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# Clinical Laboratory Technologists and Technicians

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## Significant Points

- Clinical laboratory technologists usually have a bachelor's degree with a major in medical technology or in one of the life sciences; clinical laboratory technicians generally need either an associate degree or a certificate.
- Average employment growth is expected as the volume of laboratory tests increases with both population growth and the development of new types of tests.
- Job opportunities are expected to be excellent.

## Nature of the Work

Clinical laboratory testing plays a crucial role in the detection, diagnosis, and treatment of disease. Clinical laboratory technologists, also referred to as clinical laboratory scientists or medical technologists, and clinical laboratory technicians, also known as medical technicians or medical laboratory technicians, perform most of these tests.

Clinical laboratory personnel examine and analyze body fluids, tissues, and cells. They look for bacteria, parasites, and other microorganisms; analyze the chemical content of fluids; match blood for transfusions; and test for drug levels in the blood to show how a patient is responding to treatment. These technologists also prepare specimens for examination, count cells, and look for abnormal cells. They use automated equipment and instruments capable of performing a number of tests simultaneously, as well as microscopes, cell counters, and other sophisticated laboratory equipment. Then they analyze the results and relay them to physicians. With increasing automation and the use of computer technology, the work of technologists and technicians has become less hands-on and more analytical.

The complexity of tests performed, the level of judgment needed, and the amount of responsibility workers assume depend largely on the amount of education and experience they have.

*Clinical laboratory technologists* generally have a bachelor's degree in medical technology or in one of the life sciences, or they have a combination of formal training and work experience. They perform complex chemical, biological, hematological, immunologic, microscopic, and bacteriological tests. Technologists microscopically examine blood, tissue, and other body substances. They make cultures of body fluid and tissue samples, to determine the presence of bacteria, fungi, parasites, or other microorganisms. Clinical laboratory technologists analyze samples for chemical content or a chemical reaction and determine blood glucose and cholesterol levels. They also type and cross match blood samples for transfusions.

Clinical laboratory technologists evaluate test results, develop and modify procedures, and establish and monitor programs, to ensure the accuracy of tests. Some clinical laboratory technologists supervise clinical laboratory technicians.

Technologists in small laboratories perform many types of tests, whereas those in large laboratories generally specialize. Technologists who prepare specimens and analyze the chemical and hormonal contents of body fluids are called clinical chemistry technologists. Those who examine and identify bacteria and other microorganisms are microbiology technologists.

Blood bank technologists, or immunohematology technologists, collect, type, and prepare blood and its components for transfusions. Immunology technologists examine elements of the human immune system and its response to foreign bodies. Cytotechnologists prepare slides of body cells and examine these cells microscopically for abnormalities that may signal the beginning of a cancerous growth. Molecular biology technologists perform complex protein and nucleic acid testing on cell samples.

*Clinical laboratory technicians* perform less complex tests and laboratory procedures than technologists perform. Technicians may prepare specimens and operate automated analyzers, for example, or they may perform manual tests in accordance with detailed instructions. Like technologists, they may work in several areas of the clinical laboratory or specialize in just one. Histotechnicians cut and stain tissue specimens for microscopic examination by pathologists, and phlebotomists collect blood samples. They usually work under the supervision of medical and clinical laboratory technologists or laboratory managers.

## Working Conditions

Hours and other working conditions of clinical laboratory technologists and technicians vary with the size and type of employment setting. In large hospitals or in independent laboratories that operate continuously, personnel usually work the day, evening, or night shift and may work weekends and holidays. Laboratory personnel in small facilities may work on rotating shifts, rather than on a regular shift. In some facilities, laboratory personnel are on call several nights a week or on weekends, in case of an emergency.

Clinical laboratory personnel are trained to work with infectious specimens. When proper methods of infection control and sterilization are followed, few hazards exist. Protective masks, gloves, and goggles are often necessary to ensure the safety of laboratory personnel.

Laboratories usually are well lighted and clean; however, specimens, solutions, and reagents used in the laboratory sometimes produce fumes. Laboratory workers may spend a great deal of time on their feet.

## Employment

Clinical laboratory technologists and technicians held about 297,000 jobs in 2002. More than half of jobs were in hospitals.



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Most of the remaining jobs were in offices of physicians and in medical and diagnostic laboratories. A small proportion was in educational services; other ambulatory healthcare services, including blood and organ banks; outpatient care centers; and scientific research and development services.

**Training, Other Qualifications, and Advancement**

The usual requirement for an entry-level position as a clinical laboratory technologist is a bachelor’s degree with a major in medical technology or in one of the life sciences; although it is possible to qualify through a combination of education, on-the-job, and specialized training. Universities and hospitals offer medical technology programs.

Bachelor’s degree programs in medical technology include courses in chemistry, biological sciences, microbiology, mathematics, and statistics, as well as specialized courses devoted to knowledge and skills used in the clinical laboratory. Many programs also offer or require courses in management, business, and computer applications. The Clinical Laboratory Improvement Act requires technologists who perform highly complex tests to have at least an associate degree.

Medical and clinical laboratory technicians generally have either an associate degree from a community or junior college or a certificate from a hospital, a vocational or technical school, or one of the U.S. Armed Forces. A few technicians learn their skills on the job.

The National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) fully accredits 467 programs for medical and clinical laboratory technologists, medical and clinical laboratory technicians, histotechnologists and histotechnicians, cytogenetic technologists, and diagnostic molecular scientists. NAACLS also approves 57 programs in phlebotomy and clinical assisting. Other nationally recognized accrediting agencies that accredit specific areas for clinical laboratory workers include the Commission on Accreditation of Allied Health Education Programs and the Accrediting Bureau of Health Education Schools.

Some States require laboratory personnel to be licensed or registered. Information on licensure is available from State departments of health or boards of occupational licensing. Certification is a voluntary process by which a nongovernmental organization, such as a professional society or certifying agency, grants recognition to an individual whose professional competence meets prescribed standards. Widely accepted by employers in the health industry, certification is a prerequisite for most jobs and often is necessary for advancement. Agencies certifying medical and clinical laboratory technologists and technicians include the Board of Registry of the American Society for Clinical Pathology, the American Medical Technologists, the National Credentialing Agency for Laboratory Personnel, and the Board of Registry of the American Association of Bioanalysts. These agencies have different requirements for certification and different organizational sponsors.

Clinical laboratory personnel need good analytical judgment and the ability to work under pressure. Close attention to detail is essential, because small differences or changes in test substances or numerical readouts can be crucial for patient care. Manual dexterity and normal color vision are highly desirable. With the widespread use of automated laboratory equipment, computer skills are important. In addition, technologists in particular are expected to be good at problem solving.

Technologists may advance to supervisory positions in laboratory work or may become chief medical or clinical laboratory technologists or laboratory managers in hospitals. Manufacturers of home diagnostic testing kits and laboratory equipment and supplies seek experienced technologists to work in product development, marketing, and sales. A graduate degree in medical technology, one of the biological sciences, chemistry, management, or education usually speeds advancement. A doctorate is needed to become a laboratory director; however, Federal regulation allows directors of moderately complex laboratories to have either a master’s degree or a bachelor’s degree, combined with the appropriate amount of training and experience. Technicians can become technologists through additional education and experience.

**Job Outlook**

Job opportunities are expected to be excellent, because the number of job openings is expected to continue to exceed the number of job seekers. Employment of clinical laboratory workers is expected to grow about as fast as the average for all occupations through the year 2012, as the volume of laboratory tests increases with both population growth and the development of new types of tests.

Technological advances will continue to have two opposing effects on employment through 2012. On the one hand, new, increasingly powerful diagnostic tests will encourage additional testing and spur employment. On the other hand, research and development efforts targeted at simplifying routine testing procedures may enhance the ability of nonlaboratory personnel—physicians and patients in particular—to perform tests now conducted in laboratories. Although hospitals are expected to continue to be the major employer of clinical laboratory workers, employment is expected to grow faster in medical and diagnostic laboratories, offices of physicians, and other ambulatory health care services, including blood and organ banks.

Although significant, job growth will not be the only source of opportunities. As in most occupations, many openings will result from the need to replace workers who transfer to other occupations, retire, or stop working for some other reason.

**Earnings**

Median annual earnings of medical and clinical laboratory technologists were \$42,910 in 2002. The middle 50 percent earned between \$36,400 and \$50,820. The lowest 10 percent earned less than \$30,530, and the highest 10 percent earned more than \$58,000. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technologists in 2002 were as follows:

General medical and surgical hospitals .....	\$43,340
Medical and diagnostic laboratories .....	42,020
Offices of physicians .....	38,690

Median annual earnings of medical and clinical laboratory technicians were \$29,040 in 2002. The middle 50 percent earned between \$23,310 and \$35,840. The lowest 10 percent earned less than \$19,070, and the highest 10 percent earned more than \$43,960. Median annual earnings in the industries employing the largest numbers of medical and clinical laboratory technicians in 2002 were as follows:

General medical and surgical hospitals .....	\$30,500
Colleges, universities, and professional schools .....	30,350
Offices of physicians .....	27,820
Medical and diagnostic laboratories .....	27,550
Other ambulatory health care services .....	26,710

According to the American Society for Clinical Pathology, median annual wages of staff clinical laboratory technologists and technicians in 2002 varied by specialty as follows:

	<i>Lowest</i>	<i>Average</i>	<i>Highest</i>
Cytotechnologist .....	\$41,454	\$49,920	\$54,600
Histotechnologist .....	33,280	41,122	45,760
Medical technologist .....	33,280	40,186	45,760
Histotechnician .....	28,413	34,549	38,667
Medical laboratory technician .....	27,040	31,928	35,776
Phlebotomist .....	18,720	21,944	25,168

### **Related Occupations**

Clinical laboratory technologists and technicians analyze body fluids, tissue, and other substances, using a variety of tests. Similar or related procedures are performed by chemists and materials scientists, science technicians, and veterinary technologists and technicians.

### **Sources of Additional Information**

For a list of accredited and approved educational programs for clinical laboratory personnel, contact:

► National Accrediting Agency for Clinical Laboratory Sciences, 8410 W. Bryn Mawr Ave., Suite 670, Chicago, IL 60631. Internet: <http://www.naacls.org>

Information on certification is available from the following organizations:

► American Association of Bioanalysts, Board of Registry, 917 Locust St., Suite 1100, St. Louis, MO 63101. Internet: <http://www.aab.org>

► American Medical Technologists, 710 Higgins Rd., Park Ridge, IL 60068.

► American Society for Clinical Pathology, Board of Registry, 2100 West Harrison St., Chicago, IL 60612. Internet: <http://www.ascp.org/bor>

► National Credentialing Agency for Laboratory Personnel, P.O. Box 15945-289, Lenexa, KS 66285. Internet: <http://www.nca-info.org>

Additional career information is available from the following sources:

► American Association of Blood Banks, 8101 Glenbrook Rd., Bethesda, MD 20814-2749. Internet: <http://www.aabb.org>

► American Society for Clinical Laboratory Science, 6701 Democracy Blvd., Suite 300, Bethesda, MD 20817. Internet: <http://www.ascls.org>

► American Society for Clinical Pathology, 2100 West Harrison St., Chicago, IL 60612. Internet: <http://www.ascp.org>

► American Society for Cytopathology, 400 West 9th St., Suite 201, Wilmington, DE 19801. Internet: <http://www.cytopathology.org>

► Clinical Laboratory Management Association, 989 Old Eagle School Rd., Wayne, PA 19087. Internet: <http://www.clma.org>