

# Medical Laboratory Scientist

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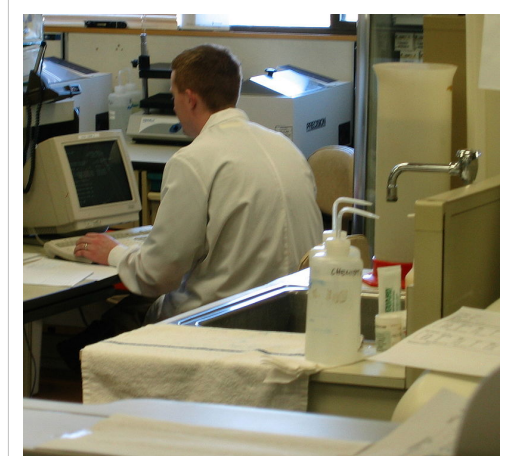
A **Clinical Laboratory Scientist (CLS)** is a healthcare professional who performs chemical, hematological, immunologic, microscopic, and bacteriological diagnostic analyses on body fluids such as blood, urine, sputum, stool, cerebrospinal fluid (CSF), peritoneal fluid, pericardial fluid, and synovial fluid, as well as other specimens. Medical Laboratory Scientists work in clinical laboratories at hospitals, doctor's offices, reference labs, and biotechnology labs.

## Educational requirements

A Clinical Laboratory Scientist typically earns a bachelor's degree in clinical laboratory science, medical technology or in a life science, in which case certification from an accredited training program is also required. In most four-year medical technology degree programs, the student attends classroom courses for three years and clinical rotations for one year. This combination is called a 3+1 program; 2+2 and 4+1 programs also exist, offering the respective numbers of years in classroom and clinical experiences. In clinical rotations, the student experiences hands-on learning in each discipline of the laboratory and, under supervision, performs diagnostic testing in a functioning laboratory. Although not compensated, a student in the clinical phase of training usually works 40 hours per week for 52 weeks (or one full year), experiencing work as a full-time employee. In addition, limited universities now offer graduate level programs to allow students who have undergraduate degrees in disciplines unrelated to science to enter the field.

In the United States, a similar two-year degree qualifies the graduate to work as a medical laboratory technician (MLT). Depending on the state where employment is granted, the job duties are very similar, but MLTs receive training more exclusively in laboratory sciences. The shorter training time is attractive to many students, but there are disadvantages to this route. For example, CLSs usually earn higher salaries than MLTs, and some institutions do not employ MLTs at all.

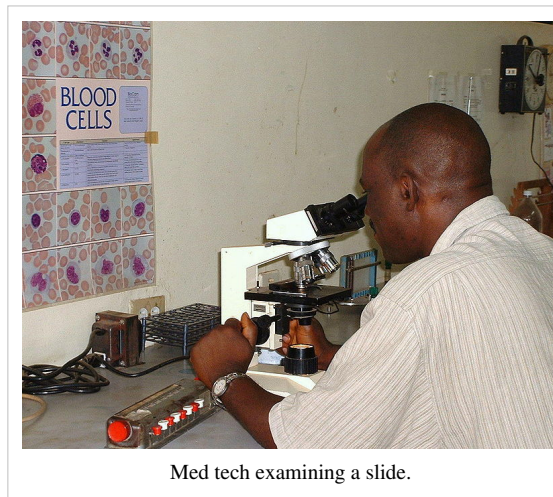
In Canada, three-year college programs are offered that include seven semesters, two of them comprising an unpaid internship. The student graduates before taking a standard examination (such as the Canadian Society for Medical Laboratory Science, or CSMLS, exam) to be qualified as a medical laboratory technologist.<sup>[1]</sup> Many MLTs go on to receive a bachelor of science degree after they are certified, but a few university programs affiliate with a college MLT program to allow students to graduate with both MLT certification and a degree.



Lab tech in his work environment.

## Certification and licensing

Clinical Laboratory Scientists who are certified and in good standing with the American Society for Clinical Pathology (ASCP) are entitled to use the credential "MLS" after their names. Formerly before the merger between ASCP and the National Credentialing Agency for Laboratory Personnel (NCA), Medical Laboratory Scientists certified by (ASCP) were entitled to use the credential "MT" (for Medical Technologist) <sup>[2]</sup> <sup>[3]</sup> and if credentialed by (NCA), the credential "CLS" (Clinical Laboratory Scientist) was used.<sup>[4]</sup> Those certified by the Department of Health Services (HHS formally HEW), the American Association of Bioanalysts (AAB) and the American Medical Technologists (AMT) are still entitled to use the credential "MT."<sup>[5]</sup> AMT is located in Rosemont, Illinois and has state societies which publish newsletters, and hold continuing education credit seminars during the year with a national meeting in the summer. Additional certifying agencies include the National Healthcareer Association, National Phlebotomy Association, the National Center for Competency Testing, and the Accrediting Bureau of Health Education Schools. However the NCA and ASCP have now merged into the major certification agency.<sup>[6]</sup>



Med tech examining a slide.

In the United States, the Clinical Laboratory Improvement Amendments (CLIA '88) define the level of qualification required to perform tests of various complexity.<sup>[7]</sup> Clinical Laboratory Scientists is the highest level of qualification, and CLSs are generally qualified to perform the most complex clinical testing including HLA testing (also known as tissue typing) and blood type reference testing.

In addition to the national certification, 12 states (California, Florida, Georgia, Hawaii, Louisiana, Montana, Nevada, North Dakota, Rhode Island, Tennessee, West Virginia and New York) and Puerto Rico also require a state license. Minnesota, Texas, Illinois, Massachusetts, Michigan, Vermont, Washington, New Jersey, Iowa, , Utah, Ohio, South Carolina, Wyoming, Pennsylvania, Virginia, South Dakota, Delaware, Missouri, Georgia and Alaska are currently attempting to obtain licensure. All states require documentation from a professional certification agency before issuing state certification. A person applying for state certification may also be expected to submit fingerprints, education and training records, and competency certification. Some states also require completion of a specified number of continuing education contact hours prior to issuing or renewing a license.

Some states recognize another state's license if it is equal or more stringent, but currently California does not recognize any other state license.<sup>[8]</sup>

## Specialty areas

Most Clinical Laboratory Scientists are *generalists*, skilled in all areas of the clinical laboratory. However some CLSs are *specialists*, qualified by unique undergraduate education or additional training to perform more complex analyses than usual within a specific field. Specialties include clinical biochemistry, hematology, coagulation, microbiology, bacteriology, virology, parasitology, mycology, immunology, immunohematology (blood bank), histopathology, histocompatibility, cytopathology, genetics, cytogenetics, electron microscopy, and IVF labs. Medical Technologists specialty may use additional credentials, such as "SBB" (Specialist in Blood Banking) from the American Association of Blood Banks, or "SH" (Specialist in Hematology) from the ASCP. These additional notations may be appended to the base credential, for example, "MLS(ASCP)SBB".

## Job duties

Clinical Laboratory Scientists work in all areas of the clinical laboratory including blood banking, chemistry, hematology, immunology, and microbiology. They perform a full range of laboratory tests – from simple prenatal blood tests, to more complex tests to uncover diseases such as HIV/AIDS, diabetes, and cancer. They are also responsible for confirming the accuracy of test results, and reporting laboratory findings to pathologists and other physicians. The information that a Clinical Laboratory Scientist gives to the doctor influences the medical treatment a patient will receive. Clinical Laboratory Scientists operate complex electronic equipment, computers, and precision instruments costing millions of dollars.<sup>[9]</sup>

A Clinical Laboratory Scientist analyzes human fluid samples using techniques available to the clinical laboratory, such as manual white blood cell differentials, bone marrow counts, analysis via microscopy, and advanced analytical equipment. Clinical Laboratory Scientists assist doctors and nurses in choosing the correct lab tests and ensure proper collection methods. Clinical Laboratory Scientists then receive the patient specimens, analyze the specimens, interpret and report results. A Pathologist may confirm a diagnostic result, but often the Medical Technologist is responsible for interpreting and communicating critical patient results to the physician.

Clinical Laboratory Scientists must recognize anomalies in their test results and know how to correct problems with the instrumentation. They monitor, screen, and troubleshoot analyzers featuring the latest technology available on the market. The CLS performs equipment validations, calibrations, quality controls, "STAT" or run-by-run assessment, statistical control of observed data, and recording normal operations. To maintain the integrity of the laboratory process, the medical laboratory scientist recognizes factors that could introduce error and rejects contaminated or sub-standard specimens.

Common tests performed by Clinical Laboratory Scientists are complete blood count (CBC), comprehensive metabolic panel (CMP), electrolyte panel, liver function tests (LFT), renal function tests (RFT), thyroid function test (TFT), urinalysis, coagulation profile, lipid profile, blood type, semen analysis (for fertility and post-vasectomy studies), serological studies and routine cultures. In some facilities that have few phlebotomists, or none at all, (such as in rural areas) Clinical Laboratory Scientists may perform phlebotomy on patients, as this skill is part of the clinical training.

## Role in the healthcare process

A Clinical Laboratory Scientist's role is to provide accurate laboratory results in a timely manner. Safeguards, such as experimental controls, calibration of laboratory instruments, delta checks (monitoring of significant changes within a normal series of results, formerly known as the "previous patients check"<sup>[10]</sup>), and periodic surveys from the College of American Pathologists (CAP), ensure accuracy. Laboratory results aid clinical practitioners in confirming or ruling out diagnoses, monitoring chronic disease changes, and analyzing the effects of medical therapies.

## Job title

The informal abbreviations of job titles may be a source of confusion. Medical Laboratory Scientist (formally Medical Technologist)(ASCP) and Medical Technologists (AMT) or (AAB) are often called "med techs" (based on the era in which they were known as "medical technologists"), but this shorthand term is shared by other healthcare employees, including pharmacy techs, x-ray techs and, formerly, respiratory techs, (now called respiratory therapists) and medical laboratory technicians (MLTs).

There is a formal distinction between a MLT and a MT/CLS that is not always understood by others. Both may be certified or registered by one or more nationally-recognized professional organizations, but technicians have a two-year associates degree, and may have less classroom training than other professionals. MTs and CLSs have a bachelors degree and usually do more difficult, complex analyses than technicians are trained to do. Scientists and

technologists generally earn a higher income than technicians do and have more opportunities for advancement.

Much of the confusion could also be from the fact that the NCA and the ASCP certification agency, had two different titles (clinical laboratory scientist and medical technologist respectively) but with the two of them merging together into a "newer" ASCP and that organization choosing the name "Medical Laboratory Scientist", it can be said that finally the field has a "unified" title between the two organizations, however, the AMT still continues to use the title Medical Technologist.

## Shortage

The United States is currently experiencing a shortage of Clinical Laboratory Scientists as well as virtually all other healthcare professionals. Student enrollment in CLS programs is steadily declining. Many universities have cut budgets for Clinical Lab Science programs, and some have closed them altogether. According to an article in the October 2008 issue of *Critical Values* (Vol. 1, Issue 4), a critical shortage of MLSs is swiftly approaching.

"The number of technologist/scientist and technician education programs has declined by more than 50% since 1970, with the most dramatic decline in technologist/scientist programs, 71% of which closed between 1970 and 2007. In contrast, the number of phlebotomy training programs increased sixfold from 1987 to 2003.... The shortage of technologists/scientists and technicians is expected to worsen over the next decade with demographic changes and requirements."<sup>[11]</sup>

A primary reason for this decline is the vast disparity in salary compared to other healthcare workers.<sup>[12]</sup> A typical medical technologist's salary is only 50% to 70% of that of a registered nurse (RN), depending on geographical location.<sup>[13]</sup> For instance, in Washington, D.C., the median MLS salary is \$55,000, compared to \$67,695 for a registered nurse with an equivalent amount of experience. United States Bureau of Labor Statistics statistics from 2005 list the median annual income for a medical technologist in California as \$64,540, the highest average in the nation. A major reason for this disparity is lack of public view for the profession. Hospitals and other clinical laboratories prefer to cut costs in ways that are less obvious to patients, so when expenses are reduced, MLSs are more likely than nursing staff to be affected by it.

Another reason for the shortage of Clinical Laboratory Scientists in the United States is an aging workforce.

"The average laboratory professional is believed to be almost 50. Given the number of new laboratory professionals needed due to increasing requirements for laboratory services and the number of employees within 5-10 years of retirement, demand is expected to far exceed the number anticipated to be available for hire."<sup>[14]</sup>

A positive effect of this shift is that the number of job openings for CLSs will increase in the next decade as baby boomers retire and make way for new staff in laboratories. But at the same time, the workload will also increase for the young, inexperienced Medical Laboratory Scientists as the elderly population increases and become greater consumers of health care. This will only increase the need for more people to enter the profession, and the number of students currently in training programs will not be sufficient to satisfy the future vacancies and the increased work load.

One possible way to decrease the shortage is to make secondary and post-secondary educators and advisers aware of both the benefits associated with degrees from accredited medical technology/Clinical laboratory Science programs and urge them to inform their students about the profession. Students should be aware that Medical Laboratory Scientists perform complex laboratory testing requiring accuracy and integrity, and that a degree in medical Laboratory Science can lead to satisfying wages, management opportunities, or even a path to another professional career, such as dentist, pharmacist, physician, or laboratory equipment sales or repair.

## Australia

Similar to the US, Australian laboratories also employ Clinical Laboratory Scientists to perform a large role of duties within a clinical laboratory. The training required is that of a bachelor degree ranging from 3 to 4 years in duration depending on the institution. Those with a degree in Biomedical Science with majors in the relevant fields are also employed to fill the same roles however there is a growing push to hire only those with a recognised CLS degree due to their more specialised training and knowledge. The body that oversees registration of scientists in the medical laboratory in Australia is AIMS, Australian Institute of Medical Scientists, not to be confused with the Australian Institute of Marine Scientists. Most employers require that scientists are members of AIMS.

## See also

- Allied health professions
- Automated analyser
- Blood bank
- Blood test
- Biomedical Scientist similar career outside of the US
- Body fluids
- Clinical pathology
- ISO 15189
- Laboratory centrifuge
- Laboratory information system
- Medical technology
- Medical laboratory
- Phlebotomist
- Reference ranges for common blood tests
- Urine test

## External links

- Canadian Society for Medical Laboratory Science <sup>[15]</sup>
- U.S. Department of Labor information on Clinical Laboratory Technologists and Technicians <sup>[16]</sup>
- American Society of Clinical Pathology <sup>[17]</sup>
- American Society of Clinical Laboratory Science <sup>[18]</sup>
- National Credentialing Agency for Laboratory Personnel <sup>[19]</sup>
- National Accrediting Agency for Clinical Laboratory Science <sup>[20]</sup>
- Medical Technologist Continuing Education <sup>[21]</sup>
- AIMS: Australian Institute of Medical Scientists <sup>[22]</sup>

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- [2] ASCP career information (<http://www.ascp.org/certification/CertifyingExaminations/>)
- [3] AAB certification requirements (<http://www.aab.org/mt.htm>)
- [4] National Credentialing Agency for Laboratory Personnel (<http://www.nca-info.org/>)
- [5] Letter to the editor of [[Advance for Medical Laboratory Professionals ([http://community.advanceweb.com/blogs/mt\\_1/archive/2009/10/19/letter-to-the-editor-amt-s-view-of-the-ascp-nca-merger.aspx](http://community.advanceweb.com/blogs/mt_1/archive/2009/10/19/letter-to-the-editor-amt-s-view-of-the-ascp-nca-merger.aspx))] from the executive director of AMT]
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