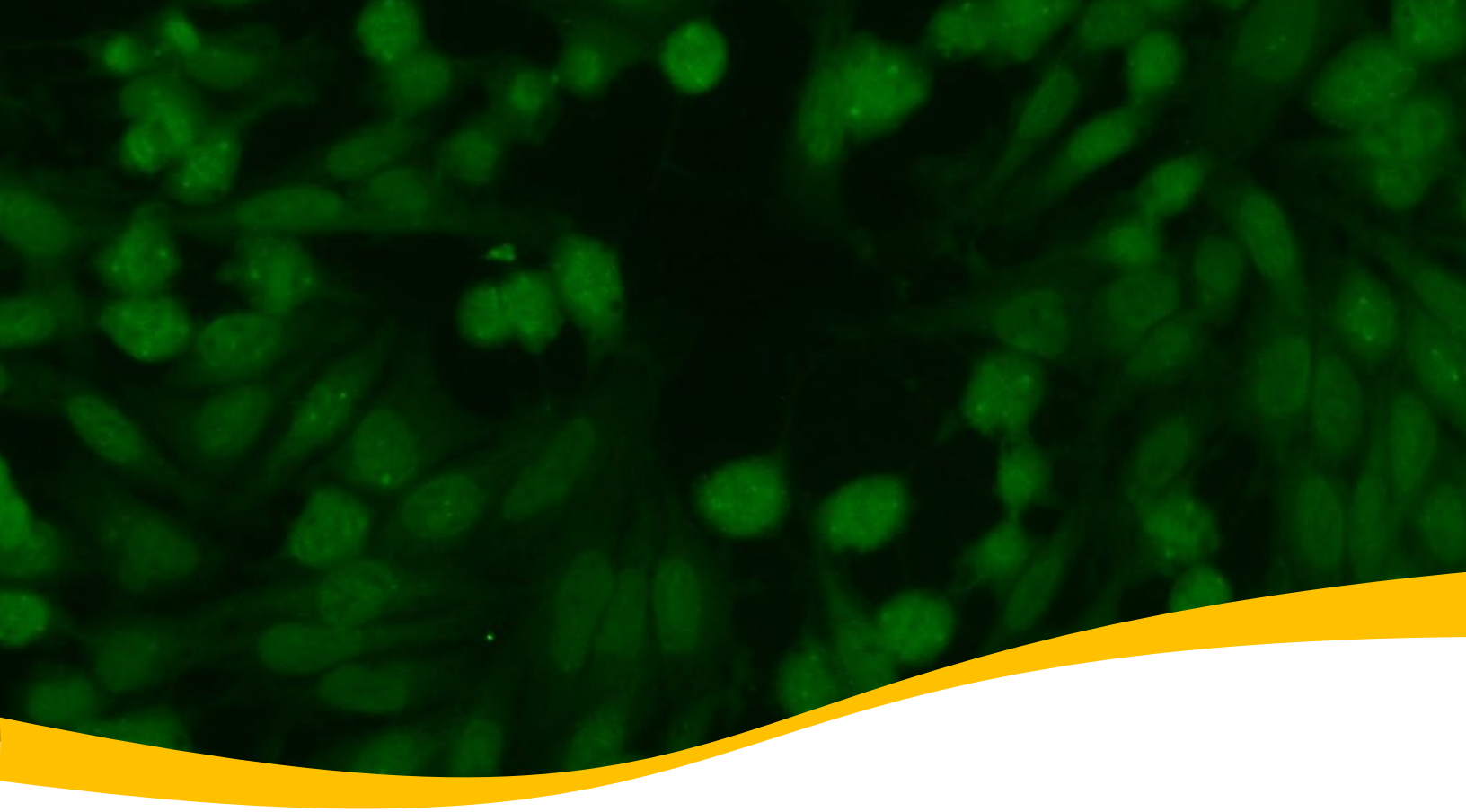
Research:
Involvement in research activities is an integral part of the program. Beginning in the PGY2 year, residents undertake one or more research projects with the advice and mentorship of the Resident Research Committee. Residents present their research findings at the annual departmental research day, as well as at national and international meetings. During 2020, University of Calgary Anatomical Pathology residents co-authored 10 peer-reviewed scientific publications.

Resident progress and news:
Our program graduated four residents in 2020. One is working as a pathologist in Lethbridge, and the other three were accepted to one or two fellowships, including Hematopathology at the University of Pennsylvania, Cytopathology at Columbia University, Breast Pathology at Alberta Precision Laboratories, GI/liver pathology at Emory University, and GYN pathology at the University of California-San Francisco. Out of our four 2021 graduates, one accepted a faculty position at the University of Alberta, and the other three are currently completing fellowships in Breast Pathology at Memorial Sloan Kettering Cancer Center, Pediatric Pathology at Harvard University / Boston Children's Hospital, and Renal Pathology at Cedars-Sinai Medical Center. The University of Calgary's Anatomical Pathology residency program is well-regarded nationally and receives a large number of applicants for the annual CaRMS match. In 2020 we filled all four CaRMS positions with outstanding applicants.

Program accreditation and upcoming changes:
The Anatomical Pathology residency program received full accreditation by the Royal College of Physicians and Surgeons of Canada following an External Review in 2015. Our program underwent a mid-cycle internal review in October 2020. This review went very well and no deficiencies were noted. Our next formal Royal College external accreditation review is scheduled for September 2022.

Our program's greatest challenges include navigating changes related to the COVID-19 pandemic, managing our ongoing transition to Competency By Design (CBD), and ensuring a stable and supportive training environment for our residents despite ongoing changes and uncertainties in healthcare provision at the provincial level.





General Pathology Residency Training Program

(Program Director: Dr. Davinder Sidhu; Assistant Program Director & Competency Committee Chair: Dr. Amy Thommasen)

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 Alberta Precision Laboratories offer General Pathology Residency Training highlighting on laboratory management and pathology informatics.

The General Pathology Residency Program is five years in duration (four 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. The program has now transitioned to the new CBD curriculum.

The General Pathology program has filled all resident positions at the CaRMS match. 2020 was the second year General Pathology of the Royal College Competency By Design Residency Program curriculum.

Part of the success of our program is based 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. We hope to leverage these resources to best support our new CBD residency program.

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. 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, Chemistry and Microbiology seminars are held weekly with additional sessions 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 numerous 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/ Hematology/Nephrology/TBCC) are also encouraged.

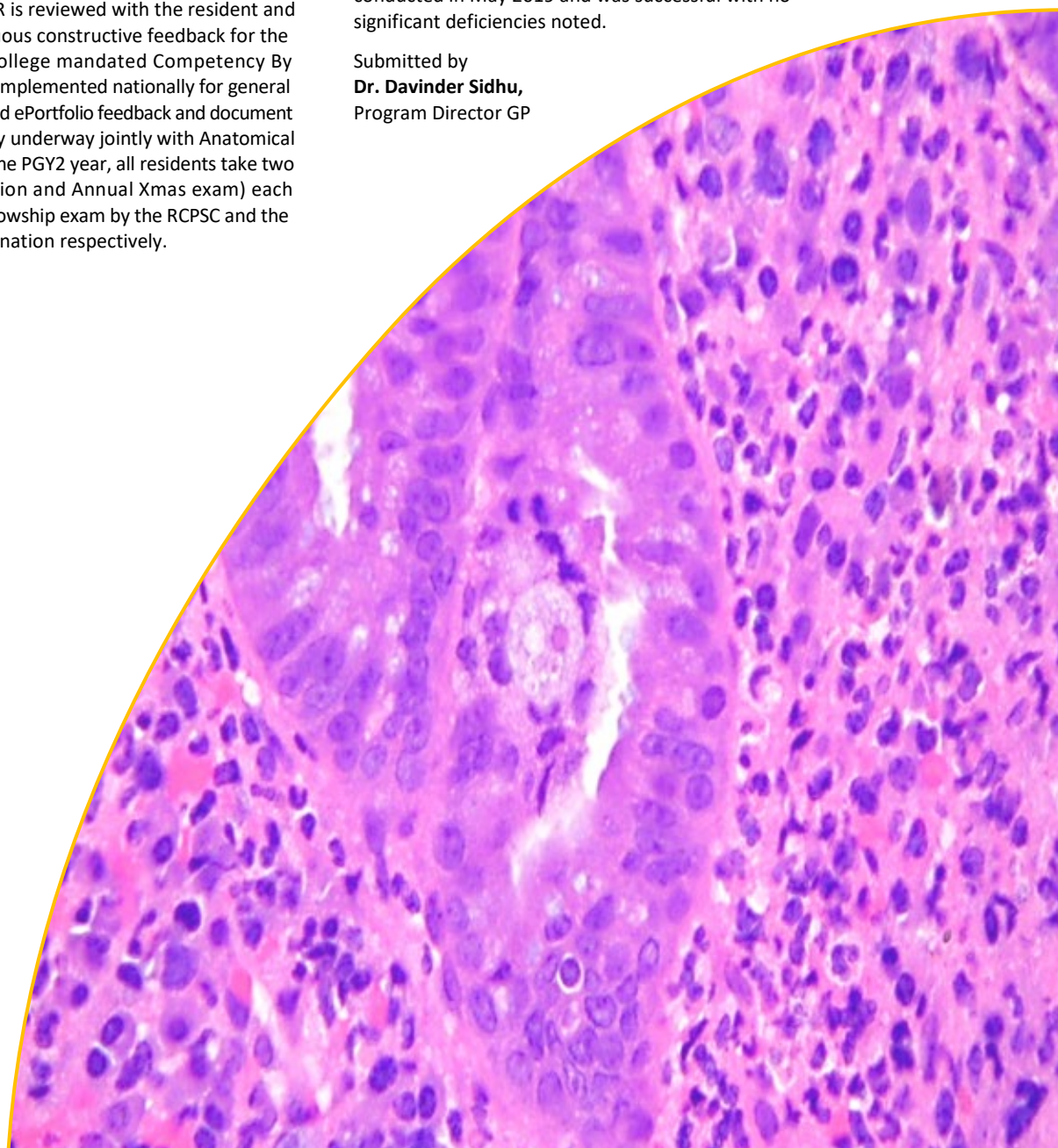
Evaluation:
An in-training evaluation report (ITER) is completed after each rotation. The ITER is reviewed with the resident and emphasis is on continuous constructive feedback for the resident. The Royal College mandated Competency By Design (CBD) initiative implemented nationally for general pathology evaluation and ePortfolio feedback and document preparation is currently underway jointly with Anatomical Pathology. 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 and the American Board Examination respectively.

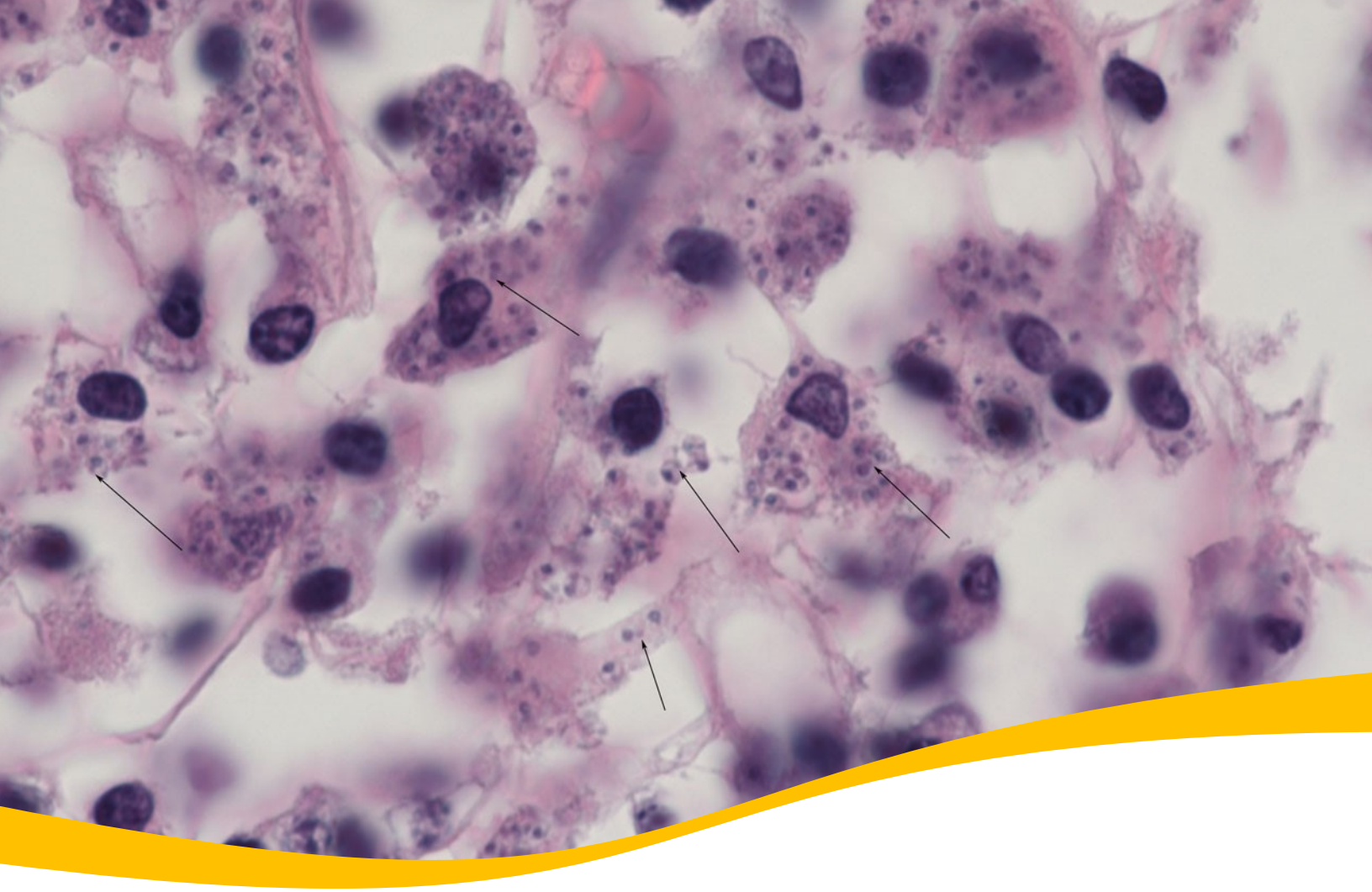
Training Sites:
Alberta Children's Hospital (ACH), Diagnostic and Scientific Centre (DSC), Foothills Medical Centre (FMC), Peter Lougheed Centre (PLC), Rockyview General Hospital (RGH), South Health Campus (SHC), Medical Examiner's Office, Community/rural laboratories (provide extensive opportunity for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

Successful internal onsite program evaluation was conducted in May 2019 and was successful with no significant deficiencies noted.

Submitted by
Dr. Davinder Sidhu,
Program Director GP





Microbiology Residency Training Program

(Program Director: Dr. Julie Carson)

Program

The Medical Microbiology residency training program at the University of Calgary is a five-year program that aims to train medical microbiologists to be competent and confident practitioners.

The program's training is focused at developing expertise and skills in the four major spheres of medical microbiology as outlined by the Royal College of Physicians and Surgeons of Canada: the medical, scientific, administrative direction and management of a clinical diagnostic laboratory; the provision of clinical consultation in infectious diseases; infection control and antimicrobial stewardship; and public health.

The year 2020 marked our fifth full academic year. Our program continues to expand with three residents in the program for the 2020-2021 academic year. We hope with the pandemic putting a spotlight on the importance of laboratory medicine, in particular microbiology, the interest and demand for our program will continue.

Program accreditation and upcoming changes

The Medical Microbiology residency program was fully accredited by the Royal College of Physicians and Surgeons of Canada in 2015 at its inception.

The internal review in September 2020 was successful and our first external review is scheduled for September 2022. Adapting to the new accreditation system will be a challenge but will provide the program opportunities to continually improve upon itself.

Medical Microbiology begins its journey to Competency by Design, the Royal College competency-based medical education program, in November 2021 with a tentative implementation date of July 2023 or 2024. This will be an ongoing challenge for our program to implement and manage the transition in parallel with laboratory service changes at a provincial level.

Training Overview

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 two through five involve a mix of rotations in the diagnostic laboratory, with focus in bacteriology, virology, mycology, parasitology and public health microbiology; clinical infectious diseases, including both adult and pediatric, inpatient and outpatient services; infection control, antimicrobial stewardship, and public health. There is a significant amount of elective time included to allow trainees to further develop in subspecialties of their choosing.

While COVID-19 had significant impact on many programs ability to meet training requirements, the Medical Microbiology program was able to adapt and have minimal changes to rotations and training opportunities. Some of the changes to online learning and teaching were good changes and expect to be maintained beyond the pandemic.

The Medical Microbiology Program has three major laboratory training sites. The Diagnostic Scientific Center is the primary site for bacteriology, mycology, parasitology and molecular training and where residents have the majority of their core laboratory training. The Public Health Lab – South (Calgary) location is the primary training site for virology, serology, molecular and public health lab microbiology.

Residents have five to six blocks over their training here. And finally, our program has an inter-university agreement with University of Alberta whereby our residents have one mandatory rotation at the Public Health Lab – North (Edmonton)/University of Alberta Hospital Laboratory to meet their mycobacteriology, containment level three and bacterial typing objectives.

Our residents also have opportunities in their Community Microbiology block to engage with our Microbiologists and technical teams (in person and remotely) in the regional centers microbiology laboratories – Red Deer Regional Hospital, Chinook Regional Hospital (Lethbridge) and Medicine Hat Regional Hospital.

Our clinical sites for training in Infectious Disease include all the major hospitals in Calgary: Foothills Medical Center, Peter Lougheed Center, Rockyview General Hospital, South Health Campus Hospital and the Alberta Children's Hospital as well as the Sheldon M. Chumir Health Centre for several public health related outpatient clinics.

Our program also supports the training of Infectious Disease Residents (12 weeks) and General Pathology Residents (24 weeks) and electives for these programs. We collaborate closely with our Infectious Disease programs with respect to shared curricula in Infection Control and Stewardship as well as our academic half day content.

Research

Medical Microbiology residents are expected to complete at least one research project during their residency. Despite our faculty being very busy with COVID response, we continue to support our residents in research and our residents have been involved in a number of research projects, presenting their findings at national and international meetings and the DPLM research day in the last year.

Submitted by
Dr. Julie Carson,
Program Director Microbiology

Neuropathology Residency Training Program

(Program Director: Dr. Denise Ng)

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 is in its last year of traditional stream residents and looking forward to transitioning to Competency by Design in 2022 due to Covid-19 related delays. This traditional stream 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. More reflection and work will also be underway in preparation for the University of Calgary Site Review by the Royal College this upcoming spring after having completed the Mid-Cycle Internal Review this past March 2020. However, as the program was recently given full accreditation in the internal review in 2018, this review is expected to be smooth as we continue to make improvements in our training program.

The program is also heavily involved in teaching medical students and residents from other specialties who complete rotations with us, including Neurosurgery, Adult and Pediatric Neurology, Anatomic Pathology, General Pathology, Neuroradiology and Radiation Oncology. As needs are changing in the CBD paradigm, our staff are also adjusting to the different objectives and training needs.

Within the last few years, the University of Calgary Neuropathology Residency Program has been one of the more active neuropathology training programs across Canada. In the 2020-2021 academic year, we have three residents in the program. We welcome a new PGY1 resident Dr. Chris Newell from the University of Calgary.

We also welcome a new addition to our neuropathology teaching staff, Dr. Kristopher Langdon MD, PhD.

Submitted by
Dr. Denise Ng,
Program Director Neuropathology

Resident History/Growth (Figures 1 and 2)

Figure 1 – Resident History/Growth

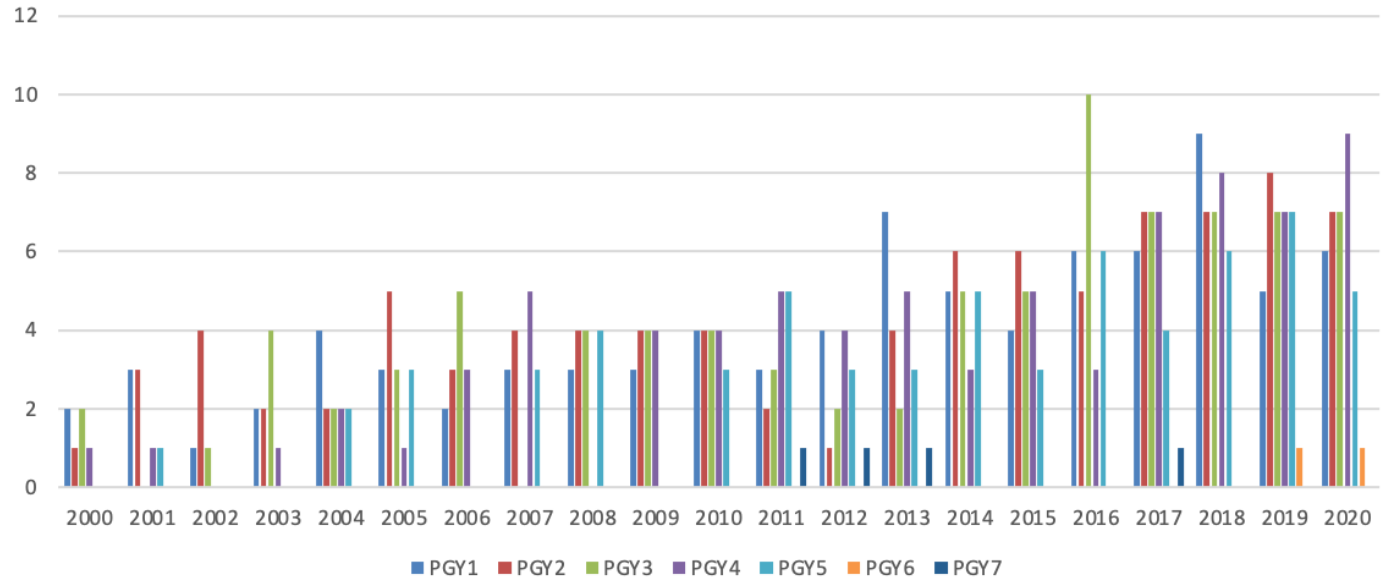
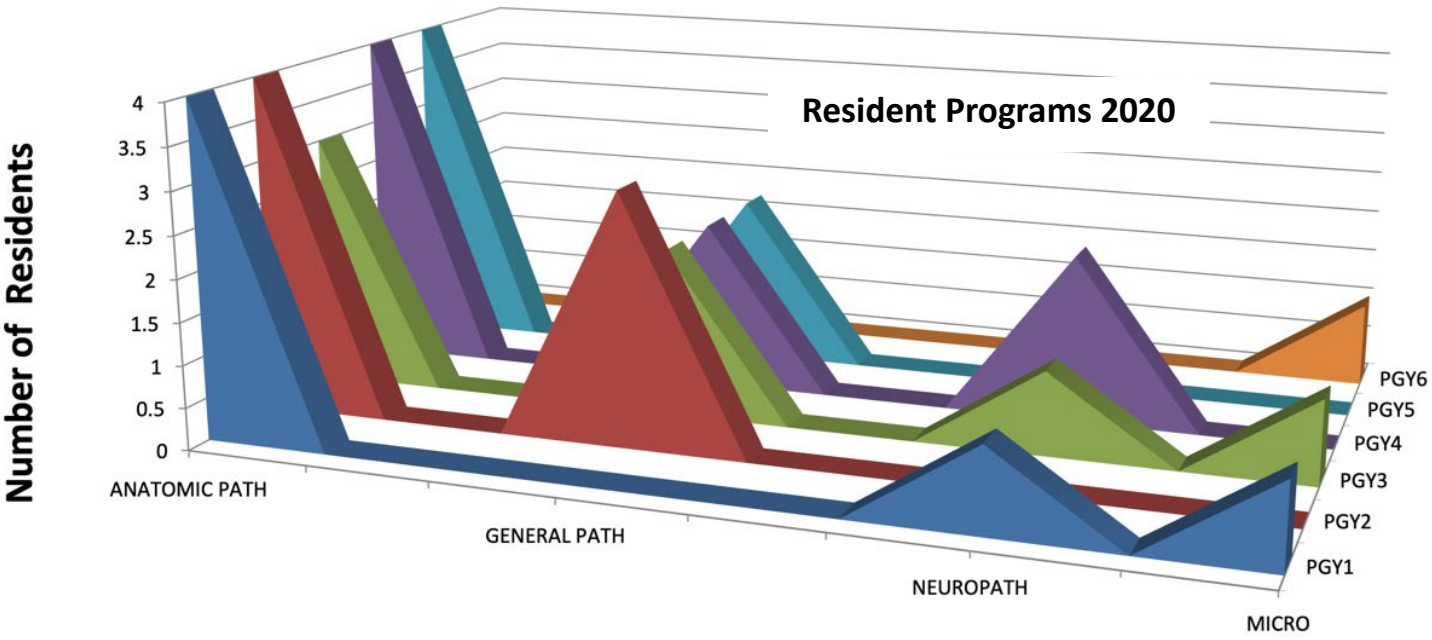


Figure 2 – Enrolment in DPLM Residency Training



Medical Sciences 515/Biology 515 Course

(Course Director: Dr. Etienne Mahe)

The BIOL/MDSC 515 is offered annually during the winter semester (January-April). This is one of the pre-eminent courses of the BIOL/MDSC programmes and features a wide breadth of expert speakers from our and other Departments. 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. Students are also provided an introduction (both taught and practical) to the practice of biomedical research.

The Department of Pathology and Laboratory Medicine is responsible for the development and teaching of the BIOL /MDSC 515 course, and it continues to be very well received by students. The 2020 year's enrolment was 28 students.

Twenty-two of our faculty (both clinical and GFT) provided 32 hours of lectures over the course of the semester in this course. Each faculty member provides a focused lecture in a given area of pathology in which they are local experts. Students then take weekly probing quizzes, which account for the bulk of the final course grade.

Two written assignments, one a critical appraisal and one a scientific study proposal, are required, and address the biomedical research curriculum content of this course. Students must also take a low-stakes cumulative final exam.

Despite the challenges of the pandemic, the BIOL/MDSC 515 course was readily amenable to an online-only delivery. Student feedback has remained positive, even during these challenging times.

Undergraduate Medical Education

(Department Representative, Dr. Amy Bromley)

The University of Calgary undergraduate teaching program for medical students follows an integrated approach in accordance with requirements of the Medical Council of Canada. As such, pathology is integrated into the systems based courses in the curriculum, which include hematology, gastroenterology, cardiology, respirology, nephrology, endocrinology, neurology, gynecology, and pediatrics, among others.

Pathology is taught through multiple modalities, including lectures, small groups, and clinicopathological correlation sessions, where pathologists partner with clinicians and other diagnosticians to present cases as they would play out in real clinical life.

Department members are also preceptors for Applied Evidence Based Medicine courses, as well as pre-clerkship and clerkship electives. Recently, in an effort to expose medical students to pathology earlier in their career, members of the Department have participated in the Immersive Career Exploration program at the University of Calgary, which pairs first year medical students with physicians to allow for a direct observation of their practice. Many members of the Department are also involved in the University's career coaching program, which helps medical students navigate the pre-CaRMS landscape to inform their choices in the future. The medical school curriculum is being restructured, and pathology will be even more integrated with clinical presentations in the new curriculum.

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

(Chair: Dr. Jeffrey Joseph)

Up to six internally (APL) 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/APL 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, Dermatopathology, Gastrointestinal Pathology, Gynecological Pathology, Hematopathology, Histocompatibility, Pediatric Pathology, Pulmonary Pathology, Renal/Transplant Pathology, Transfusion Medicine, Uropathology and offer an Area of Focused Competence (AFC) in Cytopathology.

The following Clinical Fellows trained at APL:

Fellows	Specialty Area	Supervisor	Year
Heather Paul	Clinical Biochemistry (2nd year)	Drs. Hossein Sadrzadeh, Alex Chin	2018-2020
Dustin Proctor	Clinical Biochemistry (1st year)	Drs. Hossein Sadrzadeh, Alex Chin	2019-2021
Alison Gareau	Histocompatibility	Dr. Noureddine Berka	2018-2020
Nikoo Parvinnejad	Dermatopathology	Dr. Thomas Brenn	2019-2020
Nicholas Wiebe	Gynecological Pathology	Dr. Martin Koebel	2019-2020
Erik Nohr	Pediatric Pathology	Dr. Kyle Kurek	2019-2020

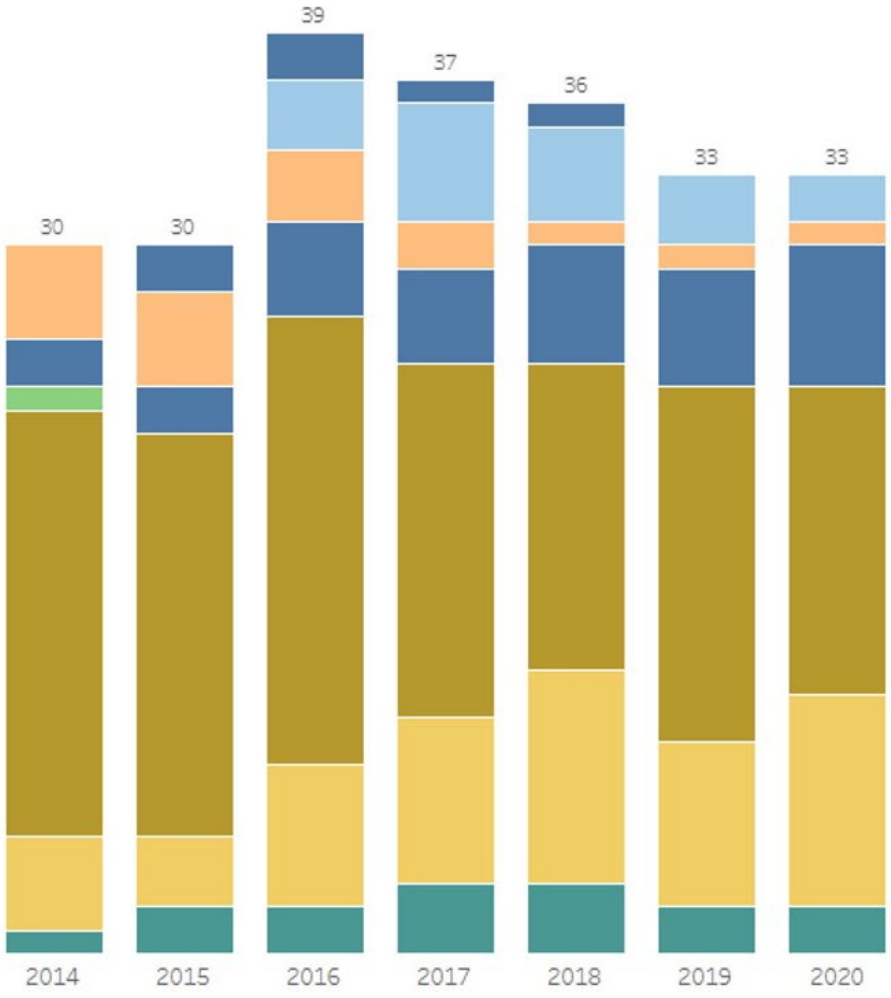
Continuing Medical Education

(Department Representative: Dr. Etienne Mahe)

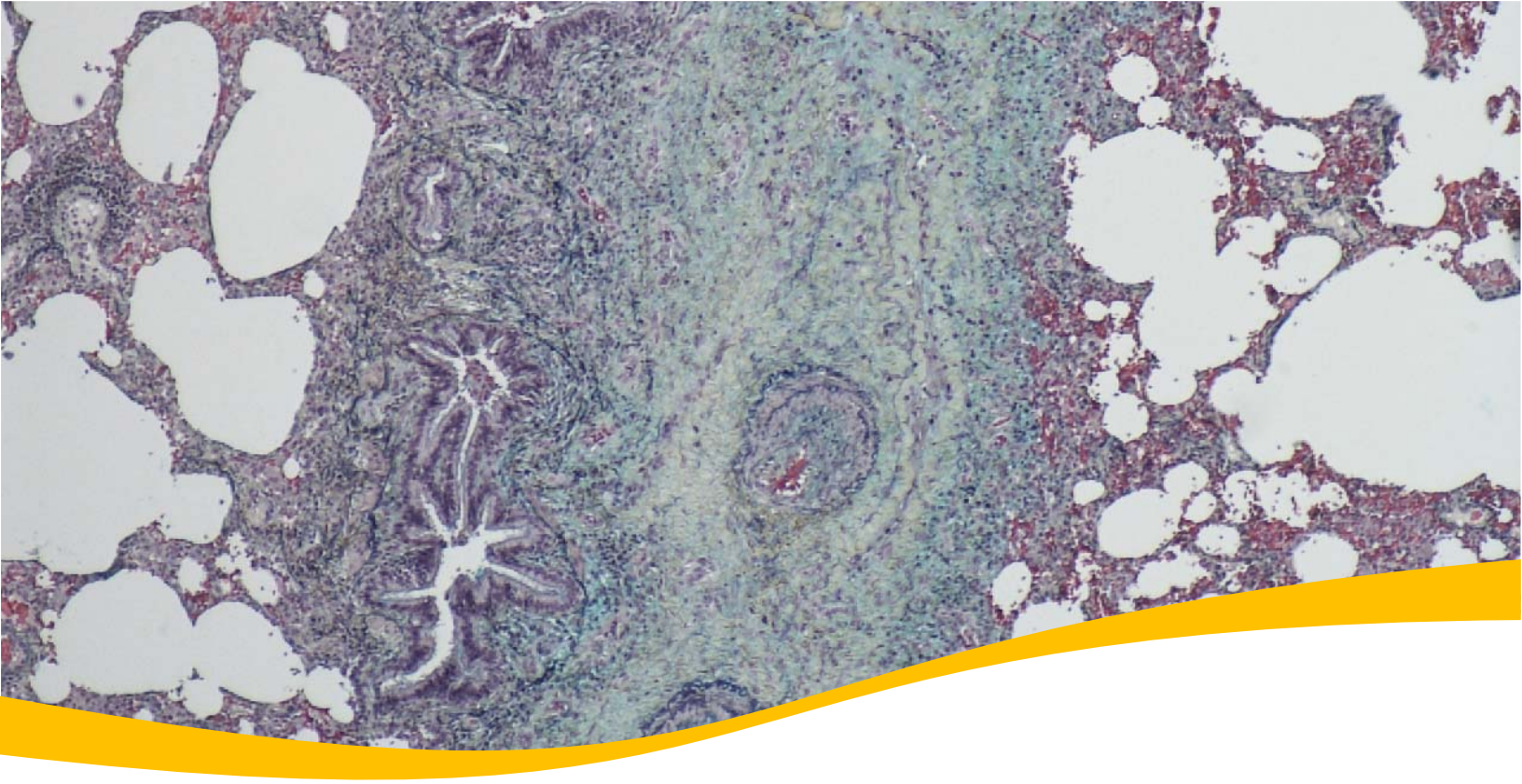
APL provides teaching for Medical Laboratory Technologists (MLT)/Medical Laboratory Assistants (MLA), Cytotechnology, Combined Laboratory and X-Ray Technologists (CLXT) Education Program.

Additionally, department members provide weekly CME Rounds and participate in numerous Department of Medicine Rounds as well as presentations at National and International conferences.

Graduate Students



Tableau, Cumming School of Medicine, University of Calgary

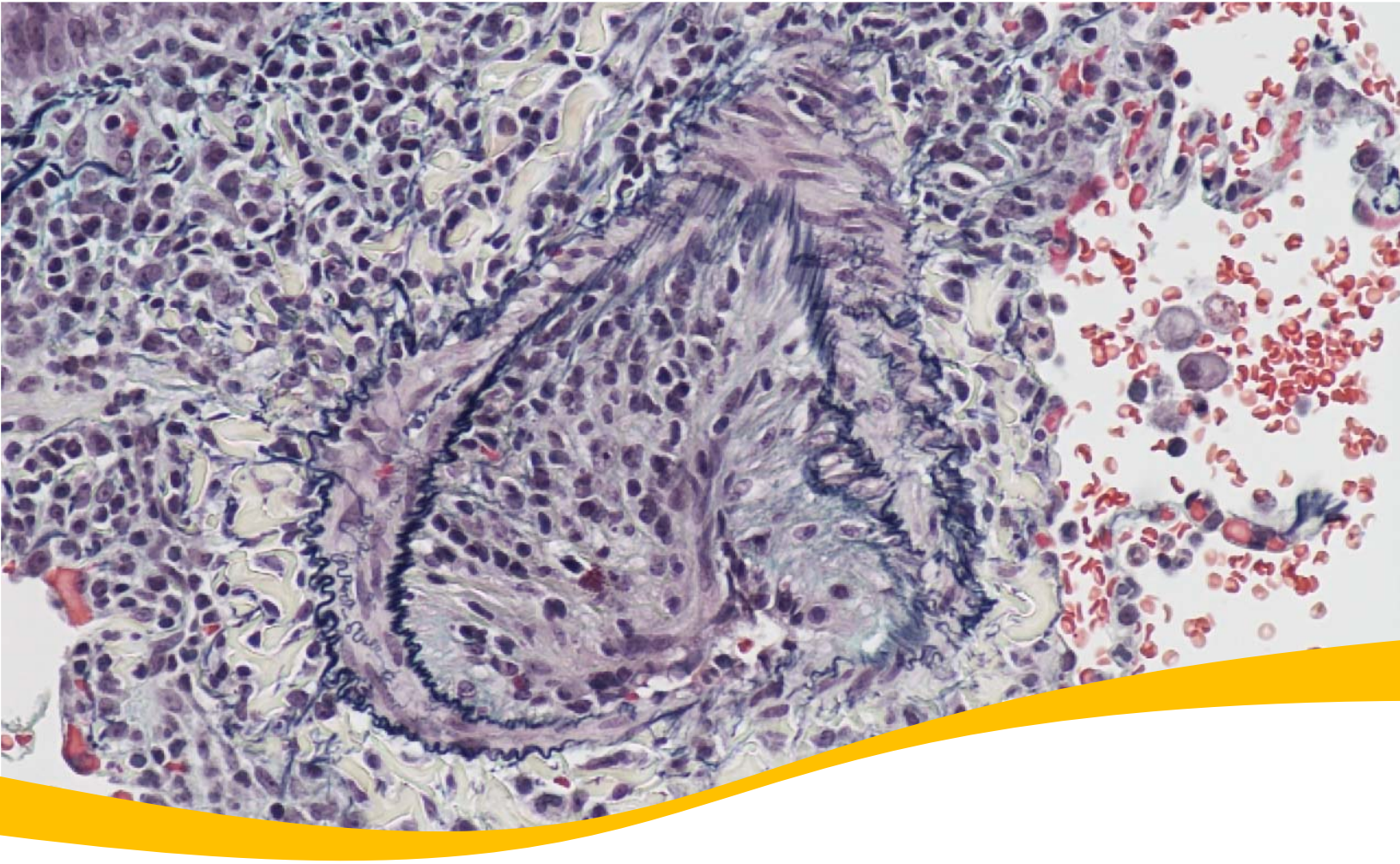


Master of Pathologists' Assistant Program

Program Director: Bill Gorday, 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 and performing diagnostic work.
- The thesis-based Pathologists' Assistants (PA) Masters program at the University of Calgary began in 2012 as a specialization within Medical Sciences Graduate studies and in 2016 transitioned to a course based Masters Program under Graduate Science Education at the Cumming School of Medicine.
- The PA program is accredited by 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. The PA program's five-year NAACLS accreditation was renewed in October 2019, for another five-year cycle and allows students to write the American Society of Clinical Pathology board certification exam and Canadian Certification Council of Pathologists' Assistants exam, which allows them to work anywhere in North America.
- 2020 Program Statistics- Graduation rate 100%, Attrition rate 0%, Employment rate 100%, ASCP Exam pass rate 100%, CCCPA-CCCAP exam pass rate 100%. Exam pass rates are based on eligible graduates who have found employment within the provinces of Alberta, British Columbia, Saskatchewan, Nova Scotia and Ontario.
- One of our 2020 graduates had their manuscript chosen as the "Top Manuscript" submission for the student delegates for the American Association of Pathologists' Assistant Fall Conference.
- Lee D. Myoepithelial Carcinoma of the Left Maxilla with Extension to the Inferior Pterygoid Plates. The Cutting Edge. Volume 10, Issue 1, 2020.
- Since 2016 the program has admitted six students a year. For the 2021 cohort we will be accepting eight students with two students doing a portion of their practical training in Saskatoon and Regina.
- The program has practical affiliations with APL (Calgary), Chinook Regional Hospital (Lethbridge), Medical Examiner's Office (Calgary), Vancouver General Hospital, BC Children's Hospital and the University of Saskatchewan, College of Medicine, BC Children's Hospital and the University of Saskatchewan, College of Medicine.
- Due to the Covid-19 pandemic out of province practical rotations were not available for 2020.

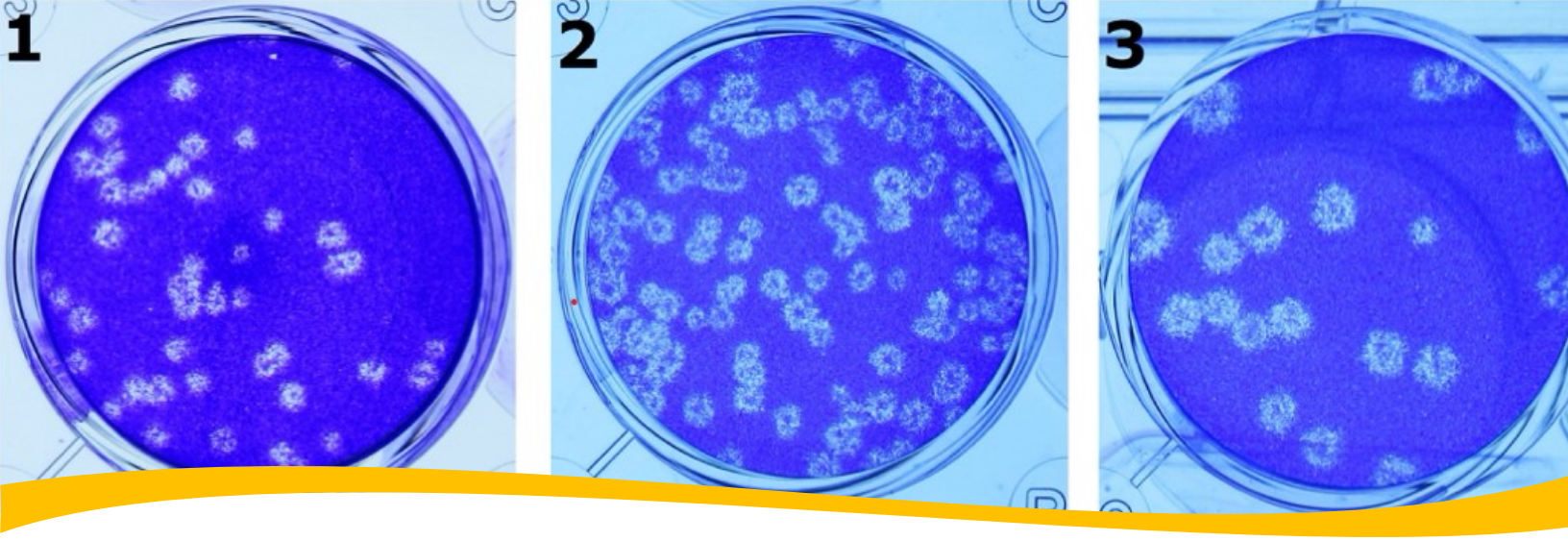
Research



Research (APL):

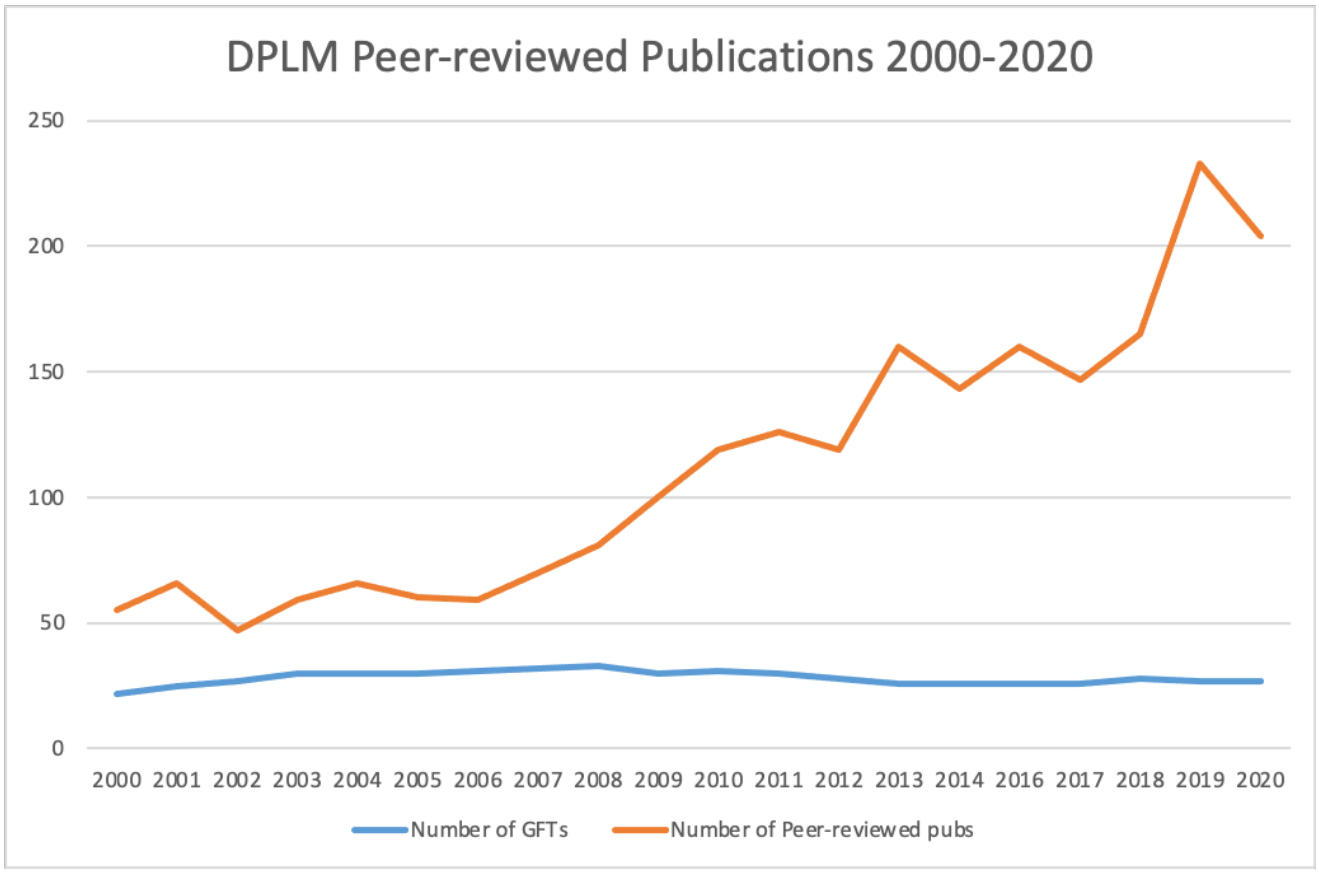
Submitted by Ms. Rhonda Jackson, Manager, Clinical Trials and Research

- Demand for APL Research Lab Service support and testing continued throughout the Pandemic and included lab support for several COVID-19 Clinical Trials and Research studies.
- The provincial government announced a partnership between AHS, six of Alberta's health foundations and APL in May 2020, for the establishment of a biorepository for human COVID-19 samples in the province. APL was integral in safely collecting, cataloguing and storing samples for the biorepository. The biorepository allows for the long-term preservation of COVID-19 positive samples, giving Alberta's world-class medical-scientific researchers local access to the biological material they need to further study the virus and further enhance patient care.
- APL is capping and providing samples for a Prevalence of SARS CoV in Alberta- COVID-19 Residual Sample Study being performed at Provincial Lab.
- Continued focus on Connect Care implementation and Wave 4 Calgary interim state working group meetings.
- Regular meetings with APL Finance to ensure adequate research test and service cost recovery and invoicing for research lab activity continues to be a work in progress.
- Consistent collaboration with the APL Decision Support Team to further enhance the research request for research data (RFD) process and TAT's.
- New Cancer Care Centre working group meetings are in progress with a focus on current and future state workflows and confirmation of equipment requirements.
- Participated in several meetings regarding revisions to the APL website for Research including creation of an enquiry form for future implementation in the fall.
- Provincial APL research standardization and workflows remain a priority where applicable and continues to be a work in progress.
- Establishment of a provincial APL Research & Innovation Implementation Working Group
- Due to the pandemic and transition of APL Research to a Provincial Integrated Program, no Research competition or summer studentship competitions were held for the Calgary Zone.
- Several funded research competition projects were delayed and required extensions due to the Pandemic.

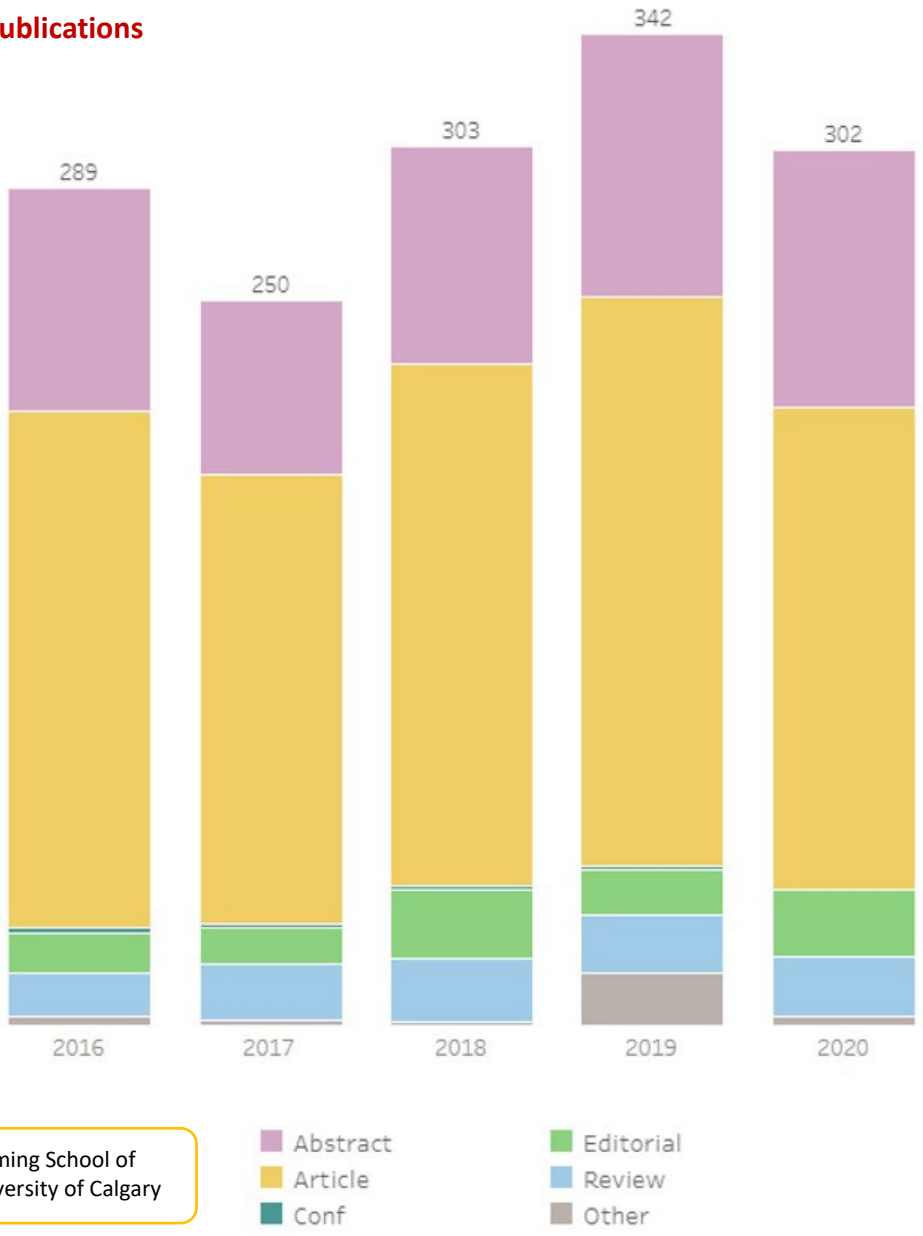


Peer-reviewed publications (DPLM primary appointment)

Department members with a primary appointment in the DPLM and whose primary remuneration is derived from either APL or DPLM (excludes cross-appointments) published 204 peer-reviewed papers and book chapters in 2020.



All DPLM Publications



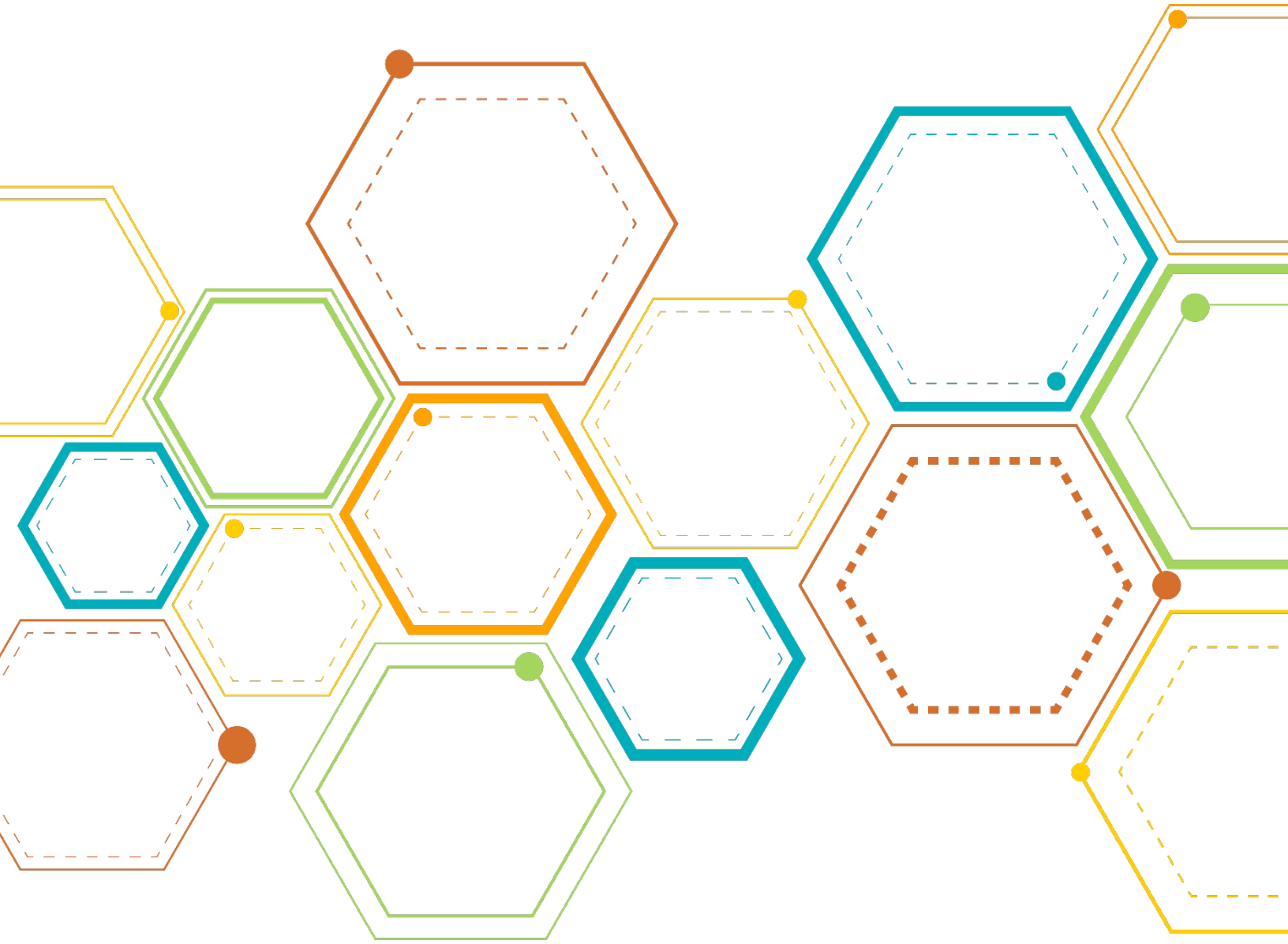
Tableau, Cumming School of Medicine, University of Calgary

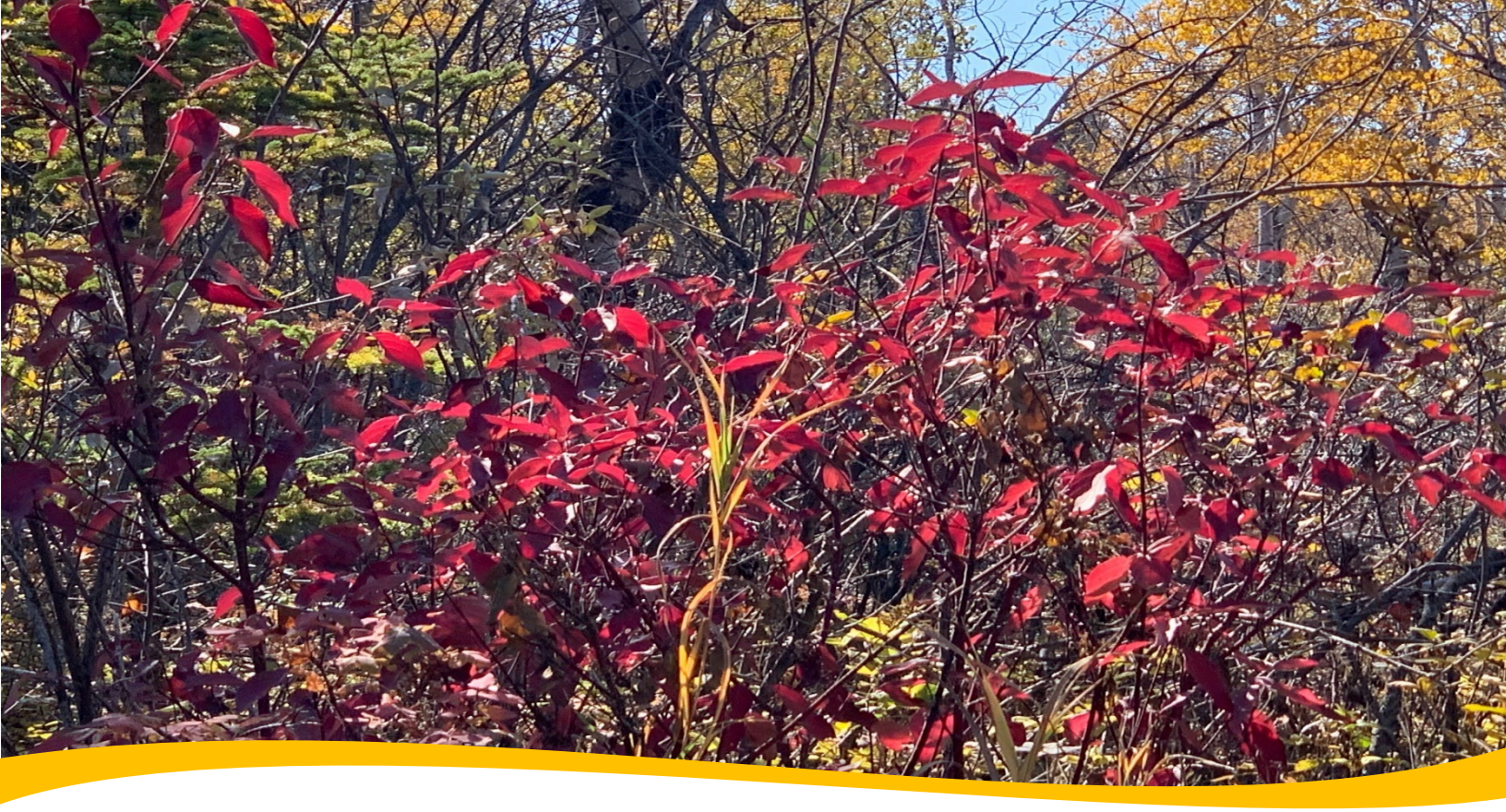
Research Grants

Another measure of research productivity is peer-reviewed grant funding.

For a complete list of Departmental research grant holdings, both as principal investigator, co-investigator and collaborator, please refer to Appendix 1.4.

Department recruitments





Summary of Recruitments and Departures

Name	Division	Date	Recruitment	Departure
Zargham, Ramin	Anatomic Pathology	2020 February	Recruit	
Langdon, Kristopher	Anatomic Pathology	2020 May	Recruit	
Khetani, Karim	Anatomic Pathology	2020 July	Recruit	
Nohr, Erik	Anatomic Pathology	2020 July	Recruit	
Paul, Heather	Clinical Biochemistry	2020 July	Recruit	
Abi Daoud, Marie	Anatomic Pathology	2020 August	Recruit	
Wiebe, Nicholas	Anatomic Pathology	2020 August	Recruit	
Husain, Arjumand	Anatomic Pathology	2020 September	Recruit	
Morava-Protzner, Izabella	Anatomic Pathology	2020 January		Departure
Itani, Doha	Anatomic Pathology	2020 February		Departure
Rashid-Kolvear, Fariborz	Anatomic Pathology	2020 March		Departure
Resch, Lothar	Anatomic Pathology	2020 July		Departure
Simpson, Roderick	Anatomic Pathology	2020 July		Departure
Pinto-Rojas, Pinto	Anatomic Pathology	2020 August		Departure
Gough, James	Anatomic Pathology	2020 December		Departure
Shao, Xiao Xia (Tiffany)	Anatomic Pathology	2020 December		Departure

Appendices:
Membership Lists

Clinical Section of Anatomic Pathology

Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Abi Daoud, Marie	Clinical	Associate 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
Box, Adrian	Clinical	Assistant Professor	FMC	Molecular Genetic Pathology, Autopsy
Brenn, Thomas	GFT	Professor	DSC	Dermatopathology
Bromley, Amy	Clinical	Associate 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
Cota Schwarz, Ana	Clinical	Assistant Professor	FMC	Surgical Pathology, General Pathology, Hematopathology
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	Gastrointestinal Pathology, Head and Neck Pathology
Franko, Angela	Clinical	Assistant Professor	FMC	Pulmonary Pathology, Autopsy
Galman, Lanie	Clinical	Assistant Professor	SHC	Breast Pathology, Bone and Soft Tissue Pathology
Gao, Chen	Clinical	Assistant Professor	DSC	Cytopathology
George, David	Clinical	Associate Professor	FMC	Renal Pathology
Gorecki, Margaret	Clinical	Assistant Professor	DSC	Surgical Pathology, Cytopathology
Gorombey, Steve	Clinical	Assistant Professor	PLC	Cytopathology, General Pathology
Guggisberg, Kelly	Clinical	Assistant Professor	RGH	ENT Pathology, Dermatopathology
Howell, Jenika	Clinical	Assistant Professor	PLC	Surgical Pathology
Hunter, Charlene	Clinical	Associate Professor	DSC	Dermatopathology
Husain, Arjumand	Clinical	Assistant Professor	FMC	Breast Pathology
Hyrcza, Martin	GFT	Assistant Professor	FMC	Head/Neck, Endocrine & Ophthalmic Pathology

Joseph, Jeffrey	GFT	Professor	FMC	Neuropathology
Kelly, Margaret	GFT	Professor	FMC	Pulmonary Pathology
Khalil, Moosa	Clinical	Associate Professor	FMC	Cytopathology, Surgical Pathology, Endocrine Pathology
Khetani, Karim	Clinical	Assistant Professor	PLC	Surgical Pathology
Klonowski, Paul	Clinical	Assistant Professor	DSC	Breast Pathology, Lab Informatics
Koebel, Martin	GFT	Associate Professor	FMC	Gynecological Pathology
Koro, Konstantin	Clinical	Assistant Professor	FMC	Gastrointestinal & Liver Pathology
Kulaga, Andrew	Clinical	Associate Professor	RGH	Genitourinary Pathology, Surgical Pathology
Kurek, Kyle	GFT	Assistant Professor	ACH	Pediatric Pathology
Langdon, Kristopher	Clinical	Assistant Professor	FMC	Neuropathology
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	Associate Professor	FMC	Gastrointestinal Pathology, Hematopathology
Naert, Karen	Clinical	Assistant Professor	DSC	Dermatopathology
Ng, Denise	Clinical	Assistant Professor	FMC	Neuropathology
Nikolic, Ana			FMC	Neuropathology
Nohr, Erik	Clinical	Assistant Professor	ACH/FMC	Pediatric Pathology, Molecular Pathology
O'Connor, Kate	Clinical	Assistant Professor	FMC	Gastrointestinal, Liver and Breast Pathology
Ogilvie, Travis	GFT	Associate Professor	FMC	Breast and Gynecological Pathology
Paslawski, Doreen	Clinical	Assistant Professor	RGH	Breast Pathology, Surgical Pathology
Schell, Andrew	Clinical	Assistant Professor	RGH	Gastrointestinal Pathology
Schneider, Michelle	Clinical	Assistant Professor	DSC	Dermatopathology
Siadat, Farshid	Clinical	Associate Professor	RGH	Genitourinary Pathology
Sienko, Anna	Clinical	Professor	PLC	Surgical Pathology, Cytopathology
Swanson, Paul	Clinical	Professor	DSC	Bone & Soft Tissue, Gastrointestinal Path, Breast Path, Lung & Thoracic, ENT
Teman, Carolin	Clinical	Associate Professor	FMC	Breast and Head and Neck Pathology, Hematopathology
Terzic, Tatjana	Clinical	Assistant Professor	DSC	Cytopathology, Gynecologic Pathology
Trpkov, Kiril	GFT	Professor	RGH	Genitourinary Pathology, Renal Pathology
Urbanski, Stefan	Clinical	Professor	FMC	Gastrointestinal Pathology, Liver Pathology, Pulmonary Neoplasia
Waghray, Ranjit	Clinical	Professor	DSC	Surgical Pathology, Cytopathology
Wang, Yinong	Clinical	Associate Professor	DSC	Surgical Pathology, Cardiac Pathology
Whitcomb, Emma	Clinical	Assistant Professor	SHC	Gastrointestinal and Liver Pathology
Wiebe, Nicholas	Clinical	Assistant Professor	FMC	Head and Neck Pathology, Gynecologic Pathology
Wright, James	GFT	Professor	ACH	Pediatric and Perinatal Pathology, Experimental Pathology
Yang, Hua	Clinical	Associate Professor	FMC	Breast Pathology
Yilmaz, Asli	GFT	Associate Professor	RGH	Genitourinary Pathology, Surgical Pathology
Yu, Weiming	Clinical	Associate Professor	ACH	Pediatric Pathology, Cardiac Pathology
Zargham, Ramin	Clinical	Assistant Professor	DSC	Surgical Pathology, Cytopathology

Clinical Section of Clinical Biochemistry

Medical/Scientific Staff	GFT/ Clinical	Rank	Site	Special Expertise
Boyd, Jessica	Clinical	Associate Professor	DSC	Analytical and Environmental Toxicology
Chin, Alex	Clinical	Associate Professor	DSC	Immunochemist, Clinical Chemistry
de Koning, Lawrence	GFT	Associate Professor	ACH	General Pathology, Pediatric Clinical Chemistry
Gifford, Jessica	Clinical	Assistant Professor	DSC	Clinical Biochemistry
Orton, Dennis	Clinical	Assistant Professor	DSC	Clinical Biochemistry
Paul, Heather	Clinical	Assistant Professor	DSC	Clinical Biochemistry
Sadrzadeh, Hossein	Clinical	Professor	DSC	Endocrinology, Nutrition Pharmacogenomics, Clinical Biochemistry
Seiden Long, Isolde	Clinical	Associate Professor	FMC	Clinical Biochemistry
Venner, Allison	Clinical	Associate Professor	DSC	Clinical Chemistry

Clinical Section of General 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
Larsen, Erik	Clinical	Assistant Professor	RGH	Surgical Pathology, Clinical Chemistry
Mourad, Walid	Clinical	Professor	DSC	General Pathology Hematopathology, Cytopathology
Naugler, Christopher	GFT	Professor	DSC	Lab Informatics, General Pathology
Thommasen, Amy	Clinical	Assistant Professor	DSC	General Pathology, Dermatopathology

Clinical Section of Hematopathology

Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Auer, Iwona	Clinical	Associate Professor	FMC	Flow Cytometry, Lymphoma
Berka, Noureddine	Clinical	Professor	DSC	Tissue Typing
Dharmani-Khan, Poonam	Clinical	Assistant Professor	FMC	Transplantation Immunology, Flow Cytometry and Transcriptome Analysis
Fourie, Thomas	Clinical	Assistant Professor	FMC	Hematological Pathology, Flow Cytometry
Jiang, Xiu Yan (Sue)	Clinical	Associate 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
Mirza, Imran	Clinical	Professor	FMC	Medical Genetics in Molecular Genetic Pathology
Prokopishyn, Nicole	Clinical	Assistant Professor	FMC	Stem Cell Lab
Roshan, Tariq	Clinical	Assistant Professor	FMC	Hematopathology
Shabani-Rad, Meer-Taher	Clinical	Associate Professor	FMC	Hematopathology
Shameli, Afshin	Clinical	Assistant Professor	FMC	Hematopathology

Clinical Section of Microbiology

Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Berenger, Byron	Clinical	Assistant Professor	DSC	Medical Microbiology
Brown, Kristen	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
Griener, Thomas	Clinical	Assistant Professor	DSC	Medical Microbiology
Groeschel, Michael	Clinical	Assistant Professor	DSC	Medical Microbiology
Pillai, Dylan	GFT	Professor	DSC	Molecular Diagnostics Parasitology
Pitout, Johann	GFT	Professor	DSC	Antibiotic susceptibility/ARO Bacteriology, Parasitology
Santiago Lisboa, Luiz	Clinical	Assistant Professor	DSC	Medical Microbiology

Clinical Section of Transfusion Medicine

Medical Staff	GFT/ Clinical	Rank	Site	Special Expertise
Baskin, Leland	Clinical	Professor	DSC	Chemical Pathology, General Pathology
Sidhu, Davinder	Clinical	Associate Professor	FMC	General Pathology, Transfusion Medicine

Appendices:
Publications

Department members with a primary appointment in the DPLM and whose primary remuneration is derived from either APL or UofC DPLM (i.e., list excludes cross-appointments) published 204 peer-reviewed papers and book chapters in 2020.

Auer, Iwona

Au KLK, Latonas S, Shameli A, **Auer I**, Hahn C. Cerebrospinal Fluid Flow Cytometry: Utility in Central Nervous System Lymphoma Diagnosis. Can J Neurol Sci. 47(3):382-388, 2020

Baskin, Leland

Baskin LB, Naugler CT, Tan RZ, Markus C, Choy KW, Doery JCG, Loh TP. On the Use of Accuracy in Optimized Delta Check Rules for Detecting Misidentified Specimens in Children. Am J Clin Pathol. 154(4):572-574, 2020

Benediktsson, Hallgrimur

Smith A, Iablokov V, Mazza M, Guarnerio S, Denti V, Ivanova M, Stella M, Piga I, Chinello C, Heijs B, van Veelen PA, **Benediktsson H**, Muruve DA, Magni F. Detecting Proteomic Indicators to Distinguish Diabetic Nephropathy from Hypertensive Nephrosclerosis by Integrating Matrix-Assisted Laser Desorption/Ionization Mass Spectrometry Imaging with High-Mass Accuracy Mass Spectrometry. Kidney Blood Press Res. 45(2):233-248, 2020

Wright JR Jr, **Benediktsson H**, and Rasmussen SL. The Early History of Pathology and Laboratory Medicine in Calgary – The First Seventy-Five Years. Can. J. Pathol. 12(2):45-59, 2020

Berenger, Byron

Charlton CL, Kanji JN, Johal K, Bailey A, Plitt SS, MacDonald C, Kunst A, Buss E, Burnes LE, Fonseca K, **Berenger BM**, Schnabl K, Hu J, Stokes W, Zelyas N, Tipples G. Evaluation of Six Commercial Mid- to High-Volume Antibody and Six Point-of-Care Lateral Flow Assays for Detection of SARS-CoV-2 Antibodies. J Clin Microbiol. 58(10):e01361-20, 2020

Mohon AN, Oberding L, Hundt J, van Marle G, Pabbaraju K, **Berenger BM**, Lisboa L, Griener T, Czub M, Doolan C, Servellita V, Chiu CY, Greninger AL, Jerome KR, Pillai DR. Optimization and clinical validation of dual-target RT-LAMP for SARS-CoV-2. J Virol Methods. 286:113972, 2020

Mponponsuo K, Kerkerian G, Somayaji R, Missaghi B, Vayalumkal JV, Larios OE, **Berenger BM**, Lauzon M, McDonnell N, Conly J. Lack of nosocomial transmission to exposed inpatients and coworkers in an investigation of five SARS-CoV-2-infected healthcare workers. Infect Control Hosp Epidemiol. 3:1-2, 2020

Berka, Noureddine

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Appendices:
Research Grants

2020 External Research Grants and Awards (held by DPLM Faculty) - Does not include those of cross-appointments

Due to the pandemic and transition of APL Research to a provincial integrated program, no research competition or summer studentship competitions were held for the Calgary Zone.

Berka, Noureddine				
Precision Medicine Can PREVENT AMR: Applying Precision Medicine Technologies in Canada to Prevent Antibody Mediated Rejection and Premature Kidney Transplant Loss	2018-2022	Genome Canada, 2017 Large-Scale Applied Research Project Competition, Genomics and Precision Health	$9,700,000	Co-Applicant & End User

Berenger, Byron				
Development and implementation of rapid metagenomic sequencing coupled with isothermal amplification point of care testing for viral diagnostics.	2020-2022	Canadian Institutes of Health Research (CIHR)	$478,850	Co-Inv
Rapid RNA sequencing of coronavirus for public health surveillance and transmission.	2020-2022	Canadian Institutes of Health Research (CIHR)	$788,040	Co-Inv
Rapid, Ultrasensitive Clinical Detection of 2019 Novel Coronavirus (nCOVID-19) by Novel Microfluidic Electrochemical Nano-Biosensors	2020-2022	Canadian Institutes of Health Research (CIHR)	$795,560	Co-Inv

Research Grants (con't)

Bismar, Tarek				
Characterization of Novel Molecular Signature for Accurately Predicting Prostate Cancer Progression in Active Surveillance	2018-2021 Oct - Sept	Prostate Cancer Canada	$1,499,650	PI
Gene Expression Signature for Predicting Disease Progression	2020-2021	ALMAC claraT Grant Programme for Academia	$25,000	PI

Chan, Jennifer				
Combined MEK inhibition and metronomic chemotherapy for recurrent/refractory paediatric low-grade Gliomas	2020-2025	Canadian Institutes of Health Research (CIHR)	$1,526,175	Co-Inv
The Prairie Cancer Research Consortium (PCRC) – Pilot Project	2020-2022	Terry Fox Research Institute	$225,000	PI
Drivers of oligodendrocyte precursor cell dysfunction in the origin and maintenance of oligodendroglioma	2019-2022	Canadian Institutes of Health Research (CIHR)	$502,606	PI
PROFYLE Model Systems Activities in Calgary	2019-2022	Alberta Cancer Foundation, partnered with Terry Fox Research Institute	$276,500	PI
Precision Oncology for Young People (PROFYLE)	2016-2021	Terry Fox Research Institute	$159,254	Co-Inv

Church, Deirdre				
Rapid Infection Diagnostics (RID) Centre: A new weapon in the global battle against infections	2020-2022	Canadian Foundation for Innovation (CFI)	~$10,000,000	Co-Inv
Reducing the burden of antimicrobial resistance via rapid diagnosis of urinary tract infections	2019-2022	Canadian Institutes of Health Research (CIHR)	$725,000	Co-Inv
Reducing the Global Burden of Infectious Diseases through Precision Population Health	2018-2022	Genome Alberta (Large Scale Applied Research Project (LSARP)	$11,030,000	Co-Inv
Microscale Metabolomics for rapid Detection of Infections and Identification of Drug Resistance	2017-2021	Genomic Applications Partnership Program (GAPP)/Genome Canada	$6,024,696	Co-Inv

Research Grants (con't)

De Koning, Lawrence				
Development of novel risk prediction scores for emergency department patients with suspected coronary artery disease.	2019-2021	Canadian Institutes of Health Research (CIHR)	$123,000	Co-Inv
Maternal Iron Nutrition & its Consequences in Pregnant Women & Their Children in The AB Pregnancy Outcomes & Nutrition (APrON)	2018-2020	Canadian Institutes of Health Research (CIHR)	$385,000	Co-Inv

Dharmani-Khan, Poonam				
Early Detection of Acute Myeloid Leukemia (AML) relapse after allogeneic HCT	2019-2022	Alberta Cancer Foundation (ACF) R. K. Dixon Award	$925,000	Co-Inv

Gregson, Daniel				
The S. aureus Network Adaptive Platform Trial (SNAP) Canada: A Randomized Controlled Trial for Penicillin-susceptible, Methicillin-susceptible, and Methicillin-resistant Staphylococcus aureus Bloodstream Infections in Hospitalized Patients	2020-2024	Canadian Institutes of Health Research (CIHR)	$1,139,852	Co-Inv
Reducing the burden of antimicrobial resistance via rapid diagnosis of urinary tract infections	2018-2023	University of Calgary	$225,000	Co-Inv
Research Funds	2018-2023	University of Calgary/Operating Grant	$32,308	PI
AMR One Health Consortium	2018-2023	Alberta Economic Development and Trade	$140,000	Co-Inv

Hyrcza, Martin				
Head and Neck Tumour Banking Program	2019-2024	Calgary Foundation on behalf of Ohlson Family Endowment Fun	$25,000 per annum	PI
Genetic Landscape of Salivary Gland Basal Cell Adenoma and Adenocarcinoma	2019-2020	Alberta Public Laboratories	$15,000	Co-Inv

Research Grants (con't)

Joseph, Jeffrey				
Donald Burns and Louise Berlin Professor in Dementia Research	2015-2020	University of Calgary	$500,000	PI
Calgary Brain Bank	2015-2020	Marion Lamb (Private)	$500,000	PI

Kelly, Margaret				
Multiplexed Ion Beam Imaging Technology: International Microbiome Centre advanced imaging and biomarker discovery platform (Theme Lead)	2020-2025	Alberta Children's Hospital Foundation Child Health Grant Program	$1,000,000	PI
Wild Microbiome and Immunity Centre.	2020-2025	Canadian Foundation for Innovation Application; (awarded matching funds)	$4,860,000	Co-Inv
Imaging COVID-19 Lungs to Uncover Therapies	2020-2025	CIHR: COVID-19 Rapid Research Funding Opportunity	$127,140	Co-PI
Imaging COVID-19 Lungs to Uncover Therapies	2020-2025	Canadian Foundation for Innovation Application (invited to apply upon success of the rapid research grant)	$993,057	Co-Inv
Non-classical mechanisms for leukocyte recruitment in the lungs: therapeutic targets for attenuating acute lung injury	2020-2025	CIHR Fall 2020 Project Grant	$175,950.00	Co-PI
Collection and storage of clinical samples from COVID-19 positive cases	2020-2021	The Calgary Foundation, The Calgary Health Trust	$300,000.00	Co-PI
The pathogenesis of vaping-associated lung injury	2020-2021	CIHR Catalyst Grant: Health Effects of Vaping Funding Opportunity	$99,280	PI
Systemic and Local Immune landscape of Children presenting to the Emergency Department with suspected appendicitis (SLICED): Innovation through Multiplex Ion Beam Imaging	2020-2021	Department of Pediatrics 2019 Innovation Awards	$25,000.00	Co-Inv
The Pediatric Chair in Respirology	2019-2024	Alberta Children's Hospital Foundation, the Alberta Lung Association and the Cal Wenzel Family Foundation - Cumming School of Medicine.	$1,000,000.00	PI
Novel treatment to reduce allergen-induced acute bronchoconstriction and chronic inflammation of asthmatic airways	2019-2024	CIHR Fall 2019 Project Grant	$307,849.00	Co-PI

Research Grants (con't)

Khan, Faisal				
Early detection of Acute Myeloid Leukemia Relapse after Allogeneic Hematopoietic Cell Transplantation	2019-2022	R.K. Dixon Award, Alberta Cancer Foundation	$925,000	PI
Methylation Patterns of cell-free DNA as a Biomarker of Erythroid Engraftment post-Hematopoietic Stem Cell Transplantation for Sickle Cell Anemia	2018-2020	Innovation Research Grant. Department of Pediatrics, University of Calgary	$25,000	Co-Inv
Role of Natural Killer Cells in Blood and Marrow Transplantation	2016-2020	Anonymous donation for HCT Research	$185,000	PI
Immunogenetic Biomarkers Important for Pathogenesis and Therapy of Complications of Paediatric Hematopoietic Cell Transplantation	2015-2020	Alberta Children Hospital Foundation Equipment funds as part of Childhood Cancer Research Program	$300,000	PI
Role of Natural Killer Cells Receptor genes in the immunopathogenesis and prognosis of different types of Lymphoma	2015-2019	Alberta Cancer Foundation	$97,125	PI
5+14=0: A new Maths based on KIR genes to reduce Graft versus host disease after allogeneic HCT	2014-2020	Buckley Family Cancer Research Excel Award	$193,000	PI
Barb Ibbotson ACHF Chair Award	2010-2020	Alberta Children's Hospital Foundation	$500,000 ($50,000 per year)	PI

Koebel, Martin				
Racial/Ethnic Disparities in Ovarian Cancer Treatment and Survival and Integrated Approach	2020-2025	National Institutes of Health (NIH)	$4,837,742	Co-Inv
Relating Molecular Subgroups of Endometriosis-Associated Ovarian Cancers to survival and risk factors	2020-2024	National Institutes of Health (NIH)	$1,070,831	Co-Inv
A Population-Based Study of Ketorolac and Ovarian Cancer Survival	2019-2023	National Institutes of Health (NIH)	$1,430,914	Co-Inv

Kurek, Kyle				
ROHHAD: Stem Cell Models to Investigate Cause and Consequences	2019-2022	ROHHAD Foundation (UK)	$150,000; Additional $150,000 (2021)	Co-PI
ROHHAD-Determining the Genetic Basis	2019-2022	Illumina Corporation	$300,000	Co-PI

Research Grants (con't)

Mansoor, Adnan				
Pan Canadian harmonization of Immunohistochemistry protocols for cell of origin classification of diffuse large B-cell lymphoma (DLBCL)	2017-2022	Jensen Canada / Johnson & Johnson Research Fund	$56,430	Co-PI

Naugler, Christopher				
Wastewater surveillance of SARS-COV2 to enable real-time clinical case-finding in Calgary.	2020-2021	Canadian Institutes of Health Research (CIHR)	$505,310	Co-Inv
Reducing the Global Burden of Infectious Diseases through Precision Population Health	2018-2022	Genome Alberta (Large Scale Applied Research Project (LSARP)	$11,030,000	Co-Inv and Clinical Lead
De-implementing low value care: a research program of the Choosing Wisely Canada Implementation Research Network	2018-2022	Canadian Institutes of Health Research (CIHR) SPOR Innovative Clinical Trial Multi-Year Grant	$3,000,000, $1,500,00 (CIHR) + $1,500,000 (Matching Funds)	Co-Inv
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	2016-2020	Canadian Institutes of Health Research (CIHR) Project Scheme	$36,382	Co-Inv
Misutilization of laboratory tests: pathways to correction	2015-2020	Canadian Institutes of Health Research (CIHR) Foundation Scheme	$1,056,420	PI
Misutilization of laboratory tests: pathways to correction	2015-2020	University of Calgary & AB Innovates Health Solutions	$25,000	PI

Orton, Dennis				
Defining an optimal IGF-1 concentration in children undergoing in Treatment of Growth Hormone Deficiency	2021-2023	Pfizer	$228,000	PI

Pitout, Johann				
The molecular basis of the carbapenem resistance epidemic	2018-2022	National Institutes of Health (NIH)	$190,000	PI
Escherichia coli ST131: a model for high-risk transmission dynamics of antimicrobial resistance	2017-2020	Joint Programming Initiative on Antimicrobial Resistance (JPIAMR/CHIR)	$599,000	PI

Research Grants (con't)

Pillai, Dylan				
Development and Implementation of rapid Metagenomic sequencing coupled with isothermal amplification point of care testing for viral diagnostics	2020-2022	CIHR/SSHRC/Genome Canada	$957,700	PI
LAMPREG TRIAL/Illucidx Active case detection of malaria in pregnancy	2020-2022	Diagnostics/University of Calgary	$1,000,000	PI
Development of microfluid cartridge for COVID-19	2020-2022	Thistledown Foundation/Fast Grants	$300,000	PI
Quantification of SARS-CoV-2 viral load in clinical and environmental sample	2020-2021	Canada Foundation for Innovation (CFI)	$329,418	PI
Illucidx Inc. Innovate Calgary Start Up	2020-2021	Life Sciences Innovation Hub Fellowship	$200,000	PI
Calgary Colombo Dengue Diagnosis	2019-2020	University of Calgary International	$12,500	PI
C. difficile near patient testing (NPT): a cluster randomized trial	2018-2020	Clinical Research Fund, University of Calgary	$50,000	PI
C. difficile near patient testing (NPT): a cluster randomized trial	2018-2020	Canadian Institutes of Health Research (CIHR)	$328,950	PI
LAMP versus traditional diagnostic for malaria in pregnancy - LAMPREG	2017-2022	Grand Challenges Canada/ Canadian Institutes of Health Research (CIHR)	$100,000	PI

Sadrzadeh, Hossein				
To assess the diagnostic and prognostic characteristics of TSI in diagnosis and management of patients with Graves' disease	2019-2022	Siemens Healthcare Diagnostic Inc.	$64,000	PI

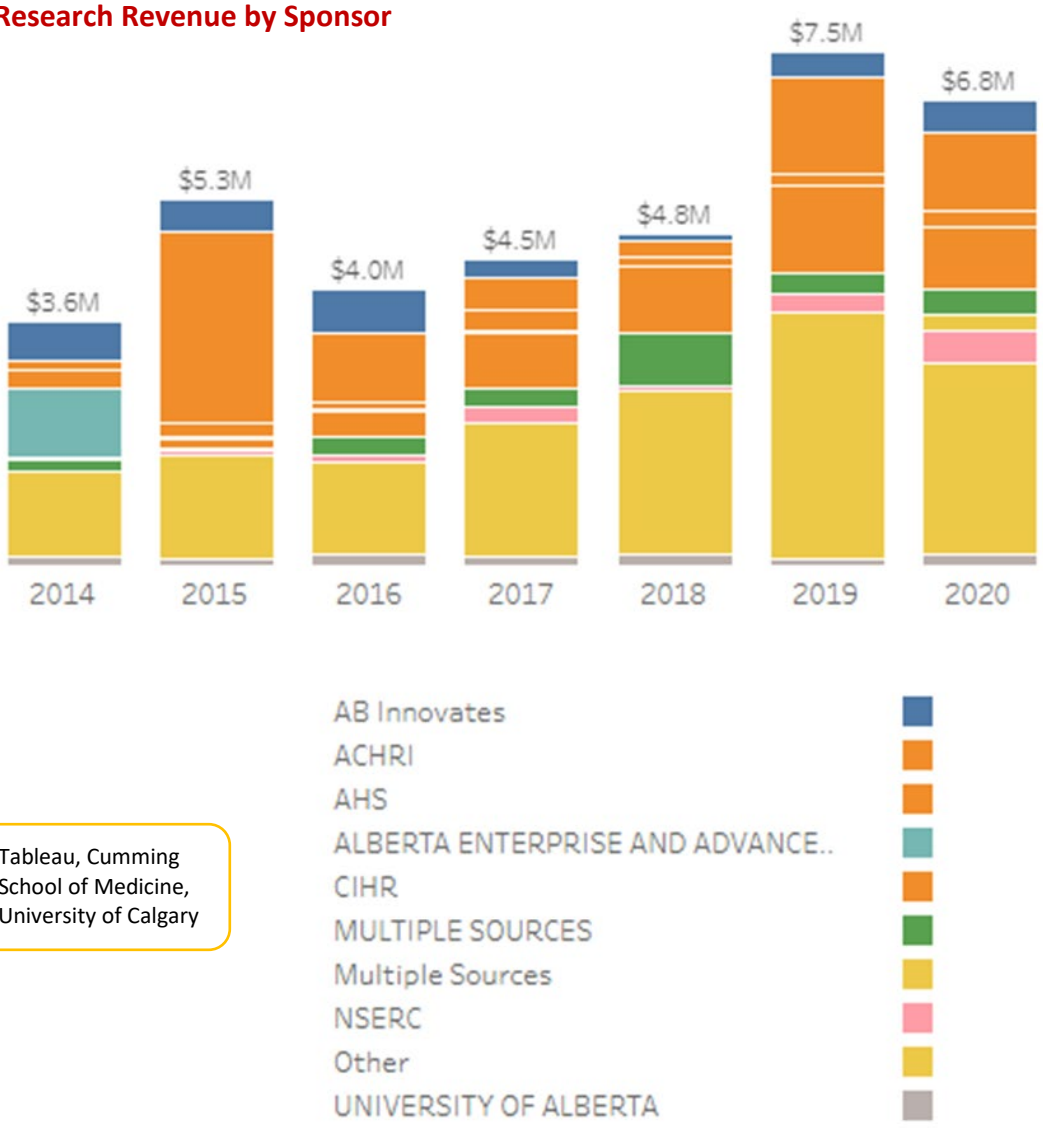
Schell, Andrew				
Fecal Immunochemical Test for post-polypectomy surveillance to reduce unnecessary endoscopy (FIT2RUN Study)	2019-2022	Canadian Institutes of Health Research (CIHR)	$225,676	Co-Inv

Shabani-Rad, Meer-Taher				
Early detection of Acute Myeloid Leukemia Relapse after Allogenic Hematopoietic Cell Transplantation	2019-2022	R. K. Dixon Award, Alberta Cancer Foundation	$925,000	Co-Inv

Research Grants (con't)

Zhang, Kunyan				
Molecular assay development and their applications in the Centre for Antimicrobial Resistance (CAR) Program	2017-2022	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. (AMR Phase I)	2017-2020	Canadian Institutes of Health Research (CIHR) Operating Grant	$389,976 (CIHR: $194,988; Industrial Partner)	PI

Annual Research Revenue by Sponsor



Tableau, Cumming School of Medicine, University of Calgary

Image Acknowledgements

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