Department of
PATHOLOGY

DALHOUSIE UNIVERSITY

2022 Annual Report

Recognizing our growth and accomplishments

Message from the department head:

Recognizing our growth and accomplishments

IN 2022, WE CONTINUED TO FEEL THE EFFECTS of the pandemic on the Department of Pathology's workload. With most restrictions lifted, physicians were able to provide their full range of services again. The backlog of postponed cases put added pressure on our laboratories. I am proud to say that our staff rose to the challenge, as they always do, but we must acknowledge that there is a need to grow both our staff and our facilities to accommodate increased demand, especially since the population in Halifax is growing quickly now.

I am excited to report that our advocacy for a new space to house the pathology laboratories in Central Zone has finally met with success! The Government of Nova Scotia has committed to funding a new space to replace the aging and inadequate MacKenzie Building. We are hard at work on the functional plan for the new space, which will provide new opportunities for automation to assist us in meeting the growing demand for testing over the next 30 years.

The department is also hard at work on improving the appropriateness of the testing that we do, through such initiatives as Choosing Wisely Canada and its spinoff, Using Labs Wisely. We are leading players in national efforts to eliminate unnecessary and ineffective testing, so that resources are focused on providing the most optimal, timely and cost-effective testing possible.

Recruiting learners is another priority to assist us in meeting the demand for our services. In 2024, Pathology and Laboratory Medicine will be offered as a three-week elective for third-year medical students at Dalhousie University, providing an opportunity to pique medical students' interest in pathology early enough in their training to influence their residency decisions.

On the residency front, we expanded further into New Brunswick, opening a training site in Fredericton, in addition to the sites in Moncton and Saint John. Our intention in offering these rotations is to encourage more residents to practice in these communities after completing their training.

The department introduced new activities to encourage research collaboration between residents and graduate students, so that they take this productive approach into their careers. In addition to the Path Forward Collaboration Award (to support research projects), we introduced joint wellness and social activities to foster connections among our graduate students and residents.

I am delighted to welcome two new members to our faculty. Clinical scientist Dr. Somayyeh Fahiminiya has joined the Central Zone Molecular Diagnostics Laboratory from Quebec, while our former resident Dr. Richard Xiang has joined the Division of Hematopathology.

I hope you enjoy learning more about our department's academic endeavours and multi-faceted efforts to improve the quality of patient care in the face of staff shortages and growing demand. I am so grateful for everyone's hard work and dedication and the progress we have made as we prepare to meet the needs of the future.

Sincerely,

Dr. Irene Sadek
Head, Department of Pathology

CLINICAL WORKLOAD

16,881,549 TOTAL NUMBER OF TESTS PERFORMED

1,198,395 TOTAL BLOOD COLLECTIONS PERFORMED

PEOPLE

100 NUMBER OF PRIMARY FACULTY

18 CROSS APPOINTED FACULTY

6 ADJUNCT FACULTY

800 NSHA TECHNICAL STAFF

126 IWK TECHNICAL STAFF

214 NEW BRUNSWICK TECHNICAL STAFF

RESIDENTS

32 NUMBER OF RESIDENTS & FELLOWS

12 ANATOMICAL PATHOLOGY

9 GENERAL PATHOLOGY

6 HEMATO-PATHOLOGY

5 MEDICAL MICROBIOLOGY

GRADUATE STUDENTS

31 TOTAL NUMBER OF GRADUATE STUDENTS

13 PhDs

10 MSc

8 PDFs

RESEARCH STATISTICS

196 NUMBER OF PUBLICATIONS

$2,972,070 GRANT CAPTURE

^ *Dr. Manal Elnenaei and Ian MacLean*

CLINICAL Feature:

Choosing tests, and **using resources**, wisely

^ *Dr. Manal Elnenaei*

LAB TESTING is the single highest-volume medical activity in health care, driving up to 80 per cent of medical decisions and making a pivotal impact on the outcomes of care. And yet, according to a large meta-analysis, on average 30 per cent of medical tests conducted are unnecessary—and some of this unnecessary testing is even harmful.

"We have to tackle low-value testing, not just for sustainability, but also appropriate care," says Dr. Manal Elnenaei, a professor in Dalhousie's Department of Pathology and head of the Division of Clinical Chemistry. "Unnecessary testing can lead to additional testing and doctor visits, invasive interventions and physical harm, not to mention a great deal of distress for the patient and their family."

The Department of Pathology is leading efforts to eliminate unnecessary testing in the Maritimes, while also playing a leadership role in Using Labs Wisely, launched in September 2022 as an offshoot of Choosing Wisely Canada, a national initiative to eliminate the overuse of medical tests and treatments. Dr. Elnenaei and Dr. Andrea Thoni, a general pathologist in the department, are involved in the clinical leadership of Using Labs Wisely, which now involves over 100 hospitals across Canada. The initiative's provincial stewardship committee, co-led by Ms. Jennifer LeFrense and Drs. Elnenaei and Thoni, helps to collaborate on utilization initiatives in labs across Nova Scotia.

In early 2022, Using Labs Wisely mounted a pilot project in 12 hospitals, including the QEII Health Sciences Centre, to see how best to limit the inappropriate use of several lab tests. The first test the QEII tackled under this program was fecal occult blood (FOB).

"Many physicians have been using fecal occult blood testing to screen for colon cancer, but it is not a good marker for colon cancer and in general has high false positive and negative rates, particularly for detecting lower-GI bleeding," Dr. Elnenaei explains. "Colon cancer screening should only be done via the Nova Scotia Colon Cancer Screening Program as they have a special system set up for that purpose."

> *"We have to tackle low-value testing, not just for sustainability, but also appropriate care."*

At Nova Scotia Health, recent efforts to restrict fecal occult blood testing to upper-GI investigations resulted in a 70 per cent reduction in the use of this low-value test, while mitigating some of the problems from false positive and false negative results.

The Department of Pathology has been making steady progress toward eliminating unnecessary testing since 2011, long before the emergence of Choosing Wisely, when now-department-head Dr. Irene Sadek was chair of the Lab Utilization Committee (LUC). The first initiative set minimum re-testing intervals for many tests, saving $500,000 by blocking premature repeat testing, after educating physicians about the rationale behind the new rules.

Re-structuring electrolyte panels in 2015 was the next big win for Nova Scotia Health. "We were generating hundreds of thousands of unnecessary reports for chloride and bicarbonate, which used to be tested routinely in a panel along with potassium and sodium, even though they have no impact on patient management," explains Dr. Elnenaei. "In the first year, we realized around $80,000 in reagent savings and total savings of around $700,000."

That same year, Dr. Elnenaei and LUC members worked with emergency physicians to restructure testing panels routinely ordered in emergency departments within Nova Scotia Health's Central Zone. This initiative reduced annual testing in emergency departments by 30 to 33 per cent.

As Dr. Elnenaei notes, the cost of reagents for lab tests varies enormously—from 13 cents to several dollars per test. Some are more costly, such as blood gas test reagents, which range from $5 to $10 per test. And then

there are quality controls and overhead costs (salaries, facilities, equipment, etc.) for locally conducted testing. When a test cannot be done locally and must be referred to another lab, costs can run into hundreds of dollars. "We developed a rigorous vetting process for refer-out tests in 2016," notes Dr. Elnenaei. "This process results in average savings of $180,000 each year. It also provides a window for lab physicians to advise on more appropriate testing, when necessary."

More recently, in 2021, the Division of Clinical Chemistry introduced an algorithm to eliminate unnecessary thyroid testing. Rather than testing thyroid stimulating hormone (TSH) and thyroid hormones FT3 and FT4 all at once, labs now test TSH levels only at first. According to the test result within the algorithm, FT4 and/or FT3 will be tested. This simple change has dramatically reduced superfluous testing, despite adding clinically required testing the physician may not have requested otherwise.

Members of Using Labs Wisely conduct regular national webinars to share data and identify which tests can safely and appropriately be limited. Early on they identified five quick wins—tests for folate, urea, PTT, CKMB and AST—and now they are looking for the next set of five tests to tackle.

"We're still in the early stages," says Dr. Elnenaei. "More and more, we are looking at how we can get this information into continuing professional development programs for family doctors and specialists across Canada, as their engagement is crucial. It's not always easy for physicians to change their behavior patterns, but we have to keep working at it. There are new, more effective tests coming along and we need to make way for them by eliminating older, less effective tests. This will ultimately lead to better care for our patients and a more streamlined and sustainable health-care system."

^ *Back row: Dr. Victor Martinez, Jayatee Ray (MSc), Meghan McLean (MSc), Olivia Walker (PhD), Mika Park (MSc), David Sapp (MSc), and Dr. Paola Marcato.*

Front row: Riley Arseneau (MSc), Mark Hanes (PhD), Yara Azizieh (MSc), and Morgan Pugh-Toole (MSc)

GRAD STUDENT Feature:

Pathology's **graduate program** prepares participants for **myriad careers**

^ *Dr. Wenda Greer*

THE DEPARTMENT OF PATHOLOGY'S graduate program has been flourishing since the early 1990s, when Dr. Wenda Greer spearheaded efforts to certify the program to train PhD students through Dalhousie's Faculty of Graduate Studies. Since then, the program has graduated dozens of masters and PhD students, who have gone on to pursue myriad careers in medicine, academia and industry.

"From the beginning, we were very successful at attracting high-quality students," says Dr. Greer, a geneticist and professor in the Department of Pathology and director of the DNA and molecular diagnostics laboratories at Nova Scotia Health. "The department was recruiting more basic scientists at the time, creating more need and providing more opportunities for PhD students. The program started growing and growing, from about two to more than 20 students a year."

The high calibre of students in the program is demonstrated by their high rates of external funding awards, notes Dr. Paola Marcato, an associate professor and the graduate program's director since 2020, when she took over from Dr. Karen Bedard (who took over from Dr. Greer in 2018).

"As many as 70 per cent of our graduate students hold external funding, which is an impressive rate of success," Dr. Marcato says. "They also have high publication rates and an amazing track record for winning prestigious awards, from such organizations as the Canadian Institutes of Health Research, the Killam Trusts and the Dalhousie Faculty of Medicine."

The Department of Pathology places a high value on its graduate students and is one of few grad programs in the Faculty of Medicine that consistently provides funding to grad students to attend conferences. The department also sponsors the ATOM award, which recognizes senior graduate students for exemplary mentoring of junior students, as well as the Dr. Wenda Greer Prize and the Top Publication Award to recognize excellent graduate student research contributions and publications.

"Graduate students are the hubs of the wheels of research," says Dr. Marcato. "Without them, we couldn't do our research. They are often the hands-on doers in the lab, and we view them as essential members of the team. They are not just our trainees, they are also our junior colleagues with their own academic interests and priorities that we foster and accommodate within the context of our research."

Recent PhD and MSc graduates from the program have gone on to diverse careers, in Halifax and much farther afield. For example, Dr. Ryan Holloway is now a clinical research associate at Pharmaceutical Product Development (PPD), a subsidiary of Thermo Fisher Scientific; Dr. Jordan Warford is senior director of research for Nova Scotia Health; Dr. Dejan Vidovic is a general surgery resident at Dalhousie; Dr. Krysta Coyle is a postdoctoral fellow at Simon Fraser University in B.C., and Dr. Derek Clements is a postdoc at Stanford University in California.

Dr. Meg Dahn received her PhD in pathology in 2020, after six years in the breast cancer research trenches, co-supervised by Dr. Paola Marcato and surgical oncologist Dr. Carman Giacomantonio. "I studied two mechanisms of tumour proliferation, with an eye to identifying potential targets for therapy," recalls Dr. Dahn. "It was challenging and fun. I loved the mentoring and teaching and bench work, as well as the energy, ideas and optimism of my fellow students."

Dr. Dahn went on to a year of postdoctoral studies with Dr. Giacomantonio, who encouraged her to consider medicine. She has now completed one year of undergraduate medical education and is keeping her career options open. "I have the skills and experience to be an independent researcher, and I want to experience all the different kinds—health services, epidemiology, clinical, knowledge translation," she says. "I'm considering a

"Graduate students contribute so much to the atmosphere of the department and they raise the calibre of our work."

Corey Filiaggi

residency in pathology, although I want to expose myself to as many specialties as possible before making my choice."

Corey Filiaggi took the MSc route through Pathology's graduate program, developing a zebrafish model of childhood acute myeloid leukemia with supervision from Dr. Graham Dellaire in the Department of Pathology and Dr. Jason Berman in the Division of Pediatric Hematology, before he relocated to the Children's Hospital of Eastern Ontario Research Institute. She is now a genetic counsellor at the IWK Health Centre.

"A friend in the graduate program mentioned genetic counselling to me and that really piqued my interest," says Ms. Filiaggi, who completed an MSc in pathology in 2017 and an MSc in genetic counselling in 2020. "I was very interested in genetics based on the research I was doing with the Pathology Department, which gave me a really nice foundation for the genetic counselling I am doing with families now."

Having a graduate program in the Department of Pathology is not just a win for the students, who are well-equipped to go on to a wide range of fulfilling careers, it is also a win for the department.

"Graduate students contribute so much to the atmosphere of the department and they raise the calibre of our work," says Dr. Greer. "It's not just that we can't do the research without them, it's what they bring with their curiosity and their questions. They keep everyone stimulated and motivated, raising the quality of both our scientific and our clinical work."

^ *Dr. Daniel Gaston, Dr. Jeanette Boudreau and Dr. Thomas Arnason*

RESEARCH Feature:

Collaboration is the key to **successful high-impact research**

COLLABORATION IS CENTRAL to the Department of Pathology's research enterprise, allowing department members to tackle larger research questions through team efforts that make the best use of each member's expertise.

"Pathology is an inherently collaborative department, as one of few that encompasses both clinical service and basic science research," says Dr. Graham Dellaire, cancer scientist, professor and director of research in the Department of Pathology. "We keep collaboration front and centre. Our research committee is even led by clinical and basic science co-chairs—we create the questions together and we work together to find the answers."

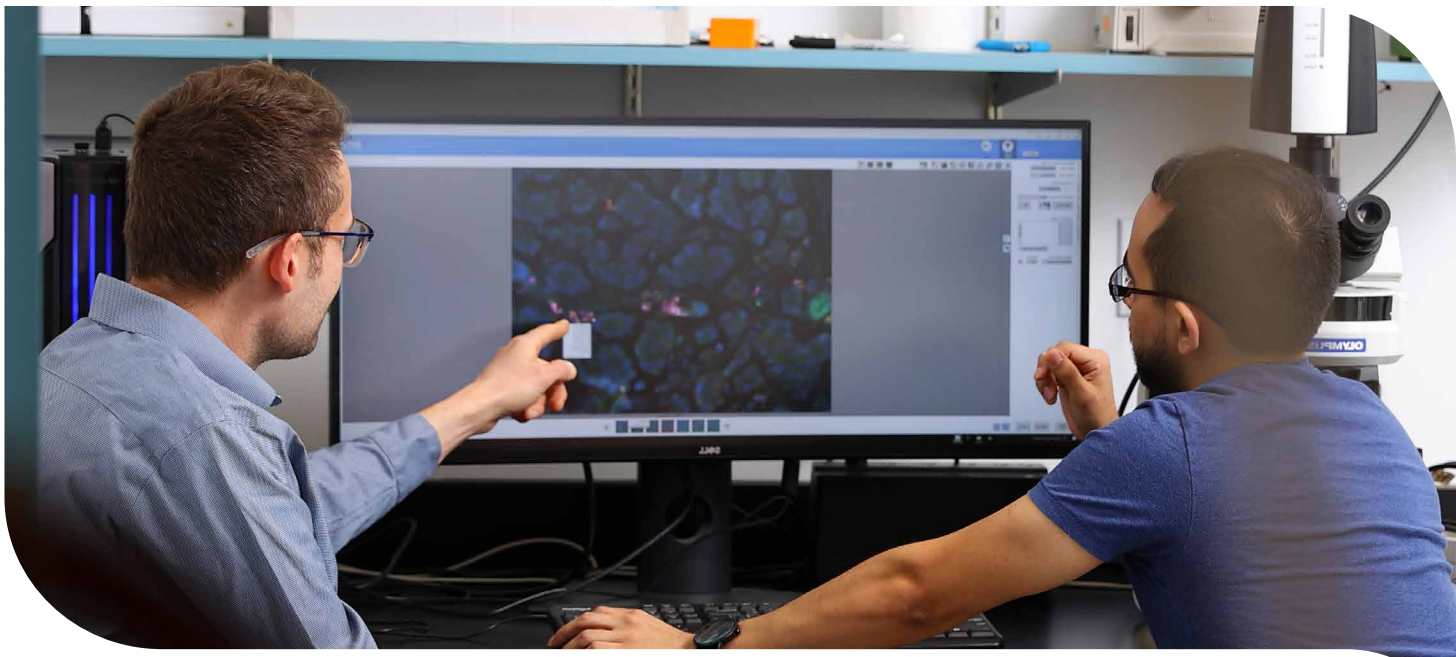
Basic scientists in the Department of Pathology collaborate with clinical pathologists and bioinformaticians within the department, and with clinicians and scientists in other departments—including surgeons, who provide resected patient tissues and clinical information for banking and analysis, as well as medical oncologists, hematologists and many others.

For example, Dr. Dellaire and Dr. Zhaolin Xu, a professor in the Department of Pathology and former director of the Dalhousie/Nova Scotia Health Biobank, are working with thoracic surgeon and scientist Dr. Alison Wallace to learn how radon- and arsenic-induced lung cancer differ from other forms of lung cancer. They aim to identify biomarkers that could be used for screening and/or targetted for therapy.

"The lung tumour bank and depth of expertise at Dalhousie was a big draw for me to come to Nova Scotia," notes Dr. Wallace, who joined Dalhousie from the University of Toronto in 2019. "It is unique in Canada and a tremendous resource for my research program."

The Dalhousie/Nova Scotia Health Biobank—created and maintained by the Department of Pathology—is a rich source of patient samples for research in many forms of cancer, including lung, breast, prostate, colorectal, ovarian, pancreatic and hematological cancers. As research director for the department, Dr. Dellaire is dedicated to facilitating the best possible use of these samples by providing guidance and making connections among colleagues who would work well together to use them in their research.

"Graham really helped me frame my research questions, find the right collaborators and refine my approach," says Dr. Amy Trottier, a QEII hematologist who is working with Dr. Dellaire and Dr. Jeanette Boudreau to uncover the genetic and environmental influences that lead to multiple myeloma and, ultimately, identify potential ways to screen for those at increased risk of the disease. "As a clinician, I don't have access to a lab or grad students, so having collaborators who can handle the bench work makes this research possible."



Riley Arseneau and Dr. Jeanette Boudreau

Dr. Jeanette Boudreau, an associate professor in the departments of Pathology and Microbiology & Immunology, is involved in many other research collaborations, with funding from such agencies as the Terry Fox Research Institute, Canadian Institutes of Health Research and the Irving Foundation, in the areas of pancreatic, colon and ovarian cancer. She works closely with many colleagues, including Dr. Tom Arnason, an anatomical pathologist and associate professor, and Dr. Dan Gaston, a bioinformatician and assistant professor, in her quest for effective cancer immunotherapies.

"I started collaborating with Tom on a large ovarian cancer project," recalls Dr. Boudreau. "As a clinical pathologist, he helped my grad students understand the disease they were seeing under the microscope, which is a rare opportunity for a grad student. He also helped us build, train and test a machine learning algorithm that allowed us to study immune cells in the tumour microenvironment in our effort to identify potential approaches to immunotherapy."

Dr. Arnason has also worked with Dr. Boudreau to develop methods of studying immune cells in pancreatic cancers, and to identify and validate a mouse model of pancreatic cancer, among key contributions to many other projects.

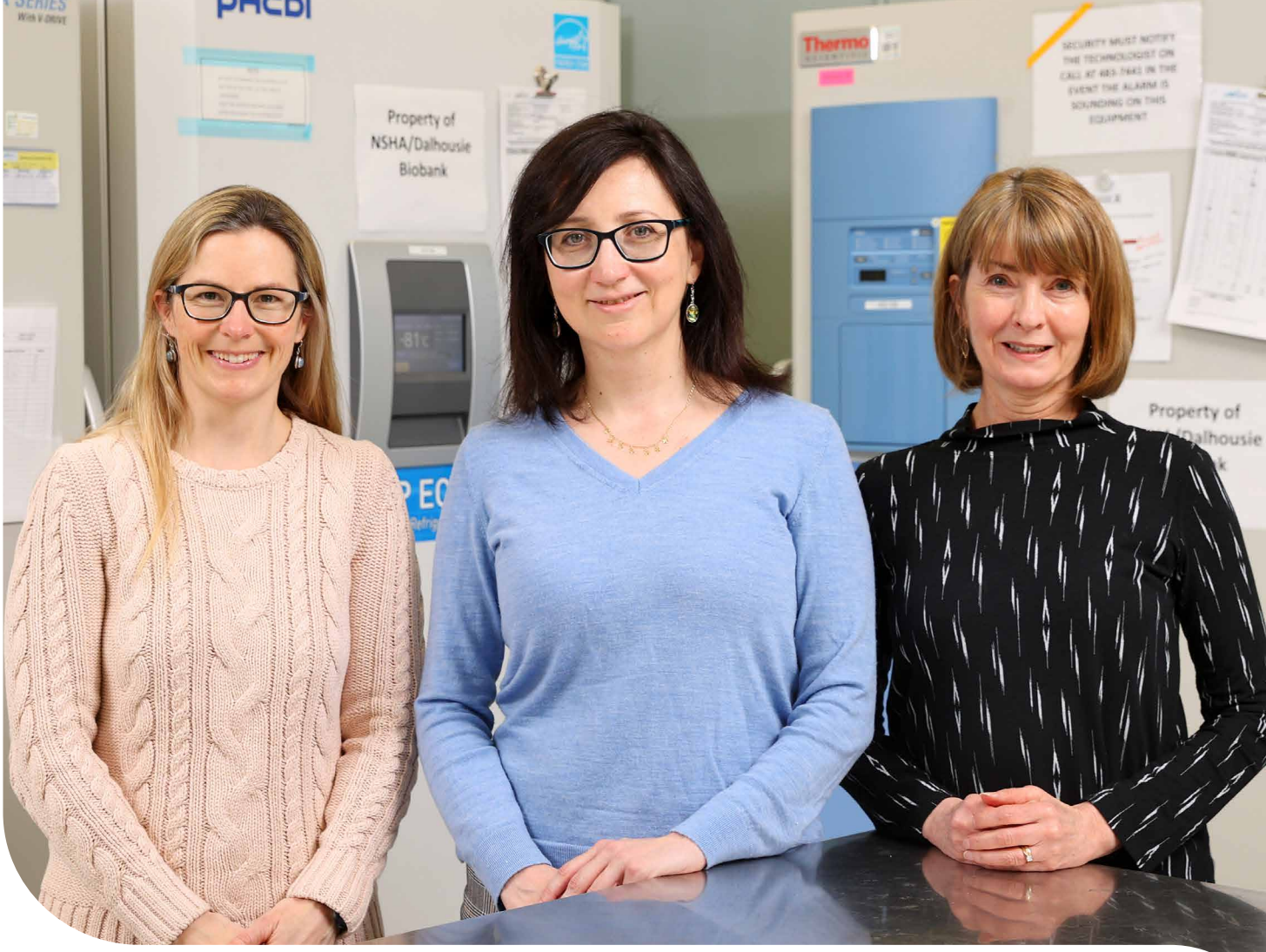
"Our collaboration just keeps growing," Dr. Arnason says. "It's a great opportunity for me to be involved in big research projects involving large numbers of patient samples, large teams and substantial funding. On my own, I am too busy with clinical work and teaching to lead big projects. But connecting with Jeanette, I can use my skillset to help out. My research career would be dwindling if I was on my own, but instead it is expanding."

As a bioinformatician, Dr. Dan Gaston collaborates with everyone in the department doing sequencing studies on patient samples and helps facilitate large-scale regional and national collaborations. "The raw data is incomprehensible," he explains. "We are sequencing tumours as well as healthy tissue, looking at 25,000 protein-coding genes, non-coding RNAs, and many other parameters. There could be millions to billions of nucleotides in a single sample."

With his combined biology and informatics expertise, Dr. Gaston is able to apply machine learning, deep learning, and other statistical tools to make sense of the data. He also works with colleagues like Dr. Dellaire and Dr. Paola Marcato to mentor graduate students in the bioinformatics skills they need to master.

Dr. Marcato, an associate professor in the Department of Pathology, relies on bioinformatics across the many large-scale breast cancer research projects she leads in such new frontiers as cancer stem cells and non-coding RNAs. Over the last two years she has been working ever more closely with two anatomical pathologists in the Department of Pathology, Dr. Penny Barnes, professor, and Dr. Gillian Bethune, associate professor.

"When a scientist like Paola wants to test an idea from her lab in patient samples, we know how to handle the tissues and pass them along, and we know how to examine and interpret the slides," notes Dr. Bethune, while Dr. Barnes adds, "We are also able to contribute anonymized patient data, such as biomarker status and staging information."



Dr. Gillian Bethune, Dr. Paola Marcato and Dr. Penny Barnes

Most recently, the three have been collaborating on Dr. Marcato's pioneering work to understand the role of non-coding RNAs in breast cancer. "These RNAs are almost completely unstudied, but we have found they play a role in regulating gene expression, which gets dysregulated in cancer," says Dr. Marcato. "Patients with higher levels have low t-cells in their tumours, which makes them harder to target with immunotherapy, but if we can find a way to knock the non-coding RNAs down, we can make tumours more susceptible to treatment." This collaborative research project was recently funded by the Breast Cancer Research Priority Funding Announcement in the most recent CIHR Project Grant.

For Dr. Marcato, access to clinical samples and expertise is essential, while for Dr. Barnes and Dr. Bethune, collaborating with a basic scientist opens exciting new doors.

"Working in collaboration makes the best use of my limited time for research," notes Dr. Bethune, "and allows me to work with a scientist who is thinking big and running larger projects with funding and graduate students to move the work forward."

There truly is strength in numbers, especially in a pursuit as challenging as medical research. "We are able to support and encourage each other through the inevitable setbacks and obstacles," says Dr. Marcato. "At the same time, we inspire each other with new perspectives and opportunities that keep us motivated and productive as we pursue our goals."

^ *Lizzy Baker, Stewart Langley, Christopher Liwski, and Dr. Thomas Arnason Foreground, Alex Eaton*

TRAINEE Feature:

Medical students flock to pathology with **ever-increasing levels of interest**

Dr. Thomas Arnason

INCREASING NUMBERS of medical students are pursuing an interest in pathology, through electives, Research in Medicine (RIM) projects and even by establishing a Pathology Interest Group through the Dalhousie Medical Students' Society.

"This is new to me, I've never noticed this degree of medical student interest in pathology before in my career," says Dr. Tom Arnason, an associate professor in the Department of Pathology who teaches extensively in Dalhousie's undergraduate medical education program. "We essentially now have a 'pipeline' of potential pathology residents filling up, with students from first year to fourth now very involved in pathology and actively interested in following this career path."

The heightened interest in pathology among medical students may be in part thanks to Dr. Arnason's teaching style—he has won the students' choice "Teacher of the Year" award four times in recent years. But he gives much of the credit to the hard work of his colleagues, who worked with him to upgrade the undergraduate pathology lectures and labs to improve the student experience and stimulate their interest in the field.

The advent of Dalhousie's Bachelor of Science in Medical Sciences Program is another driver of student interest. "We have a lot of department members teaching in that program now, in Pathology 3000, and in another undergraduate course, Pathology 2115 that is open to students in other undergraduate programs," notes Dr. Arnason. "The literature suggests that you have to capture students' interest early if you want to recruit them to your field, so an opportunity to reach them during their first degree, before they even choose to pursue medicine, is very helpful."

Second-year medical student Lizzy Baker has been considering a career in pathology since she stumbled upon an article about the various medical specialties at the age of 12. "I thought it would be neat to be the person making the diagnosis, the mystery-solver," she recalls.

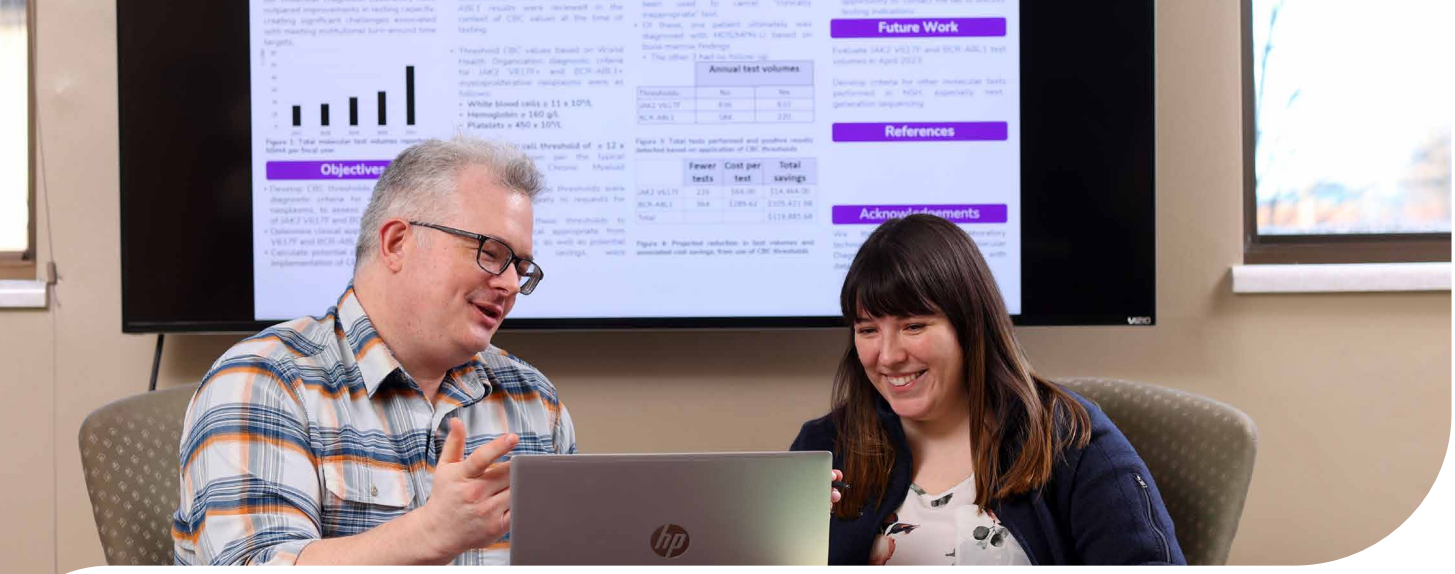
Lizzy Baker and Stewart Langley

"I've kept going with it ever since."

Ms. Baker pursued bachelor and master degrees in biochemistry and molecular biology at Mount Allison and Dahousie, respectively, learning the techniques of fixing, staining and examining samples under the microscope. She brought these skills with her into the MD program at Dalhousie, taking on a RIM project in breast cancer pathology with Dr. Gillian Bethune and Dr. Paola Marcato.

Now she and her second-year colleague, Stewart Langley, have established the Pathology Interest Group, to share their enthusiasm for pathology with their fellow Dalhousie medical students. The pair is planning to mount a case-study challenge, tours of the MacKenzie building pathology labs, and a lifestyle night where members of the Pathology Department share their insights about working in the field—as a start.

"The literature suggests that you have to capture students' interest early if you want to recruit them to your field."



Dr. David Conrad and Alex Eaton

"Helping other students find pathology is really rewarding," says Mr. Langley. "There is so much variety in the field, and it touches all the other disciplines, offering an understanding of the deeper causes of disease as well as the diagnostic process."

Third-year medical student Alex Eaton became interested in pathology through an undergraduate chemistry class with Dr. Michael Carter, an assistant professor in the Department of Pathology. She solidified her interest by shadowing another department member, assistant professor Dr. Erica Schollenberg. By the time she reached medical school, she was fully committed to pathology and asked associate professor Dr. David Conrad if he could supervise her RIM project.

"Dr. Conrad got me going on a quality-control project to evaluate if two molecular tests used to diagnose blood cancers were being used properly. I found that a lot of doctors were skipping the first step—a complete blood test—and therefore the BCR-ABL and JAK2 tests were often not even necessary. We made new rules and shared them with doctors, realizing savings of about $200,000 in the first year."

As he approaches the end of the MD program, fourth-year medical student Chris Liwski is looking forward to pursuing residency training in pathology. He has known since high school that he wanted an academic career and volunteered in the lab of Dr. Alan Fine, a professor in the Department of Physiology & Biophysics and School of Biomedical Engineering, before going on to do an honours degree in Microbiology & Immunology with Dr. Jean Marshall. Here he became fascinated with studying lung pathology in respiratory syncytial virus (RSV) infections, with help from Dr. Mathieu Castonguay in the Department of Pathology.

Once in medical school, Mr. Liwski completed several electives in pathology as well as a research project evaluating the utility of in situ hybridization (ISH) testing in metastatic breast cancer, becoming increasingly sure of his path in pathology as he went along. "I'm attracted to the broadness of the field and the complex and challenging role of the pathologist," he says. "It's crucial to be both thorough and precise in evaluating the patient's history and pathology results, to make the definitive diagnosis that will dictate how the patient is managed."

The timing is good for a wave of medical student interest in pathology. "It's a shorthanded specialty so there are lots of job opportunities," Dr. Arnason says. "Especially with the advance of precision medicine, our workload in pathology is increasing as more genetic tests and targeted therapies come along. A lot of science students are becoming more interested in this dynamic field."

Christopher Liwski

DALHOUSIE UNIVERSITY

Department of Pathology
DIVISIONAL REPORTS

CLINICAL WORKLOAD

10,639,977 NS HEALTH TESTS

840,243 NS HEALTH BLOOD COLLECTIONS

39,503 NS HEALTH TISSUE COLLECTION

Anatomical Pathology

Clinical advances

The Division of Anatomical Pathology's major focus in 2022 was staying on top of the surge of surgical pathology specimens and consultations flowing in as COVID restrictions eased off, while expanding molecular and biomarker testing in oncologic surgical pathology. This included increasing reflex biomarker analysis of upper tract urological and GI cancers, introducing PD-L1 testing for multiple cancer sites and in-house Her2/new FISH testing for upper GI cancers, and expanding the gene panel for next-generation sequencing (NGS).

The division replaced outdated immuno-stainer and voice-dictation systems and purchased a high-throughput Leica slide scanner with funds from the Department of Pathology. In collaboration with IT and the Provincial Perioperative Team, division members advanced the use of electronic synoptic reporting in colon cancer, a major step forward for cancer care in the province.

Education improvements

The division streamlined its AP elective experience, assigning a dedicated daily "teaching pathologist" for medical students, off-service residents and Competency By Design pathology residents, while updating and improving learner assessment processes. Under the skilled leadership of Dr. Sylvia Pasternak, the division continued its successful dermatopathology fellowship program. Dr. Penny Barnes continued to coordinate the popular annual CAP-ACP Resident Review Course, which is now available online.

Research accomplishments

The Terry Fox Foundation awarded $700,000 to the Nova Scotia Health/Dalhousie Biobank over four years, as well as $3.5 million to the Atlantic Canada Biobank Consortium. The Canadian Institutes of Health Research awarded priority funding of $100,000 to Dr. Penny Barnes, Dr. Gillian Bethune and basic-science colleague, Dr. Paola Marcato, to explore new frontiers in cancer research. Dr. Zhaolin Xu obtained a new NGS sequencer to support his lung cancer research.

Division members published a number of notable papers, including an analysis of resource reduction that appeared in the *Canadian Journal of Pathology*, a study of the etiology of combined Merkel cell carcinoma published in *Modern Pathology*, recommendations for reporting cardiac neoplasms released in *Virchows Archiv*, and a report of metastases patterns in combined Merkel cell carcinomas published in *Human Pathology*.

Other highlights

Under the leadership of Dr. Laurette Geldenhuys, the division achieved a number of milestones in its wellness and green health care initiatives. The Cytopathology Green Labs Teams' "Green Labs Certification" project reduced special waste in the Cytology Lab by a massive 75 per cent, while reducing energy consumption by the Cytology Lab's incubator by 70 per cent. The team also accelerated the installation of LED lights in the MacKenzie Building so that 80 per cent of the lighting is now LED. The division continued to incorporate equity, diversity and inclusion, wellness, and green health-care initiatives into its strategic plan and day-to-day activities.

Awards

- Dalhousie medical students voted **Dr. Tom Arnason** Professor of the Year in 2022, making him an unprecedented four-time winner of this coveted award.
- The Canadian Association of Pathology awarded the 2021 CAP-ACP Leadership in Education Award to **Dr. Penny Barnes**.

Clinical Chemistry

Clinical advances

In 2022, Clinical Chemistry completed a request for proposal to replace equipment in core laboratories across Nova Scotia. Successful completion of this project will provide standardized testing platforms and reporting as well as efficiencies across core laboratories (highest-volume testing) in Nova Scotia. Clinical Chemistry demonstrated these benefits on a smaller scale by harmonizing platforms for blood-gas testing across the province and restructuring the testing panels with a novel requisition form.

Reporting has also been updated to align with current lipid guidelines. This included introducing a novel National Institutes of Health-recommended LDL equation that outperforms the classic Friedewald equation and will save on unnecessary direct LDL testing.

Also in terms of savings, the division embarked on a number of laboratory stewardship projects. It also implemented new utilization rules to regulate NT-ProBNP and Fecal Occult Blood testing, accompanied by detailed educational memos to ensure stakeholder engagement and buy-in.

Education improvements

Clinical Chemistry continued its longstanding contribution to training residents in both clinical (Internal Medicine and Endocrinology) and lab medicine (Anatomical Pathology, Hematopathology and General Pathology). Division members were also instrumental in bringing an electronic platform to the in-house examination of general and anatomical pathology residents.

Clinical Chemistry collaborated with Internal Medicine to introduce innovative cross-disciplinary teaching. The aim was to expose internal medicine residents to the core concepts and underpinnings of the lab tests they so rely on and promote the new entry pathway to the Medical Biochemistry Fellowship.

The division's Biochemical Investigations of Clinical Disease (BIOC4813) cross-listed graduate course (PATH 5013) ran again in the fall of 2022, with a full complement of students returning to its pre-COVID in-classroom format. Division members also resumed tutoring first-year medical students (Metabolism I).

More medical students than ever spent time in the division in 2022. It hosted seven medical students, many on fourth-year electives, while others took part in the new first- and second-year longitudinal lab medicine elective. Division members were very excited to be part of this new teaching venture and rare opportunity to teach doctors-to-be about the intricacies of lab tests.

Research accomplishments

Clinical Chemistry members co-led projects through the Marathon of Hope Atlantic Cancer Consortium, specifically in the realm of multiple myeloma (MM) research. They are working in partnership with Dr. Anthony Reiman at Horizon Health in New Brunswick on this multi-year project. They aim to utilize MM biobank specimens as "gold cohort" samples and generate valuable whole-genome and transcriptome sequencing that will attract collaborations with academic counterparts and students at Dalhousie.

The division published five peer-reviewed manuscripts in high-impact journals in 2022. One, a review article exploring the added clinical value of reflective testing, gained widespread interest. Other publications included collaborations with basic science colleagues and members of the CSCC (Canadian Society of Clinical Chemists).

Fundamental Research

Education achievements

In 2022, there were 22 graduate students enrolled in the Department of Pathology graduate program. Two of these students successfully completed their thesis defences for graduation from the program.

Nearly three-quarters of the graduate students in the department held a stipend award in 2022. This relatively high percentage of awards indicates that graduate students in the department are highly competitive for awards, which in turn speaks to the quality of the graduate program itself.

Research accomplishments

In 2022, grant capture for the fundamental scientist group in the Department of Pathology was $2,581,567. Investigators in this group were successful in their applications to the Canada Foundation for Innovation, Dalhousie Medical Research Foundation and Research Nova Scotia.

Together, the fundamental scientists and their trainees and collaborators published 47 peer-reviewed journal articles in 2022. Highlights include:

In Dr. Jeanette Boudreau's lab, PhD candidate Lauren Westhaver described a previously-unknown mechanism for immune regulation in *Cell Reports*. Graduate student Megan Pugh-Toole published a paper about the role of Natural Killer Cells in treating high-grade serous ovarian cancer in *Current Treatment Options in Oncology*.

From Dr. Paola Marcato's lab, PhD graduate Dr. Megan Dahn was first author of a collaborative publication about metabolite profiling that was published in *Metabolomics*.

Dr. Gregory Fairn and his team were involved in several high-impact publications, including papers about phagocytosis in macrophages in the *Journal of Cell Biology*, lipidation of the spike protein in human coronaviruses in the *Journal of Lipid Research*, and aspects of lipid metabolism in *Nature Cell Biology*.

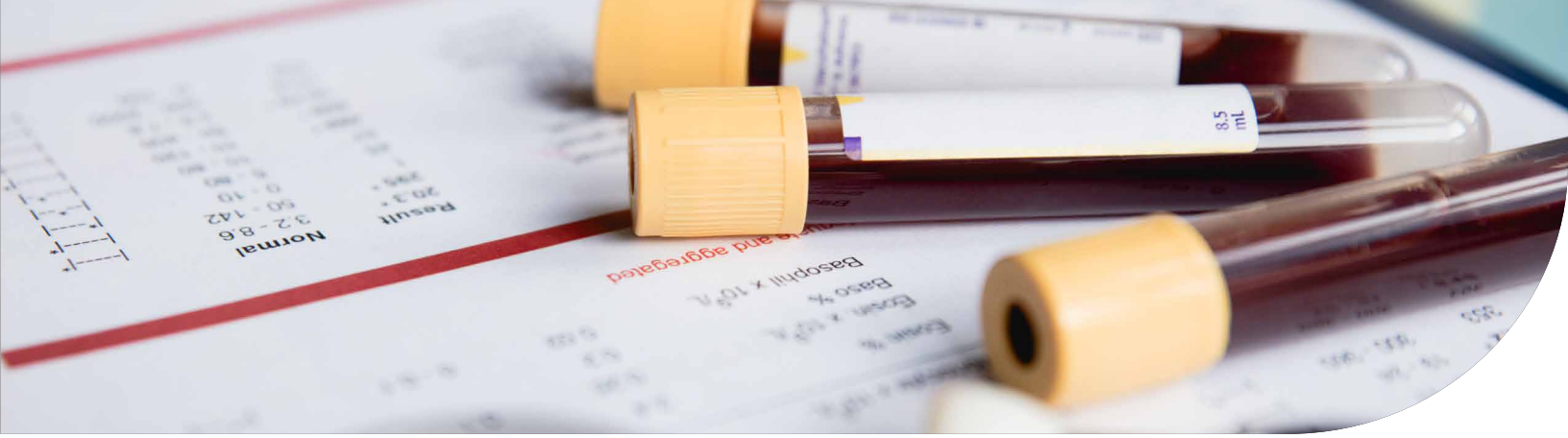
Dr. Shashi Gujar and his trainees and collaborators published numerous papers, including observations regarding immune response to virus exposure in *Frontiers in Immunology*, enhancement of reovirus oncolysis in *Molecular Therapy*, and novel antitumour CD8 T cell reactivities in *Molecular & Cellular Proteomics*.

Other Highlights

Scientists in the Department of Pathology played instrumental roles in securing a $6.5 million CFI-funded infrastructure project involving Dalhousie University and the University of Calgary. This includes construction of the new HistoCORE immunohistology facility, set to open in late 2023. HistoCORE will serve the entire Faculty of Medicine as well as Nova Scotia Health, the IWK, and broader Atlantic region. This new core facility will be essential for Atlantic Canada Cancer Consortium Terry Fox Marathon of Hope cancer research, as well as lung cancer research funded by a $5.1 million Canadian Cancer Society Breakthrough Grant.

Awards

- **Dr. Shashi Gujar** was appointed executive director of Cancer Immunotherapy, Innovation and Global Partnerships in Dalhousie University's Faculty of Medicine.
- **Dr. Gregory Fairn** was officially awarded a Tier 1 Canada Research Chair in the Multiomics of Lipids and Innate Immunity.
- Graduate students **R.P. Arun**, **S. Mathavarjah** and **M.C. Wasson** were awarded Cancer Research Training Program awards from the Beatrice Hunter Cancer Research Institute.



Hematopathology

Clinical advances

This past year, the Division of Hematopathology focused on improving the efficiency of diagnostic services. Some highlights of this effort include the installation and validation of new analysers and equipment in the blood transfusion, flow cytometry and HLA (human leukocyte antigen) laboratories. These instruments will improve the efficiency, throughput, and quality of testing, while decreasing overall turnaround time.

Hematopathology also implemented a new triaging process for molecular tests, including JAK2 and BCR-ABL gene mutations used in the diagnosis of hematological malignancies. This initiative led to a significant reduction in unnecessary testing, improving efficiency and decreasing costs.

Education improvements

On the education front, faculty, residents and technical staff continued to work hard on improving and enhancing the hematopathology residency training program. Two residents completed their training early in 2023. In collaboration with the Dalhousie University postgraduate office, the division developed a new hematopathology fellowship training program for candidates who have previously completed residency training in either general or anatomical pathology. Finally, the division accepted a fellow into its HLA director training program, which is approved by the American Society for Histocompatibility and Immunogenetics.

Research/quality improvement achievements

With regard to quality improvement, the division successfully developed and validated a novel flow cytometry-based red cell phenotyping method. This will improve throughput and decrease the cost of red blood cell phenotyping, while facilitating donor matching for patients in need of blood transfusion. Dr. Jason Quinn (medical director of Blood Transfusion Services) and Dr. Rob Liwski (medical director, HLA Laboratory) provided guidance and oversight to this important initiative. The HLA Laboratory also developed a novel “adsorption with crossmatch cells and elution” (AXE) protocol to improve HLA antibody identification and interpretation, thus improving pre-transplant immunological risk assessment for patients in need of solid organ or stem cell transplantation.

Awards

» **Dr. Robert Liwski** received the 2022 Dalhousie Dalhousie Medical Alumni Association Alumnus of the Year award for his clinical services focusing on improving care for organ and stem cell transplant patients.

Microbiology

Clinical advances

The Division of Microbiology performed 1,057,692 tests in 2022. Respiratory viruses continued to dominate the headlines and while volumes were less than they were at the peak of the pandemic, COVID NAAT testing remained the highest-volume test.

The division continued its work to streamline testing, with a focus on automating testing in bacteriology. The transition to liquid-based swabs allowed the division to further maximize the Copan total laboratory automation platform, which will improve turnaround times and allow re-deployment of precious human resources.

In 2022, the division performed all of the serologic and molecular testing for the tissue bank and organ donor transplant programs in Nova Scotia. It is the only site in Atlantic Canada that provides Health Canada-approved molecular testing for tissue and organ donations.

Emerging infections continue to threaten the health of Nova Scotians. Staff in the division identified a significant rise in Anaplasma and the first locally acquired cases of Babesia, both emerging pathogens transmitted by the same ticks that transmit Lyme disease. Microbiology staff continued to develop and implement new diagnostic methods to detect emerging pathogens.

Education improvements

Microbiology continued to play a significant role in educating medical students and residents. After 30 years as coordinator of the Microbiology 1100 course, Dr. David Haldane passed the torch to Dr. Glenn Patriquin. Over the past two years, Dr. Ian Davis has worked with colleagues on the Royal College Specialty Committee to prepare for the transition to Competency By Design in the medical microbiology residency program in 2024. Dr. Davis also co-chaired the exam committee with Royal College International in collaboration with Kuwait, and coordinated the exam committee to develop and administer the certification exam for medical microbiology in Kuwait.

Research accomplishments

Division members collaborated with fundamental scientists and clinicians at Dalhousie and across Canada. In 2022, they published 26 peer-reviewed manuscripts and presented 15 abstracts. A number of the projects were related to emerging pathogens. Members also made plans to repeat a seroprevalence survey and case reviews for several vector-borne diseases, including Lyme and Anaplasmosis.

Awards

- **Drs. Ian Davis**, **Todd Hatchette**, **Jason LeBlanc** and **Glenn Patriquin**, along with **Charles Heinstein**, received the Queen Elizabeth II Platinum Jubilee Medal for their work during the COVID-19 pandemic.
- **Dr. Todd Hatchette** and **Charles Heinstein** received the Premier's Award of Excellence 2022 for their work on the COVID-19 testing strategy team and border management response.
- **Drs. Todd Hatchette**, **Ian Davis** and **Glenn Patriquin** received the 2022 External Team Award of Excellence (member of the COVID Network) from the Dalhousie Department of Anesthesia, Pain Management and Perioperative Medicine.
- **Dr. Ross Davidson** was named 2022 Professor of the Year by the Dalhousie Medical School Class of 2025.

CLINICAL WORKLOAD

2,241,572
IWK TESTS

253,276
IWK BLOOD COLLECTIONS

IWK Pathology & Laboratory Medicine

Clinical advances

The IWK's Maritime Prenatal Screening service introduced higher-throughput tools for maternal serum screening. The team also added new functions to these instruments, allowing them to study and run the first preeclampsia-specific tests in the Maritimes and more accurately identify these higher-risk pregnancies.

The Maritime Newborn Screening service linked its specialized screening software to the electronic medical record, allowing the program to track, interpret and communicate the results of screening it conducts for more than 20 diseases in over 10,000 newborns every year.

COVID and other respiratory pathogens continued to drive a high volume of testing at the IWK. Prior to the pandemic, Microbiology Division staff handled an average of 3,000 tests per year. In 2022, the division processed and reported on more than 15,000 respiratory tests.

The Hematopathology Division installed new equipment that allows it to irradiate blood components on an as-needed basis, drastically reducing the undesirable side effects of irradiation and optimizing blood inventory management. The team also installed new, much-faster blood bank analyzers with true STAT capability. A new disposition reporting system for the blood bank reduced reporting time to Canadian Blood Services by 75 per cent.

The Clinical Genomics team created a whole-exome sequencing pipeline as part of the Genomics Applications Partnership Program. Drs. Karen Bedard, Jo-Ann Brock, Sarah Dyack and Anthony Vandersteen are collaborating on this work, which reduces the need to send patient samples to labs outside the region as they can now be conducted locally.

Education improvements

The IWK Chemistry Division pursued formal leadership education for its technical specialists (MLTIIs). By investing in these team leads, the division aimed to provide them with tools to build stronger teams, combat burnout and thrive. The division further refined its pediatric laboratory medicine rotation for general pathology residents.

The Microbiology Division completed a training needs assessment for its Biosafety and Biosecurity program, as well as a gap analysis of its current staff-training and competency-maintenance requirements, in preparation for Accreditation Canada's 2023 site visit.

Five medical laboratory students from Nova Scotia Community College completed their third-year clinical training in the IWK Hematopathology labs. The IWK is pleased to support the education of new technologists and hopes to attract new trainees.

Research achievements

The Chemistry Division continued its work in antenatal serology testing for COVID-19, to determine the presence of these antibodies in the pregnant population. Its evaluation of earlier cohorts in this study was published in the *Canadian Medical Association Journal Open*.

Dr. David Conrad in the Hematopathology Division received $10,000 to study complement activation in cardiopulmonary bypass with Dr. David Horne in Cardiac Surgery. This will shed light on the development of inflammation in patients on bypass.

Drs. Victor Martinez and Karen Bedard led an investigation of the clinical use of novel DNA-sequencing techniques (long reads) to analyze complex regions of the genome. They aim for the IWK to become the first clinical site in Canada to implement this technology. They and their team are also involved in "All for One," a Genome Canada-led initiative to establish a framework for sharing genetic data across Canada. On a different note, Dr. Martinez is co-principal investigator of a project exploring environmental effects on cancer incidence in Nova Scotia, through the Atlantic Cancer Consortium—Marathon of Hope Cancer Centres Network.

The Clinical Genomics team led a validation study to see if Spinal Muscular Atrophy should be added to the Maritime Newborn Screening panel.

Other highlights

The Chemistry Division took the lead in the IWK's participation in Using Labs Wisely, an offshoot of Choosing Wisely Canada. Clinical biochemist Dr. Lori Beach presented and published on the topic of using labs wisely during resource shortages, and was a panelist at the Canadian Diagnostic Executive Forum 2022.

The Microbiology Division finalized preparations for the first onsite Public Health Agency of Canada inspection of its licensed Containment Level 2 lab on November 17. The inspectors found the lab's overall standing to be exemplary, with only a few minor improvements to address. This stellar result is a reflection of the hard work and dedication of the team over the past six years.

Hematopathologist Dr. David Conrad launched the "Cellfie Project" in May 2022, providing young leukemia patients and their parents the opportunity to visit the lab to see and learn about their diagnosis and the effects of therapy. *Doctors Nova Scotia* Magazine featured Dr. Conrad on the cover of its October 2022 issue—he is the first pathologist to be featured in this publication.

Awards

- **Dr. Lori Beach** and her colleagues in the Canadian Society of Clinical Chemistry (CSCC) Point-of-Care Testing Interest Group received the 2022 CSCC Award for Innovation in Laboratory Medicine. This award is presented to a clinical laboratory (or group) in Canada that has distinguished itself through innovation in the field of clinical chemistry, pathology or laboratory medicine.
- **Erin Bryant-Adams**, clinical genetic technologist and clinical coordinator for the Michener Institute's Genetics Technology Program, received the Excellence in Teaching Award from the Michener Institute, which recognizes outstanding preceptorship in clinical placement experiences for genetics technology students.

New Brunswick

Clinical advances

The pathology laboratory at the Saint John Regional Hospital (SJRH) functions as a service provider to patients in southwestern New Brunswick, performing more than four million tests a year. The lab is staffed by more than 125 lab technologists and lab assistants, 10 pathologists, two hematopathologists, a molecular pathologist, a clinical chemist and two medical microbiologists.

Building on the integration that helped centralize testing for COVID during the pandemic, this year the lab began to focus on developing systems that communicate better with lab information systems in other labs across New Brunswick. This marked the beginning of a multi-year project and will help uncover inefficiencies and reduce redundancies to make health-care dollars go further.

The lab at SJRH is also the site for many provincial programs including testing for enteric pathogens, the tuberculosis lab, and the provincial toxicology lab. It also provides forensic autopsy coverage for the entire province of New Brunswick.

Education improvements

SJRH serves as a training site for undergraduate medical students at Dalhousie Medicine New Brunswick, as well as a community-based training site for residents in anatomical pathology. This year, SJRH also started accepting hematopathology residents as trainees in a community-based rotation.

CLINICAL WORKLOAD

4,000,000
NB TESTS

104,876
NB BLOOD COLLECTIONS

Other highlights

This year saw an expansion of the molecular pathology service at the SJRH, with the introduction of a wider solid tumour testing panel. The lab is now able to detect a far wider variety of genetic abnormalities, making targeted therapy available to a wider variety of patients.

In collaboration with diagnostic imaging and thoracic surgery, the SJRH pathology lab has also played a key role in becoming Canada's first site to perform fluoroscopic navigational bronchoscopy procedures, using the Illumisite platform. This will increase the diagnostic yield of biopsies obtained from lung tumours, reducing the need for repeat biopsies and reducing complications associated with these invasive procedures.

OUR FACULTY

Dr. Mohamed Abouelhassan
Dr. Behram Cenk Acar
Dr. Tom Arnason
Dr. Helena Arts
Dr. Penelope Barnes
Dr. Lori Beach
Dr. Karen Bedard
Dr. Gillian Bethune
Dr. Jo-Ann Brock
Dr. Martin Bullock
Dr. Hakan Buyukdere
Dr. Michael Carter
Dr. Mathieu Castonguay
Dr. Yu Chen
Dr. Cal Cheng
Dr. David Conrad
Dr. Sidney Croul
Dr. Lisandra Cubero Herrera
Dr. Kelly Dakin Hache
Dr. Ross Davidson
Dr. Ian Davis
Dr. Ryan DeCoste
Dr. Jennifer Duncan
Dr. Alexander Easton
Dr. Graham dellaire
Dr. Greg Fairn
Dr. Mojgan Ebrahimi
Dr. Sameh El Bailey
Dr. Manal Elnenaei
Dr. Robert Fraser
Dr. Daniel Gaston
Dr. Laurette Geldenhuys
Dr. Tanya Gillan
Dr. Marek Godlewski
Dr. Anna Greenshields
Dr. Jennette Gruchy
Dr. David Haldane
Dr. Karen Harrison
Dr. Todd Hatchette
Dr. Mohammad Hossain Dr. Thomas Issekutz Dr. Jason LeBlanc
Dr. Zaiping Liu
Dr. Robert Liwski
Dr. Amy Lou
Dr. Thai Ly
Dr. Timothy Mailman
Dr. Samina Mansoor
Dr. Victor Martinez
Dr. Kathryn McFadden
Dr. Craig Midgen
Dr. Phillip Moss
Dr. Paola Marcato
Dr. Joanne Murphy
Dr. Shawn Murray
Dr. Ather Naseemuddin
Dr. Bassam Nassar
Dr. Jennifer O'Neill Merrimen
Dr. Tish O'Reilly
Dr. Ken Obenson
Dr. Saul Offman
Dr. Sylvia Pasternak
Dr. Glenn Patriquin
Dr. Jason Quinn
Dr. Mahboubeh Rahmani
Dr. Tarek Rahmeh
Dr. Lakshmi Rajappannair
Dr. Irene Sadek
Dr. Heidi Sapp
Dr. Erica Schollenberg
Dr. Sorin Selegean
Dr. Allam Shawwa
Dr. Jennifer Shea
Dr. Ashley Stueck
Dr. Andrea Thoni
Dr. Imran Umar
Dr. Cheng Wang
Dr. Ian Wanless
Dr. Shasi Gujar
Dr. David Waisman
Dr. Dietrich Werner
Dr. Marnie Wood
Dr. Zhaolin Xu
Dr. Robert Boutiler
Dr. Yu Chen
Dr. Tsetan Dolkar
Dr. Alison Edgecombe
Dr. David Edwards
Dr. Ron Francis
Dr. Doha Itani
Dr. Jonaki Manna
Dr. Derek Minney
Dr. Erik Mont
Dr. Sergei Pozdnyahov
Dr. Muhammed Rasul
Dr. Pouya Sadeghi
Dr. Sundip Shah
Dr. Thomas Shi
Dr. Jaime Snowdon
Dr. Navarro Spartico
Dr. Ismatin Swati
Dr. Meghana Toal
Dr. Wenda Greer
Dr. David Hoskin
Dr. Patrick Lee
Dr. Noreen Walsh
Dr. Jeanette Boudreau

OUR RESIDENTS AND FELLOWS

Dr. Carley Bekkers
Dr. Angela Cheng
Dr. Alexandre Corriveau
Dr. Alexandra (Ola) Kajetanowicz
Dr. John Loggie
Dr. Allison Maybank
Dr. Laura McDonell
Dr. Rumana Rafiq
Dr. Sean Rasmussen
Dr. Priyanka Ravi
Dr. Valerie Taylor (finished June 2022)
Dr. Paul Zamiara (finished June 2022)
Dr. Ibrahim Elsharawi
Dr. Ashlyn Fong
Dr. Yuanyuan Gu
Dr. Eniko Hollo
Dr. Mahtab Khudadad
Dr. Magdalene (Maggie) Maung
Dr. Alexander Rudiuk
Dr. Nafisa Shandi
Dr. Richard Wood
Dr. Manal Al Aufi (finished June 2021/ fellow during 2022)
Dr. Tessa Boyer
Dr. Amarilis Figueiredo
Dr. Maci-Arielle Ricketts
Dr. Ian Sarty
Dr. Richard Xiang (finished June 2022)
Dr. Ziyad Allehebi
Dr. Farhan Khan
Dr. Elizabeth Simms
Dr. Yahya Shabi
Dr. Mohammed AlQahtan

OUR GRADUATE STUDENTS

Hannah Cahill
Zara Forbrigger
Elias Habib
Kateryna Kratzer
Vishnu Kumar
Meghan McLean
Morgan Pugh-Toole
Frey Verth
Riley Arseneau
(Sieun) Mika Park
Jayatee Ray
David Sapp
Hanan Aljamei
Mike Giacomantonio
Mark Hanes
Namit Holay
Edwin Leong
Leah MacLean
Saby Mathavarajah
Lauren Westhaver
Olivia Walker
Marie Claire Wasson

OUR ACADEMIC STAFF

Kimberlea Clarke
Julie Griffith
Kelly Leights
Michelle Sampson
Victor Martins Madeira

Patricia Colp
Dr. Gopal Pathak
Dr. Alamelu Bharadwaj
Dr. Jayme Salsman
Dr. Pei-Lin Chen

Dr. Rashmi Shah
Joyce Chew
Cheryl Dean
Emma Kempster
Erica Allen

Angelita Alcos
Dr. Jenny Liu
Dr. Haggag Zein

OUR POST DOCTORAL FELLOWS

Dr. Raj Pranap Arun
Dr. Dharmapal Burn.
Dr. Jaganathan Venkatesh

Dr. Charneal Dixon
Dr. Wasundara Fernando

Dr. Mahlegha Ghavami
Dr. Seketoulie Keretsu

Dr. Samir Mehndiratta
Dr. Michael Salsaa

ANNUAL DEPARTMENT AWARD WINNERS

2020-2021 DAVID T. JANIGAN TEACHING AWARD:
Dr. Erica Schollenberg
Dr. Ashley Stueck

2021-2022 DAVID T. JANIGAN TEACHING AWARD:
Dr. Jeanette Boudreau
Dr. Manal Elnenaei

WENDA GREER PRIZE FOR RESEARCH EXCELLENCE:
Dr. Meg Dahn

PATH FORWARD COLLABORATION AWARD:
Dr. Alexi Surette

BEST PAPER CLINICAL RESEARCH:
Dr. Glenn Patriquin

BEST PAPER FUNDAMENTAL RESEARCH:
Dejan Vidovic

DR. TOM ARNASON UNDERGRADUATE PRIZE:
Carley Bekkers

RESEARCH DAY WINNERS

BEST TALK BY A PATHOLOGY GRADUATE STUDENT:
Marie Claire Wasson
(Saby Mathavarajah, runner up)

BEST TALK BY A PATHOLOGY RESIDENT:
Dr. Farhan Khan
(Dr. Sean Rasmussen, runner up)

BEST TALK BY AN EXTERNAL PARTICIPANT:
Sarah Nersesian
(Jordan Lukacs, runner up)

BEST DIGITAL POSTER BY A PATHOLOGY GRADUATE STUDENT:
Mike Giacomantonio
(Meghan MacLean, runner up)

BEST DIGITAL POSTER BY A PATHOLOGY RESIDENT:
Richard Wood
(Dr. Sean Rasmussen, runner up)

BEST DIGITAL POSTER BY AN EXTERNAL PARTICIPANT:
Rhea Nickerson
(Christopher Liwski, runner up)

BEST DIGITAL POSTER JUDGES CHOICE:
Meghan McLean

GRADUATE STUDENT AWARD FOR TEACHING, OUTREACH AND MENTORING WINNER:
Dr. Wasundara Fernando

RESIDENT TEACHING AWARD WINNERS:
Drs. Laura McDonell (AP) and Yahya Shabi (MM)

GUPTA TRAVEL AWARD WINNERS:
Drs. Sean Rasmussen (AP) and Alexandre Corriveau

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