



Canadian
microbiology
proficiency
testing

ANNUAL REPORT **April 2021 to March 2022**

Innovation • Education • Quality • Assessment • Continual Improvement



THE UNIVERSITY OF BRITISH COLUMBIA

Canadian Microbiology Proficiency Testing Program (CMPT)
— Established 1982 —

ISO 9001:2015 Certified (SAI Global), Initial Registration 2002



CERT-0102326

ISO/IEC 17043:2010 Accredited (A2LA), Initial Registration 2015



Certificate no. 3749.01

Department of Pathology and Laboratory Medicine
The University of British Columbia
Room G408, 2211 Wesbrook Mall
Vancouver, British Columbia Canada V6T 2B5

Telephone: 604-827-1754

Facsimile: 604-827-1338

E-mail: cmpt.path@ubc.ca

www.cmpt.ca

TABLE OF CONTENTS

CMPT QUALITY POLICY AND MISSION STATEMENT.....	3
CMPT STAFF.....	3
CHAIR'S REPORT	3
CMPT MISSION, VISION, VALUES	3
ORGANIZATIONAL PERFORMANCE AND HEALTH	4
ADMINISTRATION AND OPERATIONS	6
FINANCIAL HEALTH.....	7
CMPT's QUALITY MANAGEMENT SYSTEM	7
STRATEGIC GOALS AND OBJECTIVES	10
SWOT ANALYSIS FOR CMPT (2020 – 2025)	12
COMMITTEE MEMBERS	13
EQA PROGRAMS RESULTS FOR 2021-22	14
CLINICAL BACTERIOLOGY PROGRAM	15
CLOSTRIDIUM DIFFICILE PROGRAM	16
WATER MICROBIOLOGY PROGRAM	16
MYCOLOGY PROGRAM	22
ENTERIC PARASITOLOGY PROGRAM.....	24
TRICHOMONAS VAGINALIS ANTIGEN PROGRAM	25
SHIGA TOXIN PROGRAM.....	25
SCREENING and MOLECULAR PROGRAM	26
ACID FAST BACILLI PROGRAM	28
ENTERIC PANEL PROGRAM	28
VIROLOGY PROGRAM.....	29
TRAINING PROGRAMS ON EQA	31
EDUCATION PROGRAMS	31
ACKNOWLEDGEMENTS	32

I. CMPT QUALITY POLICY AND MISSION STATEMENT

Innovation, Education, Quality Assessment, Continual Improvement

- ☐ We, at CMPT, are a university based, peer directed program, that provides Innovative External Quality Assessment for microbiology laboratories.
- ☐ By providing our customers with our best products and services, we help them to ensure they are providing their best for public and patient health and safety.
- ☐ Our vision is to be recognized provincially, nationally, and internationally as a valued contributor of EQA innovation, education, and as passionate advocates for continued quality improvement in EQA for the benefit of healthcare, our participants, and our programs.
- ☐ CMPT is committed to our employees by recognizing their importance to the operation and in maintaining our positive relationships with all our volunteers, customers and stakeholders.
- ☐ CMPT is committed to its Quality Management System, and regular review for continual improvement of its effectiveness.
- ☐ CMPT is committed to regulatory requirements of ISO 9001:2015 and ISO/IEC17043:2010.
- ☐ The CMPT Quality Policy is the framework for the regular establishment and review of quality objectives.
- ☐ CMPT is committed to regular review of its Quality Policy to ensure its suitability to the program.

II. CMPT STAFF

Michael A. Noble, MD, FRCPC,Chair and Managing Director (until March 2022)
Lucy A. Perrone MSPH, PhDChair and Managing Director (as of March 2022)
Esther Kwok, BSc, RT, CLQMCoordinator
Caleb Lee, MHA, BMLSc, CLQMSenior Technologist
Veronica Restelli, MScWeb Manager and Editor
Shadi Alami MSc.....Technologist
Mahfuza Sreya, BMLScTechnologist
Denise Hilker, B.A.Sc.Administrative Assistant
Selvarani Vimalanathan, PhD.....Research and Development Lead, Virology
Samantha Treagus, PhD.....Technologist

III. CHAIR'S REPORT

I. CMPT MISSION, VISION, VALUES

Our Vision

Our vision is to be recognized provincially, nationally, and internationally as a valued contributor of EQA innovation, education, and as passionate advocates for continued quality improvement in EQA for the benefit of healthcare, our participants, and our programs.

Our Mission

We, at CMPT, are a university based, peer directed program, that provides Innovative External Quality Assessment for microbiology laboratories.

By providing our customers with our best products and services, we help them to ensure they are providing their best for public and patient health and safety.

Our Values

Our values define us as an organization and continue to influence our goals toward achieving our vision. Our values are:

- Innovation
- Education
- Quality Assessment
- Continual Improvement

Each year, we have the opportunity to review our mission and vision statements. They have been stable and unchanged for many years, but they continue to be both operative and relevant to what we do and to orient us in our goal setting.

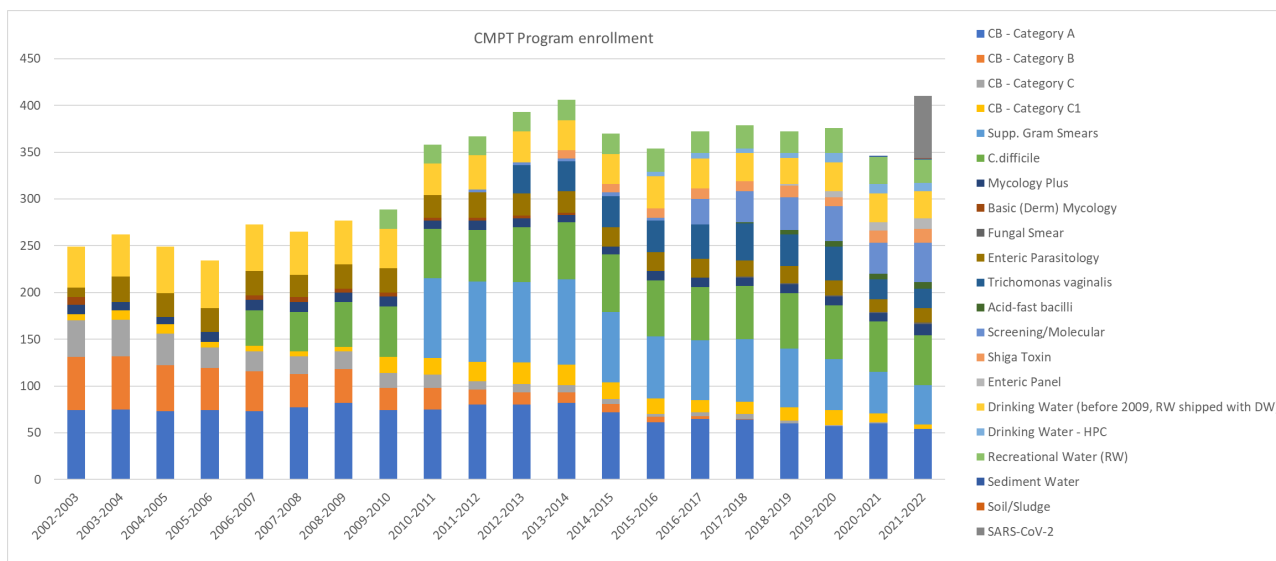
II. ORGANIZATIONAL PERFORMANCE AND HEALTH

First created in 1982, UBC's Clinical Microbiology Proficiency Testing (now Canadian Microbiology Proficiency Testing) program has stayed rooted in the UBC academic environment, and now has enjoyed over 40 years in operation, all the while consistently practicing its values of Innovation, Education, Quality Assessment and Continual Improvement. For 40 years, CMPT has been custom formulating clinically relevant proficiency testing challenges for clinical laboratories, and pivoting to meet their needs when their methods change.

As we all know, in early in 2020, CMPT (as the rest of the world), ourselves, and our client laboratory partners, endured a year of worry and stress because of the SARS CoV2 virus pandemic (COVID-19). Before an effective vaccine came online, many of us were isolated, living in fear and watching the news closely. During this nearly two-year period, many university laboratories were ordered closed and most UBC staff worked remotely for nearly two years. However, CMPT was appropriately deemed as an essential service and we were allowed to remain open and provide our services. I wish to thank the CMPT staff for their dedication and bravery to continue to come to work and serve our customers. Their passion for their work and value of patient care is unmatched. I also wish to thank our departmental leadership and the university administration who supported our requests to stay open and support the many laboratories that we serve.

Now onto business.

In March 2022, shortly after I took over Dr. Noble as the chair, I asked Esther for a summary of our programs over the last 20 years. I was struck by immensity and complexity of the following data set:



Impressive isn't it?

Importantly to note, that this graph doesn't capture the number of PT challenges sent per year, per program, and truly does not capture the body of work the CMPT produces every year. It is an immense achievement in 2022 to be a small, boutique international PT operation, handmaking clinically simulated samples using a vast array of microorganisms and sample types, maintaining international accreditation, and maintaining its high-quality educational programming in EQA. Since taking on my role from Dr. Noble in March, I am awed by the people who make this program run - without you, CMPT would have been crushed by the weight of larger competitors long ago.

This brings me to my mission and vision as the new chair. CMPT sits at the precipice of new opportunities and potential growth, vast growth. The changing diagnostic landscape in clinical laboratory practice, mixed with the possibility of greater expansion of community-based point of care testing, will necessitate that CMPT adapt and change. Across Canada, provincial governments are revising policies around testing and consolidation of lab services, which is likely to continue to be a trend. This contraction of our customer base, if not heeded, will seriously jeopardize our financial ability to function. CMPT's ability to attract international customers is also limited by the nature of our programs. Unlike the disciplines of hematology or chemistry, it is not ideal, nor do I think it is good practice, to send lyophilized or otherwise contrived challenges to labs. As such, the viability of our samples is limited and so expanding these programs to a larger international customer base will be difficult without new innovation in our sample stability. We get no shortage of requests from international customers and there may be renewed opportunities there. I welcome your ideas and input on this matter as we continue to explore possibilities in this area.

I envision that CMPT's new frontiers will be in the areas of public health and safety in addition to keeping our roots in supporting clinical care. As a biobank, CMPT is well positioned to make a variety of challenges, for a variety of customers, and I think we should grow in these directions. To this vision, in June 2022, I have instructed the CMPT team to begin research and development on cannabis microbiology testing, and have made strategic moves to expand our virology portfolio - expanding on our work with COVID to now also include other respiratory viruses. You will no doubt hear more about this in the next annual report. Again, I welcome your input and suggestions on this strategy and specific targets.

All of this growth will require change and I have asked a lot of the CMPT team already. Some changes you will hear about in the next report will include staffing and space expansion and new collaborations.

III. ADMINISTRATION AND OPERATIONS

a. CMPT Staff

i. Employees

As the chair and managing director of CMPT, I am thankful for our staff and the way in which they all pulled together to help us maintain our quality of service through the pandemic. This is not by accident, but because of our collective commitment to our program and our mission. I thank Esther Kwok, our coordinator, Caleb Lee, our senior technologist, Veronica Restelli, our web manager, editor, and safety officer. This year we have added Mahfuza Sreya as staff technologist and more recently starting in April-Denise Hilker, Dr. Selvarani Vimalanathan, and Dr. Samantha Treagus.

I would also like to thank the administrative assistance of the staff of the Department of Pathology and Laboratory Medicine.

ii. CMPT Technical Committees

CMPT is grateful for all the support we receive from our committee members and Chairs. Without the committee members, it would be impossible for us to maintain our challenge selection process, our assessment system, and the high quality of our critiques and newsletter. As always, CMPT recognizes the valuable role that our committee members contribute. We receive the benefit of their time, knowledge, and expertise. All is appreciated.

We have active committees for our Clinical Bacteriology, Mycology, and Enteric Parasitology programs, and receive assistance with our Water Program chair. Our new committee for Virology formed in September 2022.

All members in all committees are actively involved in programmatic review and critique development. My appreciation goes out to all of them. Our committee renewal process will continue on a more regular basis, keeping in mind the importance of maintaining the right balance between experience and fresh ideas.

b. Operations Update: space, equipment, supplies, safety

CMPT is provided sufficient laboratory space within the Department of Pathology and Laboratory Medicine. The department provides resources and personnel to support our finance, human resources, and administrative needs. We appreciate the support we receive from Genevieve MacMillan, Department Director and Dr. Dr. Zu-hua, Gao, Department Head.

CMPT has formalized its safety processes and participates in the Department of Pathology and Laboratory Medicine Safety Committee. Veronica Restelli serves as our CMPT Safety Officer, and through that capacity she ensures that we are up to date in our requirements, performs our monthly internal safety monitoring, and keeps us apprised of any potential concerns.

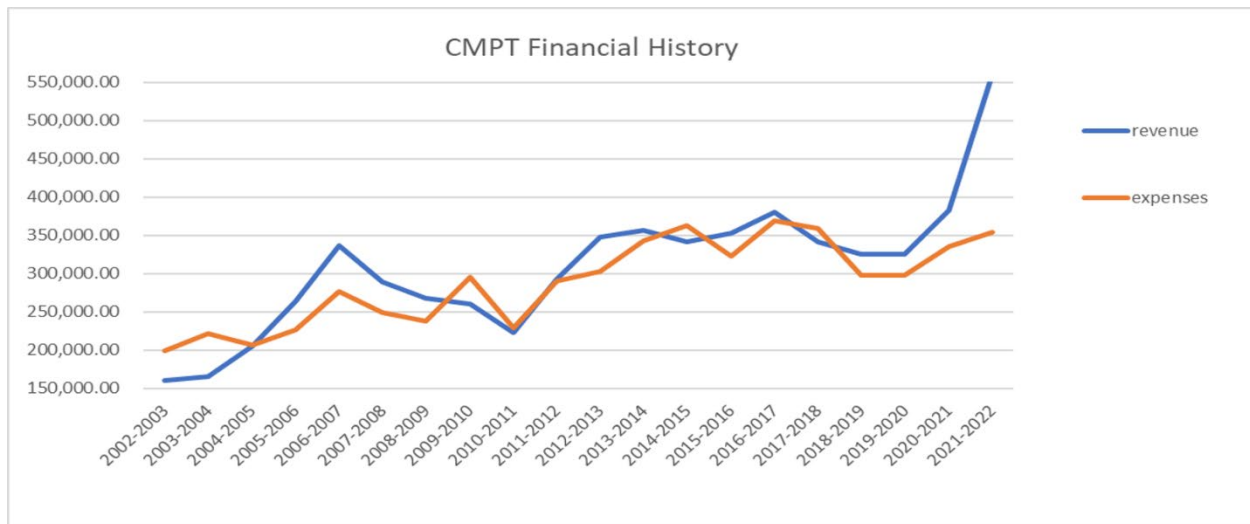
c. International Collaboration

CMPT views the landscape of EQA, both national and international as an opportunity for collaboration for the betterment of healthcare and patient safety. Dr. Perrone has recently joined the Canadian ISO 15189 mirror committee and is a member of EQALM. Dr. Perrone will be attending the EQALM Symposium in Greece in October 2022, where she will be presenting CMPT's COVID program data.

IV. FINANCIAL HEALTH

CMPT relies on the revenues generated through program registration for cost recovery. Over the past several years, many Canadian provinces have undergone laboratory restructuring and consolidation, which has had an impact on some of the CMPT programs. We have found additional revenue streams, including active research and development to develop new and novel materials for our own programs and also through collaborating with other EQA programs and providing them with consultation assistance and, in some cases, samples.

In January 2021, with the support of the BC Centre for Disease Control, we developed a new scheme to monitor performance of COVID-19 Rapid Detection Testing. This single program allowed CMPT to generate a significant revenue during the 2021-2022 year. CMPT is now in a good position to implement new programs to increase its scope, which will ensure a revenue stream that would allow CMPT to continue to be sustainable in the coming years to support our growing staff, and to enhance our research and development programs.



V. CMPT's QUALITY MANAGEMENT SYSTEM

a. Assessments

i. Internal Audits

Internal audits were completed by CMPT staff in February 2022. These audits are done to ensure our compliance with international standards, with one done consistent with ISO 9001 and the other consistent with ISO 17043. The internal audits identified some minor issues that required addressing which were successfully completed on time prior to our two external audits.

ii. External Assessment and ISO Accreditation.

CMPT's conformance to ISO 9001 was audited by SAI Global in March 2022 and we were recertified. Our Quality System was in compliance with no omissions, errors, or misalignments. This is a huge achievement for the CMPT team who works to maintain our QMS every day of the year. Our next ISO 9001 audit will be on March 2023.

In May 2022, we were assessed for compliance with the international standard ISO/ IEC 17043:2010 (Conformity assessment - General requirements for proficiency testing) by the American Association for

Laboratory Accreditation (A2LA). A2LA cited no major concerns during their audit or report. Minor concerns were noted, but all have subsequently been addressed, and CMPT's accreditation certificate for 2022 was issued. Our next 17043 audit will be in early 2023 and CMPT will have two new programs to be reviewed (Virology programs and Cannabis microbiology).

Over the years, we have found immense value in our decision to seek formal recognition by international certification and accreditation bodies. In addition to the recognition by our peers in the international quality assurance community, it has become a principal factor for national and international laboratories seeking providers for external quality services. Most importantly, CMPT has refined the skills of Quality Management, planning and development of customer services and satisfaction. As the national community of laboratories has consolidated, we have remained financially stable and secure and found the path towards continued innovation and development.

iii. Laboratory Safety

We complete monthly Safety audits which are performed and recorded using an on-line survey. There was also an annual external safety audit performed within our university department. We continue to meet all UBC and national requirements for safety.

iv. OFI Review for 2021-2022

CMPT continues to operate as a boutique proficiency testing production house, formulating simulated clinical specimens, making each sample by hand. As such, some human error is expected.

During this 12-month interval, 28 OFIs were recorded, 20 of which were Action Errors (AE). Of the remaining improvements 3 were Internal Errors that were corrected early, 2 were New Documents Required, and 3 were recorded as customer complaint. This was up slightly from the previous year (25 OFIs recorded). The full list of OFIs is maintained at CMPT.

A review of the Action Errors indicated they were mainly the result of human errors from information unawareness, inaction, or overwork. This is understandable considering that CMPT has been going through considerable new staffing and burdensome workloads, which remains an ongoing challenge. New personnel, with some inexperience, may have been asked to get involved in work perhaps a little sooner than they were ready.

The two new documents OFIs were result of the Internal Audit. The three OFIs recorded as complaints were addressed immediately. One has been an ongoing issue with low florescence of an organism in the water microbiology program, CMPT has done extensive investigation on this issue and has looked for ways of solving it; the second complaint was from a lab that received empty vials; a third complaint was about a test not performing as expected. A small number of POCT laboratories testing for SARS-CoV2 were using instruments that detected RNaseP as internal control. As our negative samples initially contained just buffer, the instrument would flag them as indeterminate. An additional hurdle was the very small volume of sample these instruments were using. CMPT worked with those laboratories and in collaboration with the BCCDC to produce a negative sample that would perform as expected in those instruments.

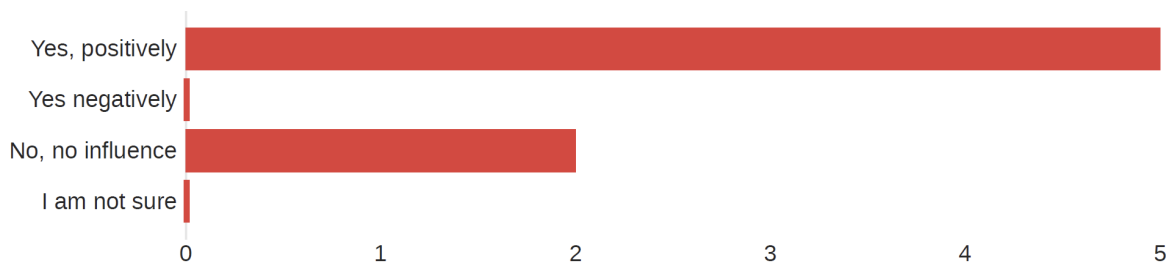
In summary, while CMPT experienced some challenges, with the implementation of some operational adaptation, we were able to adjust with minimum disruption and maintain our competency and quality as a provider of EQA services. CMPT will continue to undergo process improvement initiatives into 2023 (staffing, space, documents and records, communication) that effectively address any challenges to maintaining uninterrupted high-quality service.

b. Review of Quality Indicators

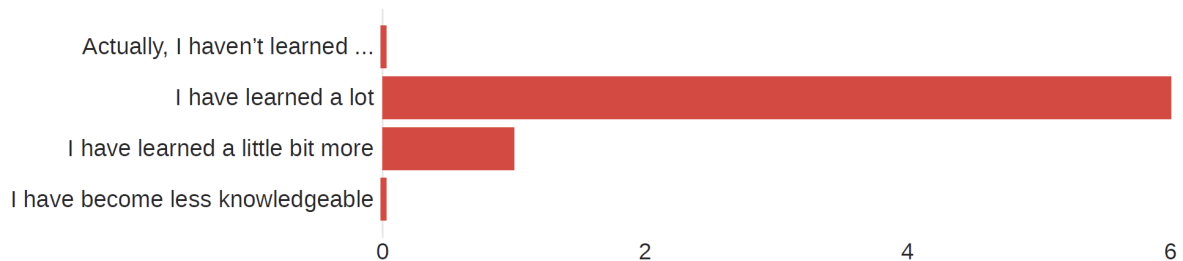
i. Member Satisfaction Survey

This year, CMPT looked at the satisfaction of our Expert Committee members; we wanted to know if in exchange for committing their time and expertise to help CMPT excel as a PT provider, they were growing in their understanding of the EQA process and thus, benefiting their laboratories.

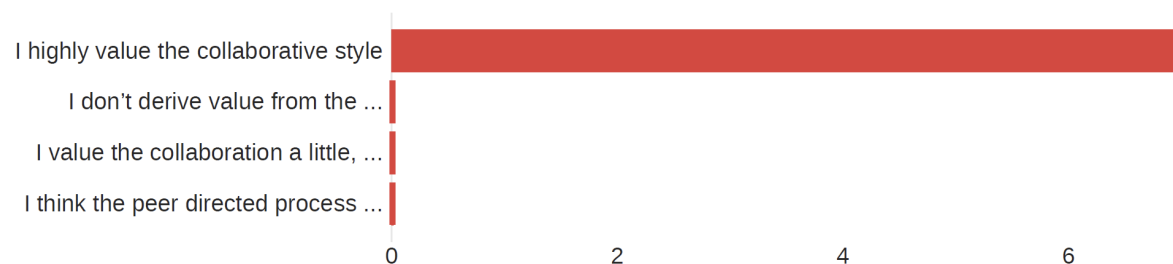
Q1 - In your opinion, has your involvement as a CMPT committee member influenced how quality is monitored and managed in your laboratory?



Q2 - How has your knowledge about quality management and the EQA process changed since your involvement as a CMPT committee member?



Q3 - What value does the peer to peer collaboration nature of the CMPT technical committees hold for you?



On balance, we interpreted the survey as strongly positive, but noted that some committee members may not be receiving the advantages of a fully diverse group as some technical committees are smaller than others. The most common comment we received was how important it was for them to work with peers from across the country. We will look into improving the experience of participating in the CMPT expert committees for the smaller programs.

ii. Customer Satisfaction

Each year, CMPT combines the information from the surveys with other factors (contracts, complaints, consultations) to evaluate its Customer Satisfaction.

In 2021-2022, we had no new contracts nor lost any contracts. We had three complaints (see OFI review section). This year's satisfaction survey consulted our expert committee members on their experience and benefits gained by participating (see below).

iii. Fully ungraded samples

We consider fully ungraded challenges a quality indicator as they reflect quality issues in the manufacturing of the sample challenges. There were no fully ungraded challenges for the 2021-2022 period. Paper and Video Challenges are not included in this analysis.

Year	Fully Ungraded samples
2000-2001	0
2001-2002	3
2002-2003	3
2003-2004	3
2004-2005	3
2005-2006	3
2006-2007	4
2007-2008	3
2008-2009	1
2010-2011	0

Year	Fully Ungraded samples
2012-2013	3
2013-2014	0
2014-2015	0
2015-2016	0
2016-2017	0
2017-2018	0
2018-2019	0
2019-2020	0
2020-2021	0
2021-2022	0

iv. Appeals Resolution

CMPT provides samples with the intent they can be graded to indicate test performance competency. If participants considered the grading unfair, they have both a right and obligation to appeal.

In 2021-2022, we had three appeals for re-evaluation. Two appeals pertained to antimicrobial susceptibility reports. The committee considered the requests, but maintained its position. A third appeal questioned the processing expectations for a specific sample. The committee considered the request, and determined its validity as not enough details were included in the history. The grade was changed from unacceptable to ungraded.

VI. STRATEGIC GOALS AND OBJECTIVES

As part of our Quality Management System, CMPT sets its goals and objectives for the upcoming year, as well as reviews its success with the previous goals. By recording and declaring our goals and objectives, we ensure our commitment to follow-through.

i. Goals and Objectives 2021 - 2022

Q21-1	<i>Develop Action Plans associated with the new SWOT analysis</i>	Completed
Q21-2	Develop new collaborative activities with European EQA	Partial
Q21-3	Complete R&D phase on Food Microbiology	Replaced with COVID, Virology and Cannabis
P21-1	Move forward to complete chair succession	Completed
P21-2	Develop a Food Microbiology Customer base	Replaced with COVID, Virology and Cannabis
P21-3	Develop new opportunities for collaborations especially with BC agencies.	Active
P21-4	Continue with Certification (ISO9001:2015)	Active
P21-5	Continue with Accreditation (ISO IEC17043:2010)	Active

ii. Goals and Objectives 2022 - 2023

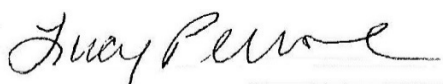
Q22-1	Continue Action Plans associated with the new SWOT analysis	Active
Q22-2	Develop new collaborative activities with International EQA	Active
Q22-3	Focus on Viral and other EQA programs	Active
P221	Maintain and Grow- COVID, virology and other EQA programs	Active
P22-2	Continue to grow opportunities for collaborations especially with BC agencies.	Active
P22-3	Continue with Certification (ISO9001:2015)	Active
P22-4	Continue with Accreditation (ISO IEC17043:2010)	Active
P22-5	Improve internal CMPT processes, including documents and records	Active
P22-6	Support employees of our programs with continuing education opportunities	Active
P22-7	Increase national and international visibility of CMPT programs	Active

VII. SWOT ANALYSIS FOR CMPT (2020 – 2025)

Strengths	<p>Strong Support within the Department of Pathology and Laboratory Medicine UBC</p> <p>Strong, Effective, Capable, Professional Staff</p> <p>Strong support by customers as seen by satisfaction surveys and Composite Satisfaction Score</p> <p>Strong commitment to Innovation, Education, Quality Assessment, Continual Improvement.</p> <p>Strong network of collaboration partners</p> <p>Certification (ISO 9001:2015) and Accreditation (ISO IEC 17043:2010)</p> <p>Strong technical capacity, microorganism library 400 pure cultures. This could support PT for other public health and safety related testing labs such as food and agriculture, cosmetics, cannabis, etc.</p>
Weaknesses	<p>Tendency to allow team to become overworked, increasing the opportunities for error</p> <p>Insufficient engagement and collaborations with other programs within the department and UBC. Insufficient engagement with laboratory medicine residents and with BMLSc</p> <p>Strong on practical R&D but not taking advantage of platform for academic research</p> <p>Funding is based on provision of service and requires regular renewals. If a client decides that they either cannot or choose to not renew a contract, then CMPT could have financial difficulties.</p>
Opportunities	<p>Expanding network of EQA collaboration partners</p> <p>Expansion into other laboratory testing arenas (Food, Virology, and others)</p> <p>New opportunities with new CMPT leadership by 2022</p> <p>Link CMPT into opportunities for Capstone projects.</p> <p>Continue to seek EQA programs wanting EQA Training</p>
Threats	<p>Senior staff are nearing retirement and there is a need for succession planning to prevent loss of institutional knowledge.</p> <p>Consistent threat of continued clinical laboratory mergers and reduced customer base.</p>

With change comes excitement mixed with dash of stress and anxiety. My goal is to guide CMPT through these changes and grow the organization in ways that build operational resilience, values and respects our people's intelligence, creativity and their personal lives, and continues to innovate to meet the needs of testing labs for better patient care and public health. The peer-directed, collaborative operating principles which guide CMPT will continue to be the bedrock on which we will grow and I think the future looks bright for CMPT.

With deepest gratitude to the CMPT staff, volunteers, partners and collaborators,



Lucy A Perrone, MSPH, PhD

Chair, CMPT

September 2022

IV. COMMITTEE MEMBERS 2021-2022

Committee members volunteer their time and are essential for selecting challenges, assessing results, and producing the critiques. The efforts contributed by each committee member are critical to the function of CMPT and are very much appreciated.

Water Microbiology Program

Chris Enick, BScElement, Surrey, BC

Mycology Program

Robert Rennie, PhD FCCM, D(ABMM)University of Alberta Hospital, Edmonton, AB

Romina Reyes, MD FRCPCLifeLabs, Burnaby, BC

Brad Jansen BSc, MLT.....Provincial Laboratory for Public Health, Edmonton, AB

Tanis Dingle PhD FCCM,D(ABMM) Provincial Laboratory for Public Health, Calgary, AB

Enteric Parasitology Program

Romina Reyes, MD FRCPCLifeLabs, Surrey, BC

Joan Tomblin, MD FRCPCSurrey Memorial Hospital, Surrey, BC

Pauline Tomlin, ART, BSc. MPH..... Provincial Laboratory for Public Health, Edmonton, AB

Quantine Wong, BSc. MLT..... BCCDC, Vancouver, BC

Catherine Hogan MDCMBCCDC, Vancouver, BC

Clinical Bacteriology Program

Ghada Al-Rawahi, MD FRCPC D(ABMM) BC Children's and Women's Hospital, Vancouver, BC

Wilson Chan, MD FRCPC D(ABMM).....Alberta Precision Laboratories, Calgary, AB

David J. M. Haldane, MD FRCPCQueen Elizabeth II Health Sciences Centre, Halifax, NS

James A. Karlowsky, PhD D(ABMM)..... St. Boniface General Hospital, Winnipeg, MB

Brandi Keller, MLTPrairie North Health Region, SK

Doris Poole, MLT, BSc.....Queen Elizabeth Hospital, Charlottetown, PEI

Robert Rennie, PhD FCCM, D(ABMM)University of Alberta Hospital, Edmonton, AB

Denise Sitter, ARTCadham Provincial Laboratory, Winnipeg, MB

Katrina Hurley , MLT..... Battlefords Union Hospital, North Battleford, SK

Janet Reid, BMLSc, ARTHorizon Health Network, NB

Virology Program

Nancy Matic, MD, FRCPC, D(ABMM).....St. Paul's Hospital, Vancouver, BC

Agatha Jassem PhD, (D)ABMM, FCCM.....BCCDC Vancouver, BC

David Goldfarb MD FRCPC.....PHSA, BC Children's & Women's Hospitals, Vancouver, BC

V. EQA PROGRAMS RESULTS FOR 2021-22

EQA supporting clinical laboratories is the core activity of CMPT. The changing landscape of medical laboratories in terms of size, number, and activity has stimulated us to be ever vigilant for opportunities in EQA innovation, to which we have responded with increased variety of samples and programs. We continue to extend research and development for new assays with the view to improve products and extend the variety of clinically relevant challenges in addition to our current programs: Clinical Bacteriology, Mycology and Enteric Parasitology, Molecular Screening for Enteric pathogens and multi-resistant organisms, *Clostridium difficile* toxin, *Trichomonas vaginalis* and Shiga toxin detection, SARS CoV-2, as well as detection of acid-fast bacilli.

CMPT also has a proficiency testing program for water testing laboratories which provides samples for 50 laboratories across Canada. Samples are provided for laboratories that work with Membrane Filtration, Presence-Absence, Enzyme Substrate, and Most Probable Water methods. We also provide samples for another Canadian PT program focused on water testing laboratories.

With this in mind, and with plans to expand our portfolio to include other programs such as cannabis microbiology, CMPT changed its name in August 2022 to the Canadian Microbiology Proficiency Testing which represents this breadth of scope.

A summary of our programs for 2021-22 is detailed below.



Interpreting the histograms

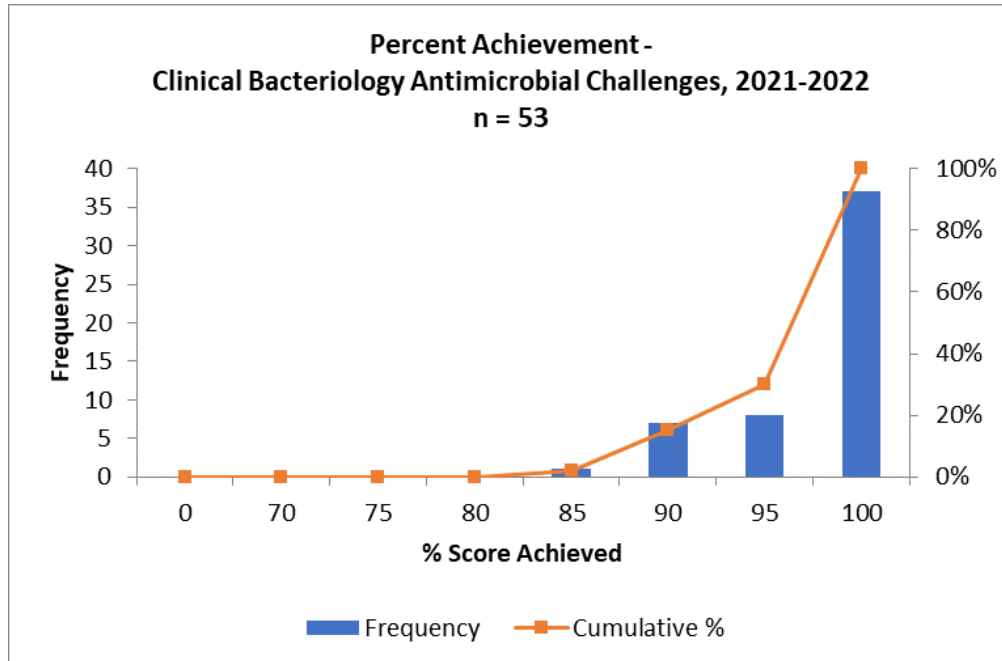
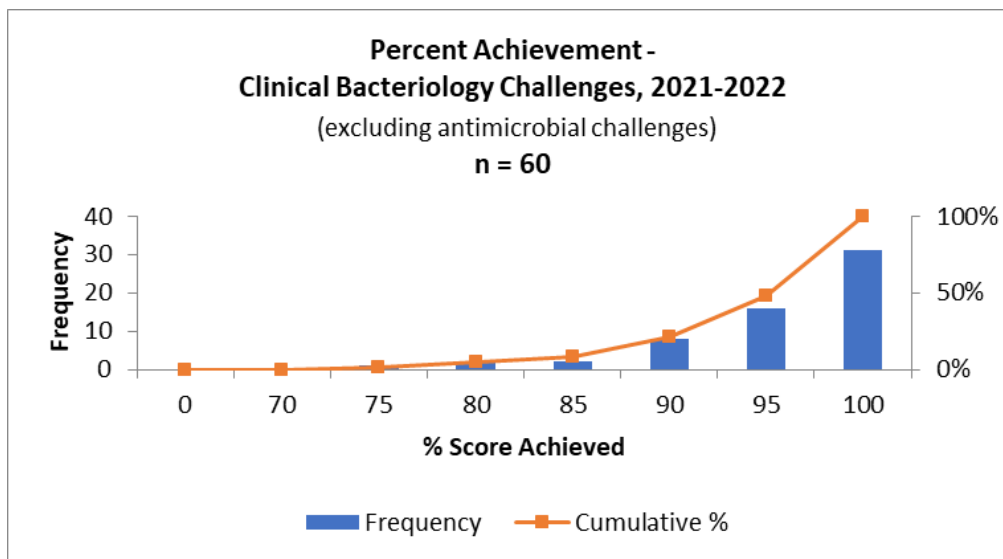
All histograms portray the total percent achievable score. For each laboratory, the sum of all challenges performed and graded was calculated, either as a total for all challenges, or within a specific category, such as “bacterial identification”. The total achievable score, which is the score the laboratory *would have obtained* if they received a grade of 4/4 for each graded challenge was calculated. Challenges that are ungraded get excluded from the analysis. For this program year, there were no ungraded challenges. The percent achievable score gets calculated as: $(\text{total achieved score} / \text{total achievable score}) \times 100$.

The number of laboratories achieving a specific grade is indicated by the height of the columns over the Percent Achievable Score, and is read on the LEFT side scale of the chart.

The Cumulative Scoring is indicated by the connected box-line that starts low on the left and rises to the right, and is read on the Right-side scale of the chart. The cumulative column indicates the percentage of laboratories that received an acceptable grade on the challenge.

A. CLINICAL BACTERIOLOGY PROGRAM

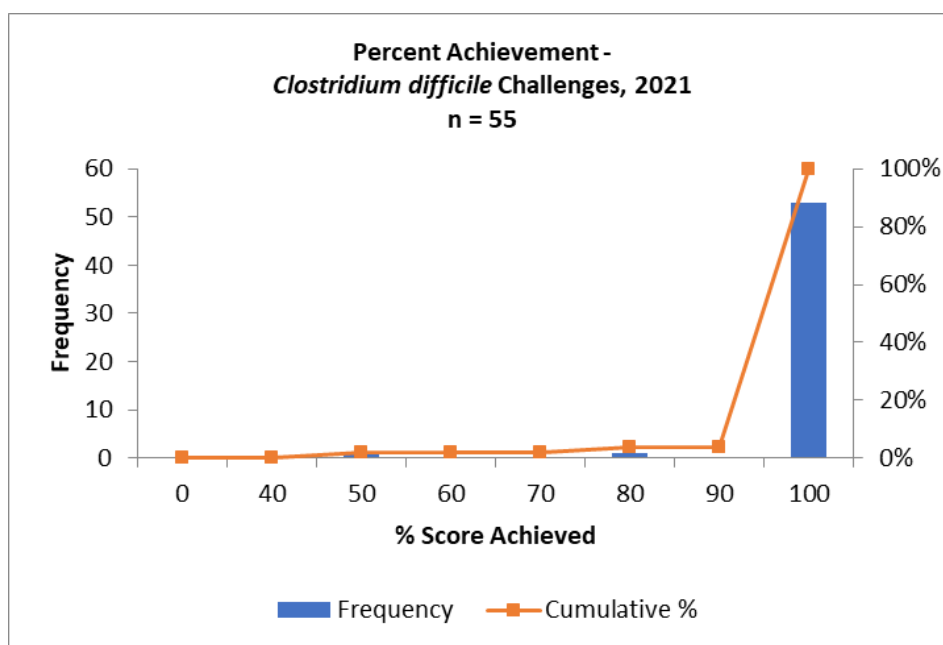
Clinical bacteriology surveys are shipped 4 times per year. Each survey can consist in up to seven different types of samples depending on the category of the laboratory and the challenges to which they are subscribed. This includes paper and video challenges, blood cultures, Gram staining and bacterial identification. The following graphs show the relative success of the participants' performance this program year. An additional histogram is included for susceptibility testing performance.



Summary of results: A total of 60 labs participated in this program this year with 47/60 labs performing at >95%. Eight laboratories achieved an overall percent achievement score of 90%, two labs achieved 85%, two labs achieved 80% and 1 lab achieved 75%. Fifty-three labs performed and reported antibiotic susceptibility testing with 52/53 achieving >90% and more than half of the labs achieving 100%.

B. CLOSTRIDIUM DIFFICILE PROGRAM

Clostridium difficile samples were added to the Clinical Bacteriology program in 2006 to address infection control concerns in facilities. The program consisted of 2 samples, shipped twice a year. Program participants report the presence or absence of a toxin gene and/or toxin antigen. Notification to the infection control department was also considered for grading, where applicable. In May 2016, the *Clostridium difficile* program was reorganized as a standalone program and graded separately from the Clinical Bacteriology program. The histogram illustrates the participants' performance in 2021.



Summary of results: A total of 55 labs participated in this program this year with 53/55 achieving 100% and one labs each achieving 80% and 50%.

C. WATER MICROBIOLOGY PROGRAM

Drinking Water challenge surveys are shipped to laboratories three times per year. Each survey consists of sets of 4 drinking water samples. Starting in 2015, the Heterotrophic Plate Count program was offered to laboratories that tested drinking water samples with this method. Recreational Water challenge surveys are shipped two times per year. Each survey consists of one set of recreational water samples (spa water, freshwater beach or marine water). Participants participate in one, two or all the recreational challenge samples.

Not all laboratories perform all challenges and not all laboratories use the same methods when testing water samples. Laboratories perform testing use one to four methods depending on the laboratory's accreditation criteria. Laboratories also perform the Presence/Absence method, as their primary method or in addition to other methods. The drinking water bacteriology (membrane filtration, Enzyme Substrate, MPN and Presence/Absence methods) challenge records for 2021 are shown in Table 1, Heterotrophic Plate Count program records are shown in Table 2, and the recreational water challenge records are show in Table 3.

Table 1: 2021 Drinking Water Bacteriology challenge record									
Date	Sample No.	Organism	Membrane Filtration mean/median/MU% cfu/100 ml		Enzyme Substrate mean/median MPN/100 ml		MPN mean/median MPN/100 ml		Presence/Absence (P/A)
			Total Coliforms	<i>E.coli</i>	Total Coliforms	<i>E.coli</i>	Total Coliforms	<i>E.coli</i>	Total Coliforms/ <i>E.coli</i>
W211 April 12, 2021	1	<i>Escherichia coli</i>	16/16/21.4	16/16/21.4	15.7/16.0	16.0/16.0	15.8/16.0	14.0/14.0	P/P
	2	<i>Enterobacter</i> species	33/36/22.8	0/0/0	34.5/33.6	0/0	≥23/≥23	0/0	P/A
	3	no organisms present	0/0/0	0/0/0	0/0	0/0	0/0	0/0	A/A
	4	<i>Escherichia coli</i>	33/33/22.6	33/33/22.3	33.0/32.5	32.4/32.7	≥23/≥23	≥23/≥23	P/P
W212 July 12, 2021	1	<i>Enterobacter</i> species	58/55/18.0	0/0/0	57.9/58.0	0/0	≥23/≥23	0/0	P/A
	2	<i>Escherichia coli</i>	56/60/18.3	54/58/20.7	59.9/57.3	60.1/57.8	≥23/≥23	≥23/≥23	P/P
	3	<i>Escherichia coli</i>	33/33/16.9	32/32/16.9	39.4/39.0	39.8/39.5	≥23/≥23	≥23/≥23	P/P
	4	<i>Enterobacter</i> species	11/12/32.9	0/0/0	12.3/12.5	0/0	9.4/9.2	0/0	P/A
W213 October 25, 2021	1	<i>Escherichia coli</i>	14/14/24.4	13/13/24.6	17.7/18.5	15.9/17.3	15/12	15/12	P/P
	2	<i>Escherichia coli</i>	26/26/18.1	26/26/20.9	30.4/29.6	26.7/27.5	21.3/23	21.3/23	P/P
	3	<i>Enterobacter</i> species	51/53/16.5	0/0/0	53.8/50.6	0/0	≥23/≥23	0/0	P/A
	4	no organisms present	0/0/0	0/0/0	0/0	0/0	0/0	0/0	A/A

Table 2: 2021 Drinking Water Bacteriology for Heterotrophic Plate Count			
Date	Sample No.	Organism	mean/median (cfu/ml)/MU%
H211 April 12, 2021	1	<i>Escherichia coli</i>	119/119/14.6
	2	<i>Enterobacter</i> species	82/86/26.0
	3	<i>Enterobacter</i> species	39/37/20.5
	4	<i>Escherichia coli</i>	61/68/27.1
H212 July 12, 2021	1	<i>Escherichia coli</i>	186/191/18.5
	2	<i>Escherichia coli</i>	196/197/15.7
	3	no organisms present	0/0/0
	4	<i>Enterobacter</i> species	86/88/28.6
H213 October 25, 2021	1	<i>Enterobacter</i> species	60/60/15.4
	2	<i>Escherichia coli</i>	94/85/26.6
	3	<i>Enterobacter</i> species	73/68/32.6
	4	<i>Escherichia coli</i>	97/84/34.9

Table 3: 2021 Recreational Water Bacteriology challenge record				
Date	Source	Challenge	mean/median/MU%	
			Membrane Filtration (cfu/100mL)	Enzyme Substrate MPN/100 ml
R211 April 12, 2021	Spa Water	<i>Pseudomonas aeruginosa</i>	255/266/15.2	297.0/300.0
	Freshwater Beach	<i>Escherichia coli</i>	206/210/10.1	217.3/235.9
	Marine Water	<i>Enterococcus</i> species	225/226/19.9	187.4/190.4
R212 August 23, 2021	Spa Water	<i>Pseudomonas aeruginosa</i>	127/123/18.4	132.9/140.0
	Freshwater Beach	<i>Escherichia coli</i>	112/110/16.4	107.9/109.0
	Marine Water	<i>Enterococcus</i> species	112/111/18.6	109.3/97.6

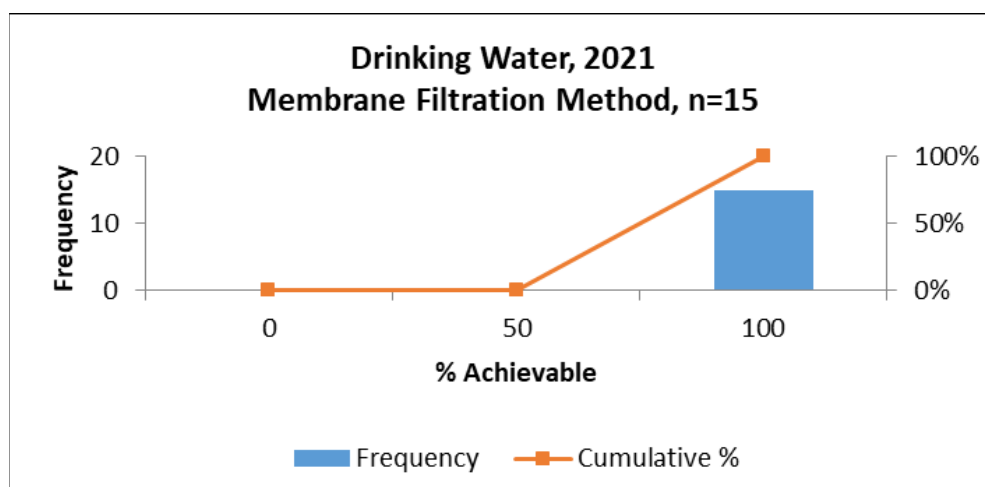
MU% - not applicable for EST, MPN or PA methods

Water Bacteriology (Drinking and Environmental Water Sample) Score

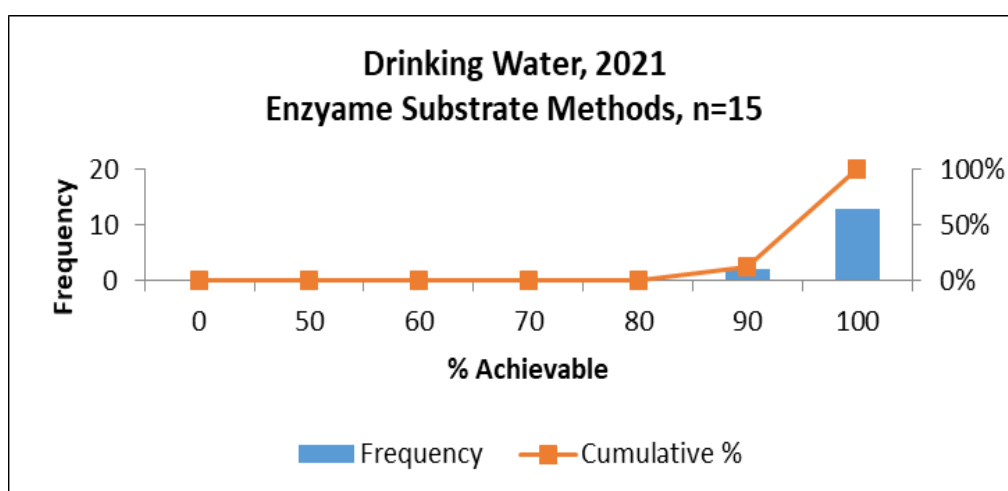
Laboratory testing results are graded based on the Membrane Filtration, Enzyme Substrate, MPN, Heterotrophic Plate Count (HPC) and/or Presence/Absence methods. All methods are graded on a point scale for assessment of water samples with the exception of the Presence/Absence method, a qualitative method and are, therefore, graded qualitatively. With 12 drinking water samples tested for the program year, the maximum score is 36. With 12 drinking water samples tested, using the HPC method, the maximum score is 36 for the program year. With 3 environmental water samples, laboratories can receive up to a maximum score of 9.

The following Score Tables illustrate the % Achievable scores for methods used for Drinking Water samples during 2021.

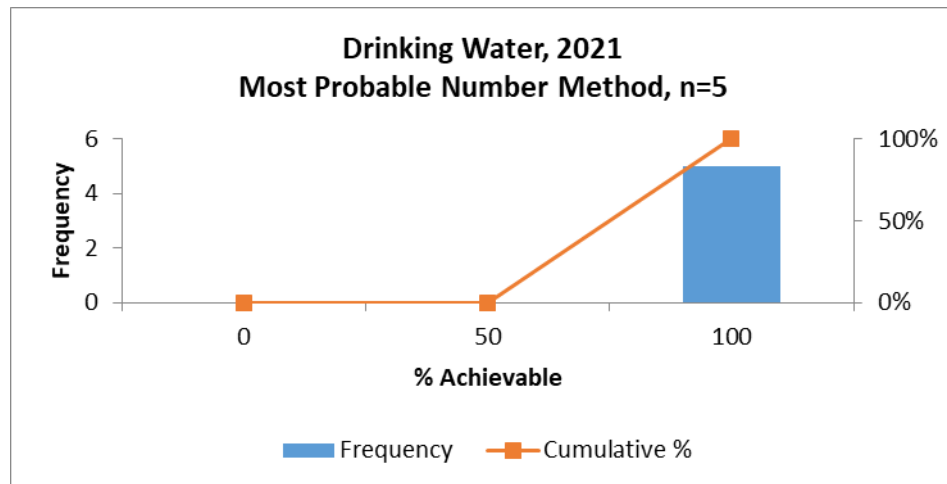
Drinking Water Performance Table for the Membrane Filtration method, 2021		
Achievable	Labs (n=15)	Cumulative %
100	15	100



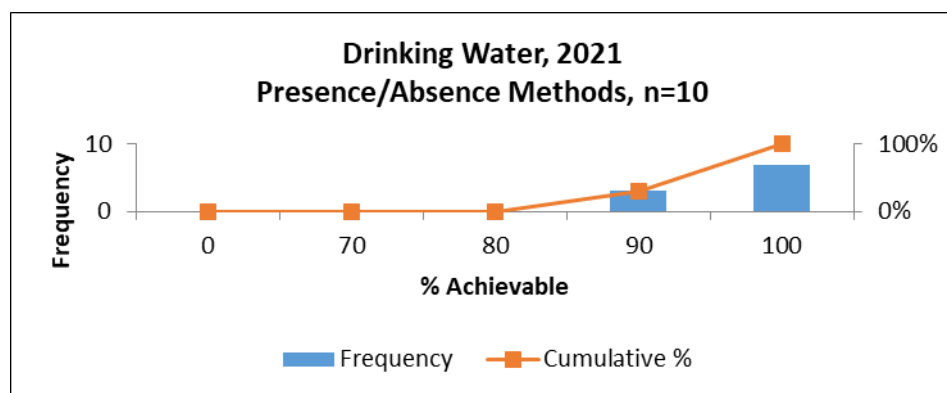
Drinking Water Performance Table for Enzyme Substrate methods, 2021		
Achievable	Labs (n=16)	Cumulative %
90	2	13.3
100	13	100



Drinking Water Performance Table for Most Probable Number (MPN) method, 2021		
Achievable	Labs (n=5)	Cumulative %
100	5	100

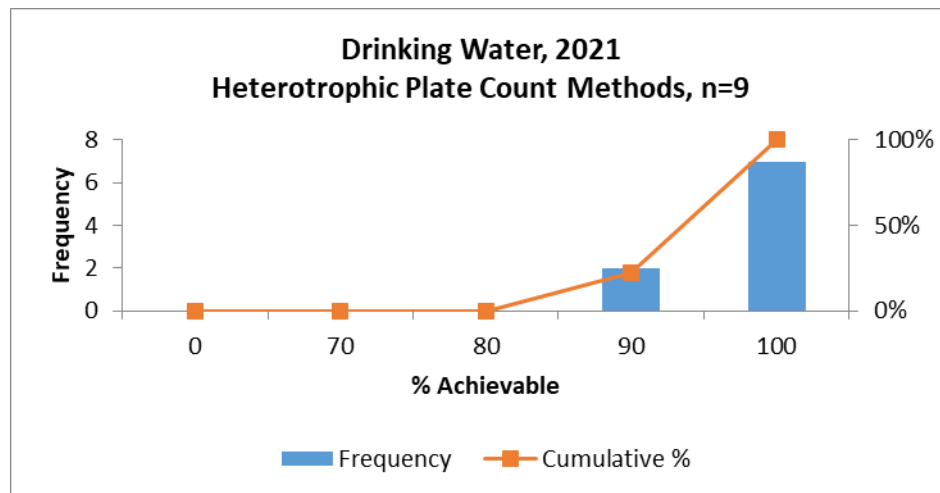


Drinking Water Performance Table for Presence/Absence methods, 2021		
Achievable	Labs (n=10)	Cumulative %
90	3	30
100	7	100



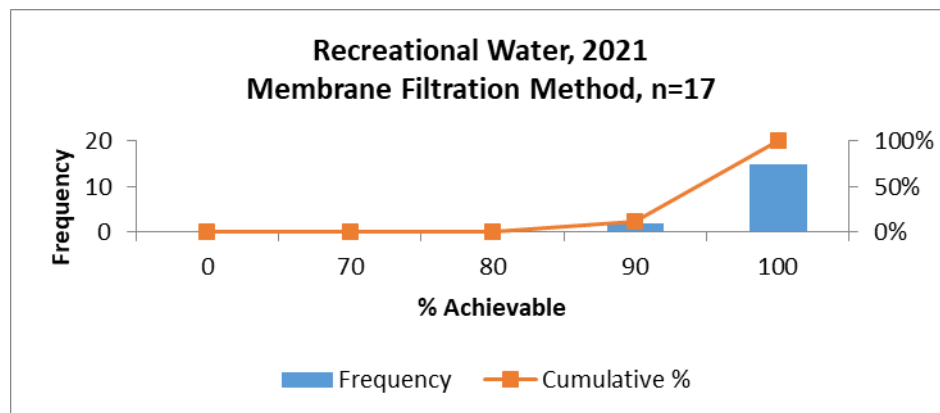
The following Table illustrates the % Achievable scores for the Heterotrophic Plate Count method used for Drinking Water samples during 2021.

Drinking Water Performance Table for Heterotrophic Plate Count method Table, 2021		
Achievable	Labs (n=9)	Cumulative %
80	2	22.2
100	7	100

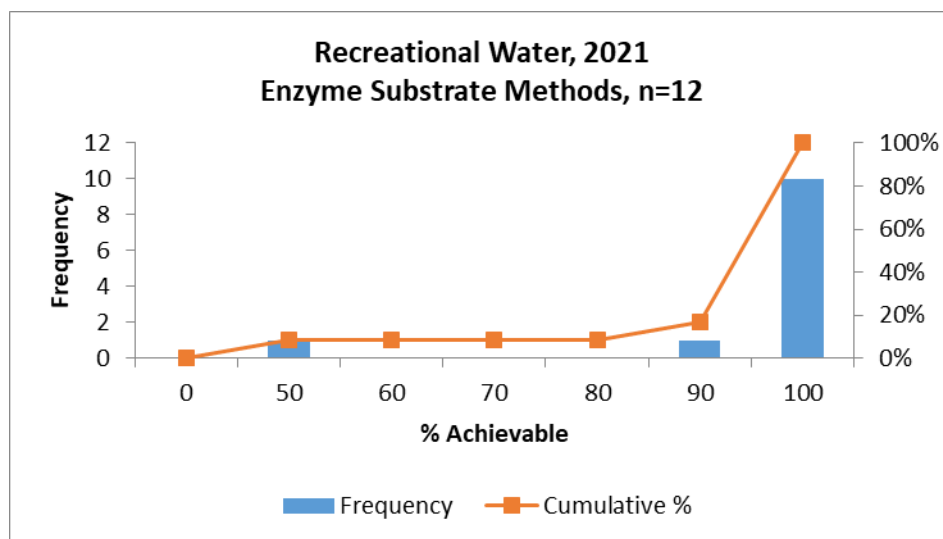


The following Score Tables illustrate the Achievable scores for Membrane Filtration and Enzyme Substrate methods used for Recreational Water samples during 2021.

Recreational Water Performance Table for the Membrane Filtration method, 2021		
Achievable	Labs (n=17)	Cumulative %
90	2	11.8
100	15	100



Recreational Water Performance Table for the Enzyme Substrate method, 2021		
Achievable	Labs (n=12)	Cumulative %
50	1	8.3
90	1	16.7
100	10	100



Summary of results: Overall, labs participating in the water microbiology program performed very well this year with some minor and rare exceptions. As with all our programs, laboratories that did not perform well were consulted about their results.

D. MYCOLOGY PROGRAM

The Mycology Plus Program was introduced in June 2001. Participants receive 3 shipments per year, each including 3 fungal smear slides for direct examination and 3 proficiency challenges for the identification of dermatophytes, molds, common laboratory contaminants, and yeasts. In 2016-2017, the expert committee decided to start grading mycology challenges. Grading is on a two-point scale, acceptable or unacceptable. Susceptibility challenges for yeasts were introduced in 2008 and laboratories performing anti-fungal testing were encouraged to report their results.

Table 1: 2021 challenge results						
Survey	Samples			Grades*		
				A	U	UG
MY2104 April 2021	Fungal Smear (hyphae)	A	Positive	12	1	
		B	Positive	13		
		C	Positive	12	1	
	Yeast**	1	<i>Candida glabrata</i>	12		
	Dermatophyte	2	<i>Trichophyton mentagrophytes</i>	12		
	Mold	3	<i>Rhizopus</i> species	12		
MY2108 August 2021	Fungal Smear (hyphae)	A	Positive	15		
		B	Negative	12	3	
		C	Positive	14	1	
	Yeast**	1	<i>Candida parapsilosis</i>	13		
	Dermatophyte	2	<i>Trichophyton viovaceum</i>	12	1	
	Mold	3	<i>Cladosporium</i> species	11		2
MY2111 November 2021	Fungal Smear (hyphae)	A	Positive	14		
		B	Negative	13	1	
		C	Negative	13	1	
	Yeast	1	<i>Candida tropicalis</i>	12		
	Dermatophyte	2	<i>Trichophyton verrucosum</i>	11	1	
	Mold	3	<i>Scedosporium apiospermum</i>	11	1	
Totals				224	11	2

Summary of results: Overall, labs participating in the mycology microbiology program performed very well this year with the majority of erroneous results stemming from the fungal smear challenges. As with all our programs, laboratories that did not perform well were consulted about their results.

E. ENTERIC PARASITOLOGY PROGRAM

Enteric parasitology samples are actual clinical samples fixed in formalin solution. Participants receive 3 surveys per year. Each survey consists of 3 SAF preserved samples that are suitable for concentration techniques and smear preparation; Grading is assessed on the combined results of the stained smear and the concentrate and is based on a 2 point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2020 challenges.

Table1. Enteric Parasitology Challenges 2021					
Date	Sample	Parasite(s)	A*	U*	UG*
April 2021	PA2104-1	<i>Hymenolepis nana</i> , <i>Blastocystis</i> species	15		
	PA2104-2	No ova or parasites	15		
	PA2104-3	<i>Dientamoeba fragilis</i> , <i>Blastocystis</i> species	15		
July 2021	PA2107-1	<i>Blastocystis</i> species	13	2	
	PA2107-2	No ova or parasites	14	1	
	PA2107-3	<i>Cyclospora cayetanensis</i>	11	4	
September 2021	PA2110-1	No ova or parasites	14		1
	PA2110-2	<i>Endolimax nana</i> , <i>Blastocystis</i> species	12	2	1
	PA2110-3	<i>Giardia lamblia</i> , <i>Blastocystis</i> species	14		1
Total			123	9	3

BOLD – pathogen **Blue – potential pathogen**

*Grades: A: acceptable; U: unacceptable; UG: ungraded

Summary of results: Overall, labs participating in this program performed very well this year with the majority of erroneous results stemming from the *Cyclospora cayetanensis* challenge in July. As with all our programs, laboratories that did not perform well were consulted about their results.

F. *TRICHOMONAS VAGINALIS* PROGRAM

CMPT launched the *Trichomonas vaginalis* program with the first shipment on August 8, 2011. The program consisted of 2 surveys in 2011. Since 2012, the number of surveys was increased to 3. Each survey consists of 4 samples which are suitable for antigen or DNA testing. Grading is based on a 2 point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2021 challenges.

Table 1. <i>Trichomonas vaginalis</i> Challenges 2021					
Date	Sample	Results	Acceptable	Unacceptable	Ungraded
April 2021	TR2104-1	Positive	22		
	TR2104-2	Negative	22		
	TR2104-3	Positive	22		
	TR2104-4	Negative	22		
July 2021	TR2107-1	Positive	22		
	TR2107-2	Negative	22		
	TR2107-3	Positive	22		
	TR2107-4	Positive	22		
September 2021	TR2110-1	Positive	21		
	TR2110-2	Positive	21		
	TR2110-3	Positive	21		
	TR2110-4	Negative	21		
Total			260	0	0

Summary of results: Overall, labs participating in this program performed excellently this year with all labs receiving acceptable scores. No labs had unacceptable results.

G. SHIGA TOXIN PROGRAM

CMPT launched the Shiga Toxin Program with the first shipment on May 7, 2012. Participants receive 2 surveys a year with each survey consisting of 3 simulated stool samples. Grading is based on a 2 point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2021 challenges.

Table 1. Shiga Toxin Challenges 2021				
Date	Sample	Results	Acceptable	Unacceptable
May 2021	ST2105-1	gene and toxin negative	14	1
	ST2105-2	gene and toxin positive	14	1
	ST2105-3	gene and toxin positive	14	1
November 2021	ST2111-1	gene and toxin positive	13	
	ST2111-2	gene and toxin negative	13	
	ST2111-3	gene and toxin positive	13	
Total			81	3

Summary of results: Overall, labs participating in this program performed very well this year. As with all our programs, laboratories that did not perform well were consulted about their results.

H. SCREENING AND MOLECULAR TESTING PROGRAM

CMPT launched the Molecular Proficiency Testing Program with the first shipment on March 23, 2009. The program consists of 2 surveys. With each survey participants receive 4 samples for methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* species (VRE) and group B *Streptococcus* (GBS) each. In 2019, CMPT expanded the Molecular Proficiency Testing Program to include carbapenem-resistant *Enterobacteriaceae* (CRE). Because all of the samples can also be tested using screening methods, such as chromogenic media, the program was renamed as the “Screening and Molecular” Program. Laboratories can participate in one, some or all of the 4 sample types.

Grading is based on a 2 point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2021 challenges.

Table 1. Screening and Molecular Challenges 2021						
Date	Sample		Results	Acceptable	Unacceptable	Ungraded
April 2021	MRSA	MR 2104-1	positive	33		
		MR 2104-2	positive	33		
		MR 2104-3	negative	33		
		MR 2104-4	negative	32	1	
	VRE	VR 2104-1	negative	30		
		VR 2104-2	positive (van A)	27		3
		VR 2104-3	positive (van A)	27		3
		VR 2104-4	positive (van A)	26	1	3
	GBS	GB 2104-1	negative	32		
		GB 2104-2	positive	32		

		GB 2104-3	positive	32		
		GB 2104-4	negative	31		
	CRE	CRE 2104-1	positive	22		
		CRE 2104-2	positive	22		
		CRE 2104-3	positive	22		
		CRE 2104-4	negative	22		
	Total			456	2	9

Table 1. Screening and Molecular Challenges 2021 cont.

Date	Sample		Results	Acceptable	Unacceptable	Ungraded
August 2021	MRSA	MR 2108-1	negative	31		
		MR 2108-2	positive	31		
		MR 2108-3	positive	31		
		MR 2108-4	positive	31		
	VRE	VR 2108-1	positive	24		6
		VR 2108-2	positive	23		7
		VR 2108-3	negative	29	1	
		VR 2108-4	positive	26	1	3
	GBS	GB 2108-1	positive	31		
		GB 2108-2	negative	31		
		GB 2108-3	positive	31		
		GB 2108-4	negative	31		
	CRE	CRE 2108-1	negative	23		
		CRE 2108-2	positive	23		
		CRE 2108-3	positive	23		
		CRE 2108-4	negative	23		
Total				442	2	16
Year Total				898	4	25

Summary of results: Overall, labs participating in the molecular and screening program performed very well this year with a total of 898 test events completed. The number of unacceptable results this year was less than in 2020-21 (down from 19), however, ungraded challenges were more numerous than in the previous year (up from 12), which required further evaluation and internal discussion. The issue with the VR-2108 survey was also linked to a strain of *Enterococcus* that seemed to have changed its resistance pattern. The organism sent was supposed to have a vancomycin MIC of 16 and ended having a MIC of 6 which is intermediate (so labs can very easily report it as susceptible). As with all our programs, laboratories that did not perform well or had questions were consulted about their results.

I. ACID FAST BACILLI PROGRAM

CMPT launched the Acid-Fast Bacilli Program on April 10, 2017. Participants receive 3 surveys a year, each survey consisting of 3 simulated smears for acid fast staining and interpretation. Grading is based on a 2-point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2021 challenges. This program enrolled 10 more labs in this program this past year (up from 51 in 2020-21).

Table 1. Acid Fast Bacilli Challenges 2021					
Date	Sample	Results	Acceptable	Unacceptable	Ungraded
April 2021	AFB2104-1	negative	7		
	AFB2104-2	negative	6	1	
	AFB2104-3	positive	7		
July 2021	AFB2107-1	positive	7		
	AFB2107-2	positive	7		
	AFB2107-3	positive	7		
September 2021	AFB2110-1	positive	7		
	AFB2110-2	negative	7		
	AFB2110-3	negative	7		
Total			62	1	0

Summary of results: Overall the number of labs participating in this program performed very well this year.

J. ENTERIC PANEL PROGRAM

CMPT launched the Enteric Panel Program with the first shipment on April 23, 2018. Participants receive 2 surveys per year; each survey consisting of 4 simulated stool samples for the detection of enteric pathogens by molecular methods. Grading is based on a 2-point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2021 challenges. The number of subscribers to this program increased this year (up from 58).

Table 1. Enteric Panel Challenges 2021					
Date	Sample	Results	Acceptable	Unacceptable	Ungraded
April 2021	EP2104-1	No pathogens	10		
	EP2104-2	<i>Yersinia</i> species	7	1	2
	EP2104-3	<i>Vibrio vulnificus</i>	6	2	2
	EP2104-4	<i>Salmonella enterica</i>	10		
August 2021	EP2108-1	<i>Salmonella enterica</i>	11		
	EP2108-2	No pathogens	10		1
	EP2108-3	<i>Aeromonas</i> species	11		
	EP2108-4	<i>Campylobacter</i> species	7		4
Total			72	3	9

Summary of results: Overall the labs participating in this program performed very well this year. The number of unacceptable results declined from the previous year but there was an increase (up from 5) in the number of ungraded challenges. Proportionately, this is a rise from 8.6% to 12.5% and is cause for greater attention during the creation of our challenges.

K. VIROLOGY (SARS CoV-2) PROGRAM

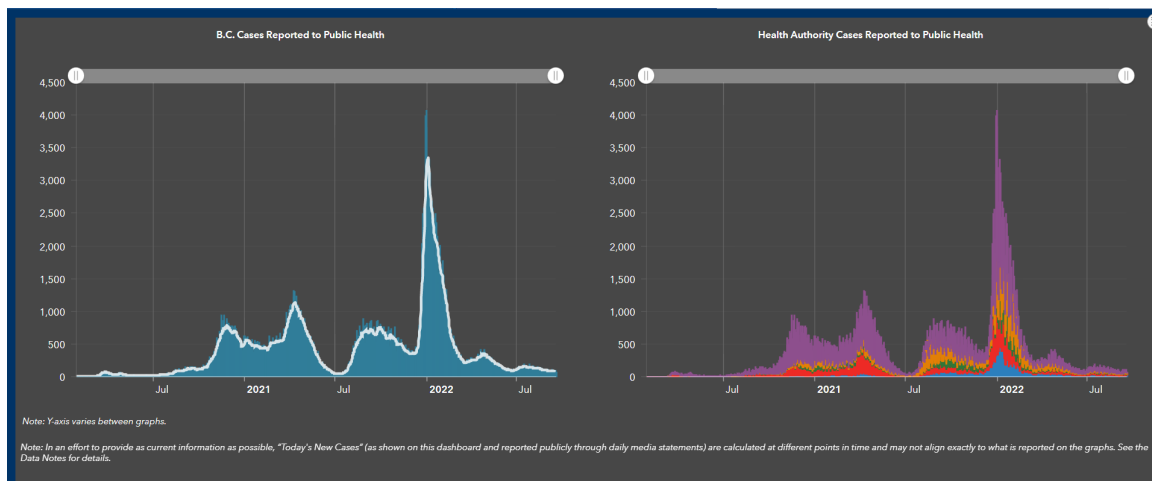
CMPT launched the SARS CoV-2 (Covid-19) Program this year with the first shipment on March 2021. This program was performed in collaboration with BC CDC who produced the source raw material used in the challenges- BPL inactivated SARS-CoV-2 virus.

Participants received 6 surveys per year; each survey consisting of 4 simulated nasopharyngeal samples for the detection of SARS CoV-2 virus by rapid antigen and molecular methods (March and May 2021 had only 3 samples per set). Grading is based on a 2-point scale (acceptable or unacceptable). Table 1 lists the samples and grades received for the 2021-2022 challenges.

Table 1. Covid-19 Challenges 2021-2022					
Date	Sample	Results	Acceptable	Unacceptable	Ungraded
March 2021	COV2103-1	Positive	20	2	1
	COV2103-2	Positive	16	7	
	COV2103-3	Negative	22	1	
May 2021	COV2105-1	Positive	21	13	
	COV2105-2	Positive	33	1	
	COV2105-3	Positive	18	16	
July 2021	COV2107-1	Negative	46		
	COV2107-2	Positive	43	3	
	COV2107-3	Negative	40	6	
	COV2107-4	Negative	44	2	
September 2021	COV2109-1	Negative	42	3	
	COV2109-2	Positive	31	14	
	COV2109-3	Positive	44	1	
	COV2109-4	Positive	42	3	
November 2021	COV2111-1	Positive	49	18	
	COV2111-2	Positive	49	18	
	COV2111-3	Positive	49	18	
	COV2111-4	Positive	63	4	
January 2022	COV2201-1	Positive	84	6	
	COV2201-2	Positive	74	16	
	COV2201-3	Negative	87	2	1
	COV2201-4	Negative	84	5	1
Total			1000	159	3

Summary of results: Overall, the majority of testing sites participating in this program performed well, but with major exception. This year, the November challenge documented the greater number of erroneous results for the entire program year with 36.7% sites with unacceptable results for that test event. One challenge for the September round also produced a high rate of unacceptable scores with nearly 50% sites failing the COV2109-2 challenge. This contributes to a 15.9% rate of error which translates to 15/100 COVID tests being incorrect. Given the timing of these challenges during the 2021

COVID surge of that autumn (see figure below), this was cause for concern and discussion with BC CDC.



Data courtesy BC CDC. Source:

<https://experience.arcgis.com/experience/a6f23959a8b14bfa989e3cda29297ded>

VI. TRAINING PROGRAMS ON EQA

From its inception, Dr. Noble and our CMPT team developed a style of PT/EQA sample production that was simple, cost effective, and strongly resembled typical clinical samples. Other programs were interested in learning this style, and, in response, CMPT developed an International Proficiency Testing Training program (2007-2017) in which countries would send students to Vancouver to learn the techniques.

While the program was effective for many countries, it was prohibitively costly for many countries, especially in Africa. Starting in 2019, and in collaboration with Oneworld Accuracy (1WA) and through funding support from Foundation Merieux, East Africa Community, and the Bernhard Nocht Institute for Tropical Medicine, 1WA and Dr. Noble were able to reverse the process by taking the training to the countries abroad, additionally supplemented with training in 1WA on-line PT/EQA informatics.

Under this revised approach PT/EQA programs in Nigeria, Ethiopia, Senegal, Guinea, Kenya and Tanzania were introduced to some of the main CMPT PT/EQA methods. To date all participants have successfully completed the training and some have started to create their own send-out surveys. This has been a valuable contribution to medical laboratory quality improvement in developing countries.

VII. EDUCATION PROGRAMS

CMPT started offering its Professional Development Course in 2016. We consider the CMPT Professional Development Course an education tool for all laboratory personnel. Through this course, laboratory technologists can learn relevant and practical information about different clinical microbiology scenarios through the reading of the challenge critiques and completing online quizzes.

In 2021 there were 61 participants that received a certificate of completion for at least one of the three categories (Clinical bacteriology, Mycology, or Parasitology).

The CMPT PD course for 2022 will finish in October 30, 2022. Of the 128 registered students, 50 are currently active students (finished at least one quiz). We usually see an increase of active students towards the end of the course as this is a self-paced course, many students find it easier to go through the quizzes in a short period of time.

VIII. ACKNOWLEDGEMENTS

As a program in the Department of Pathology and Laboratory Medicine, University of British Columbia, CMPT acknowledges and greatly appreciates the on-going support of the following individuals as well as those acknowledges in the body of this report below:

- Dr. Zu-hua Gao, MD, PhD, FRCPC, FCAHS Professor, Chair, Head, Pathology (2021-)
- Genevieve MacMillan, Director, Human Resources and Administration
- The Donald B Rix Family Foundation

CMPT participates with the following organizations to provide external quality assessment challenges and assistance for water bacteriology.

- Enhanced Water Quality Assurance (British Columbia Water Bacteriology Approval Committee)
- BCCDC Environmental Microbiology Laboratory
- British Columbia Ministry of the Environment

CMPT thanks LifeLabs, DynaLIFE, PLPHE, and BCCDC for kindly providing enteric parasitology samples.

CMPT acknowledges, with appreciation, the essential advisory and technical support of Denise Sitter, Cadham Provincial Laboratory, Winnipeg, MB for the Shiga Toxin program.