Review Article

# Educational Landscape of Clinical Chemistry and Medical Biochemistry in Canada

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## ABSTRACT

Clinical Chemistry and Medical Biochemistry are evolving fields that play a crucial role in disease diagnosis, treatment, screening, and prevention. They ensure that laboratory values are not mere numbers but actionable information that enables healthcare team to make accurate and appropriate decisions. In Canada, the field has been shaped through decades of collaboration, standardization, and academic innovation, resulting in two distinctive pathways system comprising Clinical Chemists (postdoctoral fellowship) and Medical Biochemists (Residency program). This review aims to outline the significant historical events that have influenced the profession, starting with the establishment of the Canadian Society of Clinical Chemists in 1956 to the present structure of accredited training programs, regulatory supervision, and education based on competencies. We present a summary of existing educational routes, featuring fellowship initiatives for PhD graduates at Canadian universities and Royal College residency programs for medical doctors, detailing their frameworks, accreditation criteria, and certification procedures. We also explore the various career paths the graduates can seek, including roles in hospital laboratories, academic medicine, public health, industry, and regulatory bodies. The review highlights not only the quality and the scope of Canadian biochemistry training but also the key role Clinical Chemists and Medical Biochemists play in connecting analytical science with patient-focused care.

**Keywords:** Clinical Chemistry; Clinical Biochemistry; Education; Canada

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## Introduction

In Canada, the Canadian Society of Clinical Chemists (CSCC) and the Canadian Academy of Clinical Biochemistry (CACB) use the term Clinical Biochemistry, though "Clinical Chemistry" is often used interchangeably in international contexts. Clinical Chemistry and Medical Biochemistry represent a cornerstone of modern integrated healthcare, providing essential diagnostic information that guides prevention, diagnosis, treatment, and monitoring of disease. Broadly, the field encompasses the analysis of blood samples and body fluids, the development and validation of analytical methods, and the interpretation of laboratory data within a clinical context. Laboratory professionals play a vital role in ensuring that results are accurate, reliable, and clinically meaningful. Their contributions extend beyond the laboratory bench to include quality assurance, method innovation, reference interval establishment, consultation with clinicians, and integration of bioinformatics and laboratory informatics. In this review, we aim to provide a comprehensive overview of the educational landscape of Clinical Chemistry and Medical Biochemistry in Canada, outlining the historical evolution, current training pathways, accreditation standards, and job opportunities.

## Historical context of Clinical Chemistry in Canada

Modern Clinical Chemistry in Canada came together in the mid-20$^{th}$ century around quality improvement and professional identity. The Canadian Society of Clinical Chemists (CSCC) was organized at a founding meeting in Montréal on October 17, 1956, with early leaders emphasizing two objectives: improving analytical standards and professional status. Early national quality initiatives followed, including a 1958 CSCC quality control document circulated to laboratories marking a shift from informal practices to coordinated quality efforts (1). By 1964, CSCC launched certification by examination as the recognized path for postdoctoral Clinical Chemists in Canada, an important step toward standardizing training and competency. CSCC also supported scholarly exchange, including the launch of the journal *Clinical Biochemistry* in 1967, which became a central venue for Canadian and international work (1).

During the 1960s to 1980s, structured postdoctoral training programs emerged within academic health centres. Notably, the University of Toronto's Clinical Chemistry fellowship, established in 1968, remains one of the country's largest programs (2). To consolidate standards across programs, the CSCC established the Canadian Academy of Clinical Biochemistry (CACB) in 1986. CACB assumed responsibility for accrediting training programs and candidates, defining curriculum, administering examinations, and overseeing continuing education (1).

In parallel with the Clinical Chemistry program, the Royal College of Physicians and Surgeons of Canada expanded specialty training and later recognized Medical Biochemistry as a laboratory-based physician specialty. Royal College documents define Medical Biochemists as specialists who direct laboratories and consult on biochemical disorders, with training requirements and objectives maintained centrally (3). Canadian postgraduate medical education adopted the CanMEDS competency framework in 1996, and the Royal College's Competence-by-Design (CBD) rollout began with first cohorts in 2017, reshaping residency assessment across specialties, including Medical Biochemistry. Updated subspecialty training requirements (2023) specify eligibility pathways and a minimum 24 months of dedicated Medical Biochemistry residency for eligible candidates (4).

Canadian terminology often uses "Clinical Biochemistry" for the PhD-trained profession (CSCC/CACB), while "Medical Biochemistry" refers to the RCPSC physician specialty. Both serve overlapping leadership and consultative roles in clinical laboratories. In Québec, an additional pathway exists via the Ordre des chimistes du Québec (OCQ) Specialist Certificate in Clinical Biochemistry (since 2000), reflecting provincial regulation in addition to national certification (Table 1) (5).

## Entry pathways into the profession

Clinical Chemistry and Medical Biochemistry training in Canada follows two primary routes, tailored to either doctoral scientists (PhD) or physicians (MD). The

**Table 1.** Historical milestones in clinical and Medical Biochemistry in Canada

| Year | Milestone | Reference |
|---|---|---|
| **1956** | CSCC founding meeting (Montréal). | cms.ifcc.org |
| **1958** | CSCC distributes national Quality Control in Clinical Laboratories guidance. | cms.ifcc.org |
| **1964** | Certification by examination formalized for postdoctoral Clinical Chemists. | cms.ifcc.org |
| **1967** | Clinical Biochemistry journal begins publication. | cms.ifcc.org |
| **1968** | University of Toronto postdoctoral Clinical Chemistry program established. | comacc.org |
| **1986** | CACB created to oversee accreditation, examinations, curriculum, and CE. | cms.ifcc.org |
| **1996** | CanMEDS framework approved by the Royal College. | royalcollege.ca |
| **2017** | First cohorts enter CBD programs (competency-based medical education). | royalcollege.ca |
| **2023** | Royal College updates Medical Biochemistry training requirements. | royalcollege.ca |

PhD pathway (Clinical Chemistry) typically involves completion of a doctoral degree in a relevant biomedical field such as biochemistry, pharmacology, physiology, neuroscience, and biology, followed by a structured two- to three-year postdoctoral fellowship in clinical biochemistry accredited by the Canadian Academy of Clinical Biochemistry (CACB). This route prepares graduates to serve as laboratory directors, consultants to clinicians, and leaders in test development and quality assurance.

The MD pathway is pursued through the specialty of Medical Biochemistry, overseen by the Royal College of Physicians and Surgeons of Canada (RCPSC). After completing core medical training, physicians undertake residency in Medical Biochemistry, with curriculum emphasizing both clinical consultation and laboratory management.

Both routes are coordinated through major universities, hospital networks, and provincial health systems, ensuring a balance of clinical service, research, and teaching. National accreditation and certification through either the CACB for PhD-trained clinical biochemists or the RCPSC for physician biochemists provide assurance of standardized competencies, while also aligning Canadian training with international frameworks.

## Route 1: Clinical Chemistry (PhD entry)

This pathway is designed for doctoral scientists. Entry typically requires a PhD in biochemistry, chemistry, molecular biology, or a related discipline. Candidates complete a two-year, full-time postdoctoral residency in an academic health centre or hospital network, accredited by the Canadian Academy of Clinical Biochemistry (CACB) (6). Upon completion, graduates are eligible to sit the CACB certification examination, which qualifies them for leadership positions in hospital laboratories, academic institutions, and research settings. Training emphasizes analytical method development and validation, clinical consultation with healthcare teams, laboratory quality management, point-of-care testing oversight, test utilization strategies, and informatics applications (Figure. 1 and 2).

## Route 2: Medical Biochemistry (MD entry)

This pathway is designed for physicians. Entry requires an MD degree and completion of residency prerequisites. Training spans five years under the Royal College of Physicians and Surgeons of Canada (RCPSC) framework: three years of core Internal Medicine or Pediatrics, followed by two years of laboratory-focused Medical Biochemistry residency. Graduates are eligible for RCPSC certification in Medical Biochemistry, recognized by provincial licensing authorities. This route prepares physicians for dual roles as consultant clinicians and laboratory leaders, integrating patient care with biochemical test interpretation. The curriculum emphasizes clinical-

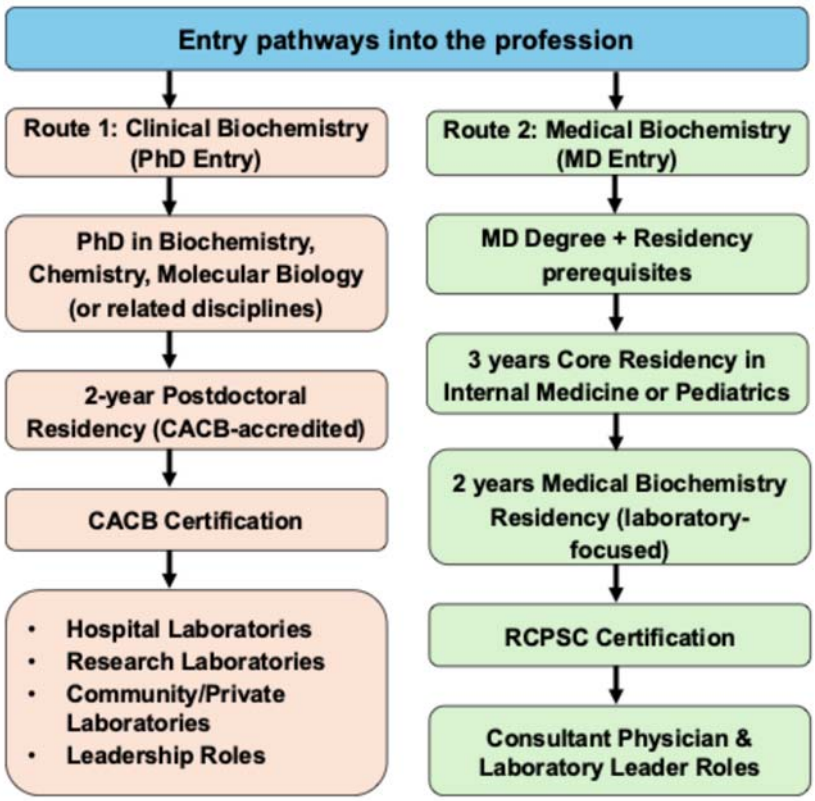


**Figure 1.** The flowchart shows the two pathways into the clinical and Medical Biochemistry in Canada.


**Figure 2.** Outline of the Clinical Chemistry fellowship in Canada. It takes three years including the board certification.

laboratory integration, laboratory operations and administration, consultative services to other physicians, and applied research (Figure. 1).

## Status of Clinical Chemistry programs in Canada

Currently, the most common route is the PhD route with 2-year CACB-accredited postdoctoral training (with two centres offering 3 years). Programs are available at 8 universities in Canada. However, only three Canadian fellowship programs are accredited by the North American ComACC framework, and some are explicitly designed to meet the eligibility requirements of both the CACB (Canada) and the ABCC (U.S.). The universities offering these programs, along with their eligibility criteria and other requirements, are outlined below.

### University of Toronto

The University of Toronto postdoctoral training program in Clinical Chemistry is the largest and one of the most established programs of its kind in Canada. It was founded by Dr Allan G Gornall in 1968 and has trained over 100 clinical biochemists currently practicing in Canada, USA, and internationally. This two-year, COMACC-accredited residency runs annually from July 1 to June 30 and is supported by the Ontario Ministry of Health and Long-Term Care. The program combines hospital-based rotations with structured coursework, tutorials, and journal clubs, ensuring broad exposure across Clinical Chemistry and related laboratory disciplines, including hematology, microbiology, and molecular biology. Trainees are evaluated through direct observation and oral examinations, reflecting both technical and consultative competencies. Successful completion leads to eligibility for certification by both the Canadian Academy of Clinical Biochemistry (CACB) and the American Board of Clinical Chemistry (ABCC). Designed to prepare fellows for leadership in academic health centres and hospital laboratories, the program emphasizes not only the interpretation of biochemical tests but also advanced training in laboratory operations, quality management, and interdisciplinary collaboration (7).

#### Length

The program spans two years, beginning on July 1 and ending on June 30 of the second year.

#### Eligibility

Applicants must hold a PhD in biochemistry or a related discipline and have successfully defended their thesis prior to the start date. A minimum academic standing of B+ is required. Candidates must be Canadian citizens or Permanent Residents and demonstrate strong communication skills.

#### Structure

Training consists of hospital-based rotations: general chemistry during the first year, followed by specialty rotations in pediatric chemistry, toxicology, genetics, microbiology, hematology, and molecular diagnostics in the second year. Major academic hospitals including Sinai Health, Toronto General Hospital, The Hospital for Sick Children (SickKids), Sunnybrook Hospital with exposure to specialized chemistry, toxicology, endocrinology, mass spectrometry, and POCT services. The curriculum also includes coursework in both analytical and Medical Biochemistry, two formal courses in statistical analysis and R programming and leadership/management, journal clubs held every two months, one to three projects per rotation, and structured teaching responsibilities.

#### Number of positions

The program accepts two fellows per year, maintaining a total of four trainees at any given time.

#### Frequency

The program has an annual intake. Applications open on October 1 and close on January 15. After an initial document review, the admissions committee prepares a shortlist of candidates who are invited to interview. Following interviews, two fellows are selected for admission.

#### Funding

The program is funded by the Ontario Ministry of Health and provides eligibility for certification by both the Canadian Academy of Clinical Biochemistry (CACB) and the American Board of Clinical Chemistry (ABCC).

### McMaster University (Hamilton)

#### Length

The program spans two years, beginning on July 1 and ending on June 30 of the second year.

### Eligibility

Applicants must hold a PhD in biochemistry or a related discipline and have successfully defended their thesis prior to the start date. A minimum academic standing of B+ is required. Candidates must be Canadian citizens or Permanent Residents and demonstrate strong communication skills.

### Structure

This program is jointly offered by McMaster University and the academic hospitals of the Hamilton Regional Laboratory Medicine Program, which include St. Joseph's Healthcare Hamilton and Hamilton Health Sciences (McMaster University Medical Centre, Hamilton General Hospital, and the Juravinski Hospital and Cancer Centre). Each participating site operates an active clinical laboratory that provides both routine diagnostic testing and specialized laboratory services.

### Number of positions

The program accepts only one fellow per year**,** maintaining a total of two trainees at any given time.

### Frequency

The program has an annual intake**.** Applications open on October 1 and close on January 15 (the dates might change). After an initial document review, the admissions committee prepares a shortlist of candidates who are invited to interview. Following interviews, two fellows are selected for admission.

### Funding

The program is funded by the Ontario Ministry of Health and provides eligibility for certification by both the Canadian Academy of Clinical Biochemistry (CACB) and the American Board of Clinical Chemistry (ABCC). Fellows could also apply for the Laboratory Medicine Resident/Fellow research Grant, awards applicants 2 times a year, and a fellow can get funding for research (8).

## University of Calgary / Alberta Precision Laboratories (9)

### Length

Clinical Biochemistry Fellowship is a two-year, full-time postdoctoral program. Training begins in July and is structured across two academic years (PGY1 and PGY2). The first year emphasizes block rotations of 4 weeks each through core areas such as general clinical biochemistry, immunochemistry, toxicology, urinalysis, and endocrine/renal pathophysiology. The second year provides a more flexible schedule, allowing fellows to pursue advanced rotations, electives, or focused research projects tailored to their interests, while also taking on on-call service and managerial responsibilities.

### Eligibility

Applicants must hold a PhD in biochemistry, chemistry, or a closely related biological science from a recognized institution, with at least 30 semester hours of advanced coursework in chemistry/biochemistry. A third-year university course in human physiology (or equivalent) is also required or must be completed prior to or during training. Strong academic performance (minimum $B^+$ average), a record of research productivity (peer-reviewed publications), teaching experience, and demonstrated leadership qualities are all important selection criteria. Priority is given to Canadian citizens and Permanent Residents, though international applicants may be considered if their credentials are formally evaluated.

### Structure

The fellowship integrates didactic instruction, mentor-led learning, and self-directed study, designed to meet the certification standards of both the Canadian Academy of Clinical Biochemistry (CACB) and the American Board of Clinical Chemistry (ABCC). Rotations span clinical biochemistry, toxicology, hematology, immunology, microbiology, pediatrics, molecular genetics, biochemical genetics, and point-of-care testing, among others. Fellows gain expertise in instrumentation, laboratory operations, quality control, budgeting, utilization management, and clinical consultation. The curriculum also incorporates on-call service, research projects (at least three in diagnostic test development), teaching opportunities, CME presentations, and collaboration across specialties such as internal medicine, nephrology, and endocrinology.

### Number of positions

The program generally supports 1 fellow per intake.

### Frequency of intake

The fellowship accepts applications annually, with a firm deadline of November 1 each year. Following the review of application packages, a shortlist of candidates is invited to interview. Selection is based on academic record, research output, teaching experience, and evidence of commitment to a career in clinical biochemistry.

### Funding

The program's funding structure reflects its joint sponsorship by the University of Calgary Department of Pathology and Laboratory Medicine and Alberta Precision Laboratories, ensuring stability and resources for both hospital-based and community-based training.

## University of Alberta (Edmonton) (10)

### Length

The fellowship is a full-time, two-year postdoctoral

training program that begins on July 1 and concludes on June 30 of the second year, aligning with academic and hospital training cycles.

### Eligibility

Applicants must hold a PhD in biochemistry, chemistry, or a closely related biomedical discipline (or equivalent) with coursework in chemistry/biochemistry and physiology, demonstrate a strong academic record (minimum B+ average), and show evidence of research productivity. Canadian citizens and Permanent Residents are given priority, though exceptional international candidates may be considered.

### Structure

The program integrates didactic teaching, hospital-based laboratory rotations, and research, covering Clinical Chemistry, hematology, immunology, microbiology, molecular genetics, toxicology, and laboratory management. Fellows engage in clinical consultation, quality management, on-call service in year two, and are expected to participate in teaching, case-based learning, and research projects leading to presentations or publications.

### Number of Positions

The fellowship admits typically accepting two fellows per year for a total complement of four fellows at any given time.

### Frequency of Intake

The program admits candidates annually, with applications due by November 1 each year. Shortlisted applicants are interviewed, and successful candidates begin training the following July.

### Funding

Fellows receive salary with benefits including health, dental, vision, and disability coverage through Alberta Precision Laboratories.

## University of Manitoba (Winnipeg)

### Length

The University of Manitoba Postdoctoral Clinical Biochemistry Fellowship spans three years, beginning July 1 each year. The first year provides foundational training in laboratory operations and core disciplines of Clinical Chemistry, while the second and third years focus on clinical and advanced laboratory rotations. By the end of the program, fellows are expected to be fully prepared for the Canadian Academy of Clinical Biochemistry (CACB) certification and independent practice as laboratory directors.

### Eligibility

Applicants must hold a PhD in biochemistry, chemistry, or a related discipline and have defended their thesis by the start of the program. Candidates must be Canadian citizens or Permanent Residents, demonstrate excellent communication, leadership, and critical thinking skills, and show evidence of self-directed learning. Applications require transcripts, proof of citizenship/residency, a personal statement, CV, copies of degrees, and three reference letters submitted directly by referees.

### Structure

The program combines hospital-based laboratory rotations with structured clinical exposure. Year one emphasizes laboratory instrumentation, method evaluation, statistics, and exposure to hematology, immunology, pathology, and therapeutic drug monitoring. Years two and three include advanced laboratory rotations (e.g., special chemistry, toxicology, molecular diagnostics, genomics, newborn screening) and clinical rotations across multiple specialties (cardiology, endocrinology, nephrology, pediatrics, oncology, and others). Residents also participate in case presentations, quality improvement projects, and direct observation assessments.

### Number of Positions

It is typically limited to one fellow every three years ensure individualized training and supervision within the hospital network.

### Frequency of Intake

The program admits new fellows on an annual basis, with applications opening on October 1 and closing on December 15. Shortlisted candidates are invited for interviews, and offers are made thereafter. The fellowship has maintained regular annual intakes since its establishment in 1977.

### Funding

The fellowship is fully funded with salaries and benefits aligned with the Professional Association of Residents and Interns of Manitoba (PARIM) agreement. Benefits include health coverage, leave entitlements, and professional allowances, comparable to those of medical residents in the University of Manitoba's postgraduate medical education system (11).

## Université de Montréal (Montréal) (12)

### Length

The D.E.P.D. in Clinical Biochemistry at Université de Montréal is a two-year, full-time postdoctoral diploma program designed specifically for PhD-trained scientists seeking specialization in clinical biochemistry within hospital or private laboratory environments.

### Eligibility

Applicants must hold a PhD in biochemistry or equivalent (with equivalency determined by the Ordre

des chimistes du Québec) obtained within the past five years and must be members in good standing of the Ordre des chimistes du Québec (OCQ). Strong proficiency in French is required, and foreign credentials are assessed for equivalence.

### Structure

The curriculum requires 69 credits comprising 18 credits of coursework across seven mandatory clinical biochemistry courses, along with six 4-month supervised hospital-based laboratory rotations (approximately 8.5 credits each), covering clinical practice, diagnostics, instrumentation, and interdisciplinary integration.

### Number of Positions

Program enrolls three to four fellows each cycle ensuring comprehensive mentorship and clinical exposure.

### Frequency of Intake

The D.E.P.D. program is offered every two years, consistent with the biannual availability of core clinical biochemistry courses offered on a two-year rotation schedule.

### Funding

Prospective fellows may seek funding through professional bodies such as the Société québécoise de biochimie clinique (SQBC), while general support may depend on departmental resources or external bursaries.

## Memorial University of Newfoundland (St. John's) (13)

### Length

The program is a full-time, three-year salaried fellowship beginning on July 2. It is accredited by the Canadian Academy of Clinical Biochemistry (CACB) and designed to provide progressive training, with the first two years emphasizing guided and self-directed study, and the third year focused on applying accumulated knowledge and skills in practice.

### Eligibility

Applicants must hold a PhD or MD in chemistry, biochemistry, or related biological sciences from a Canadian/US institution, or equivalent credentials verified through a Canadian-recognized evaluation service. They must demonstrate strong academic performance (minimum $B^+$ average), proficiency in English (IELTS ≥7.0 or TOEFL iBT ≥23 if applicable), and preferred competencies in physiology, data analytics, and coding. Proof of Canadian citizenship or permanent residency is required, and candidates must agree to a three-year return-of-service in Newfoundland and Labrador after CACB certification.

### Structure

Training follows the CACB syllabus and incorporates guided weekly learning plans, laboratory and clinical rotations, research projects, and progressive service responsibilities. The first two years emphasize laboratory medicine, clinical case-based learning, and technical expertise, while the third year focuses on applying leadership and management skills. Trainees rotate through related disciplines (molecular diagnostics, hematology, microbiology, pathology), attend conferences, and engage in teaching, administration, and quality management.

### Number of Positions

The program is highly selective, admitting one trainee at a time. This allows for individualized supervision, mentorship, and professional development within a close academic and hospital-based community.

### Frequency of Intake

The fellowship accepts one new trainee approximately every three years, depending on when the current fellow completes training. Applications for the intake close on March 15 that year and starts on July.

### Funding

This is a salaried position. The fellow receives a full stipend aligned with postgraduate medical education policies, along with standard benefits through Memorial University and Newfoundland and Labrador Health Services. In exchange, fellows must sign a return-of-service agreement with the provincial government to practice as a Clinical Biochemist in Newfoundland and Labrador for three years following CACB certification.

## University of Saskatchewan (Saskatoon) (14)

### Length

The Clinical Biochemistry Fellowship at the University of Saskatchewan is a two-year, postdoctoral training program beginning each year on July 1. The program is designed to provide intensive training in clinical biochemistry, preparing fellows for eligibility to sit the certification examination of the Canadian Academy of Clinical Biochemists (CACB).

### Eligibility

Applicants must hold a PhD (or equivalent, such as MD/PhD) in biochemistry, chemistry, physiology, or a related discipline, and must be Canadian citizens or Permanent Residents. They should demonstrate a strong academic record (minimum $B^+$ average), prior research and teaching experience, and knowledge in biochemistry, pathophysiology, statistics, immunodiagnostics, genetics, and toxicology. Candidates with international degrees must undergo credential evaluation.

### Structure

The program combines hospital-based laboratory rotations with academic and professional development.

**Table 2.** Clinical Chemistry / Biochemistry Fellowship Programs in Canada

| University / Program | Length | Eligibility | Positions | Intake Frequency | Funding |
|---|---|---|---|---|---|
| **University of Toronto** | 2 years | PhD in biochemistry/related<br>Thesis defended<br>Minimum GAP: B+<br>Canadian citizen/PR<br>Strong communication | 2/year | Annual (application due is Oct–Jan) | Ontario Ministry of Health |
| **McMaster University** | 2 years | PhD in biochemistry/related<br>Minimum GAP: B+<br>Canadian citizen/PR | 1/year | Annual (application due is Oct–Jan) | Ontario Ministry of Health |
| **University of Calgary / Alberta Precision Laboratories** | 2 years | PhD in biochemistry/related<br>Physiology course<br>Minimum GAP: B+<br>Research/teaching record<br>Priority to Canadians | 1/year | Annual (application due is Nov 1) | University of Calgary |
| **University of Alberta (Edmonton)** | 2 years | PhD in biochemistry/related<br>Minimum GAP: B+<br>Research output<br>Canadians prioritized | 2/year | Annual (application due is due Nov 1) | Alberta Precision Laboratories and University of Alberta |
| **University of Manitoba** | 3 years | PhD biochemistry/related<br>Defended thesis<br>Canadian citizen/PR<br>Strong communication/leadership | 1/years | Every three years (application due is Oct–Dec) | Fully funded, salaries/benefits under PARIM agreement |
| **Université de Montréal (D.E.P.D.)** | 2 years | PhD in biochemistry<br>(or equivalent, OCQ approval)<br>OCQ membership<br>Proficiency in French | 3–4/year | Biennial (every 2 years) | Funding via SQBC, bursaries, departmental resources |
| **Memorial University of Newfoundland** | 3 years | PhD or MD in biochemistry/related<br>Minimum GAP: B+<br>English proficiency<br>Canadian citizen/PR | 1/year | Every 3 years | Salaried fellowship; benefits; return-of-service required |
| **University of Saskatchewan** | 2 years | PhD/MD-PhD biochemistry/related<br>Minimum GAP: B+<br>Canadian citizen/PR<br>Teaching and research experience | 1/year | Annual (application due is Feb 1) | Provincial health authorities/hospitals |

Training includes exposure to routine and specialized laboratory services, development of skills in research, teaching, and independent laboratory direction, and close mentorship with faculty. Emphasis is placed on fostering independence, scholarly activity, and leadership skills, in alignment with CACB competencies.

### Number of Positions

The program typically accepts only one fellow at a time to maintain high educational quality and individualized supervision.

### Frequency of Intake

The fellowship admits trainees annually, with the program starting on July 1. Applications are due by February 1 each year. Candidates are shortlisted based on academic background, research and teaching experience, and alignment of professional goals with the practice of clinical biochemistry, followed by a competitive selection process.

### Funding

Funding for fellows comes from approved and sustainable sources such as provincial health authorities, hospitals, or government agencies. The program does not allow self-funding. Fellows receive financial support equivalent to other postgraduate medical trainees, ensuring stability for the full two-year duration. The funding model underscores the program's emphasis on training rather than service provision.

## Status of Medical Biochemistry programs in Canada

Four Canadian universities offer residency training in Medical Biochemistry: McGill University (Quebec), the University of British Columbia (British Columbia), the University of Ottawa (Ontario), and the University of Manitoba (Manitoba). Unlike the Clinical Chemistry fellowship programs (PhD-based), the Medical Biochemistry residency (MD-based) is well harmonized across the country, with consistent eligibility criteria and program length (Table 3).

**Table 3.** Medical Biochemistry Programs in Canada

| University / Program | Length | Eligibility | Positions | Intake Frequency | Funding |
|---|---|---|---|---|---|
| **McGill University** | 5 years | MD<br>Canadian citizen/PR or IMG (recognized credentials) | (1–2/year) | Annual via CaRMS | Resident salary (PARO-Québec agreement) |
| **University of British Columbia (UBC)** | 5 years | MD<br>Canadian citizen/PR or eligible IMG | (1/year) | Annual via CaRMS | Resident salary (PAR-BC agreement) |
| **University of Ottawa** | 5 years | MD<br>Canadian citizen/PR or IMG with licensure | (1/year) | Annual via CaRMS | Resident salary (PARO/collective agreements) |
| **University of Manitoba** | 5 years | MD<br>Canadian citizen/PR or IMG | (1/year) | Annual via CaRMS | Resident salary (PARIM agreement, PGME-funded) |

## Job opportunities for Clinical Chemistry and Medical Biochemistry in Canada

### Clinical Chemists (PhD-trained, CACB-certified)

In Canada, Clinical Chemists typically work as directors or consultants in hospital laboratories (community or academic centres), where they oversee analytical processes, validate new tests, troubleshoot instruments, and provide expert interpretation of complex biochemical results. They often sit on clinical advisory committees and interact with physicians on patient cases such as endocrine disorders, inborn errors of metabolism, and toxicology. In addition to hospital practice, Clinical Chemists may work in public health laboratories, provincial reference labs, or private diagnostic companies (e.g., LifeLabs, Dynacare). Academic appointments are also common, where fellows may combine laboratory practice with teaching, clinical research, or leadership in quality assurance. Some move into industry or regulatory agencies (e.g., Health Canada, in-vitro diagnostics companies) focusing on assay development, laboratory medicine policy, or accreditation frameworks (15).

### Medical Biochemists (MD-trained, RCPSC-certified)

Medical Biochemists are licensed physicians who specialize in laboratory medicine with expertise in biochemistry. Most serve as medical directors of hospital laboratories, where they hold ultimate responsibility for test interpretation, quality, and clinical consultation. Similar to Clinical Chemists, they also frequently hold clinical faculty positions within departments of pathology and laboratory medicine, combining diagnostic service with teaching of medical residents and medical students. Many are involved in multidisciplinary case reviews (e.g., metabolic rounds, oncology boards), where biochemical data inform patient care. With their medical license, they may also engage in administrative leadership within hospitals, health authorities, or provincial laboratory networks. Outside the hospital, they are qualified for roles in health policy, regulation, and laboratory accreditation bodies, and some combine laboratory leadership with clinical practice in related specialties (e.g., endocrinology or internal medicine) (16).

## Conclusion

The current state of education in Clinical Chemistry and Medical Biochemistry in Canada is the result of resilience, adaptation, and collaboration. What began with a focus on quality assurance and professional identity has evolved into a nationally coordinated system that integrates scientific expertise with clinical responsibility. Today, Clinical Chemists and Medical Biochemists complete well-structured training programs that prepare them to lead laboratories, provide expert consultation on complex biochemical disorders, and contribute to shaping healthcare policy.

As healthcare advances toward increasingly personalized medicine and highly individualized treatment, the demand for skilled laboratory leaders and scientists will continue to grow, and the role of the laboratory will become even more prominent. Canada's dual training model, built on strong accreditation and certification frameworks, provides a solid foundation; however, ongoing innovation will be essential to remain aligned with international standards and evolving healthcare needs. Ultimately, the profession's true value lies not only in delivering precise test results, but also in fostering trust with clinicians and making a meaningful difference in patient care.

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