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## Medical Scientists

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### Significant Points

- Most medical scientists need a Ph.D. in a biological science; some also hold a medical degree.
- Some medical scientists work in research laboratories at universities and hospitals; others work for pharmaceutical or biotechnology companies.
- Medical scientists with both a Ph.D. and M.D. are likely to have the best opportunities.

### Nature of the Work

Medical scientists research human diseases and conditions with the goal of improving human health. Most medical scientists conduct biomedical research and development to advance knowledge of life processes and of other living organisms that affect human health, including viruses, bacteria, and other infectious agents. Past research has resulted in advances in diagnosis, treatment, and prevention of many diseases. Basic medical research continues to build the foundation for new vaccines, drugs, and treatment procedures. Medical scientists engage in laboratory research, clinical investigation, technical writing, drug development, regulatory review, and related activities.

Medical scientists study biological systems to understand the causes of disease and other health problems. For example, some try to identify changes in cells or in chromosomes that signal the development of medical problems. They use this knowledge to develop treatments and design research tools and techniques that have medical applications. Medical scientists involved in cancer research may formulate a combination of drugs that will lessen the effects of the disease. They can then work with physicians to administer these drugs to patients in clinical trials, monitor their reactions, and observe the results. They may draw blood, excise tissue, or perform other invasive procedures. Medical scientists examine the results of clinical trials and adjust the dosage levels to reduce negative side effects or to induce better results. In addition to developing treatments for medical conditions, medical scientists attempt to discover ways to prevent health problems. For example, they may study the link between smoking and lung cancer or between alcoholism and liver disease.

Many medical scientists conduct independent research in university, hospital, or government laboratories, exploring new areas of research or expanding on specialized research that they began in graduate school. Medical scientists working in colleges and universities, hospitals, and nonprofit medical research organizations typically submit grant proposals to obtain funding for their projects. The Federal Government's National Institutes of Health (NIH) provides funding support for researchers whose proposals are determined to be financially feasible and to have the potential to advance new ideas or processes that benefit human health. Medical scientists who rely on grant money may be under pressure to meet deadlines and to conform to rigid grant-writing specifications when preparing proposals to seek new or extended funding.

Most medical scientists who work in private industry conduct applied research or support product development, using knowledge discovered through research to develop new drugs and medical treatments. They usually have less autonomy than do medical researchers in academia to choose the emphasis of their research. Medical scientists spend more time working on marketable treatments to meet the business goals of their employers. Medical scientists in private industry may also be required to explain their research plans or results to nonscientists who are in a position to reject or approve their ideas, potentially for business reasons rather than scientific merit. Medical scientists increasingly work as part of teams, interacting with engineers, scientists of other disciplines, business managers, and technicians.

Swift advances in basic medical knowledge related to genetics and organic molecules have spurred growth in the field of biotechnology. Discovery of important drugs, including human insulin and growth hormone, is the result of research using biotechnology techniques, such as recombining DNA. Many other substances not previously available in large quantities are now produced by biotechnological means; some may one day be useful in treating diseases such as Parkinson's or Alzheimer's. Today, many medical scientists are involved in the science of genetic engineering—isolating, identifying, and sequencing human genes to determine their functions. This work continues to lead to the discovery of genes associated with specific diseases and inherited health risks, such as sickle cell anemia. These advances in biotechnology have opened up research opportunities in almost all areas of medical science.

**Work environment.** Medical scientists who conduct research usually work in laboratories and use a wide variety of equipment. Some may work directly with individual patients or larger groups as they administer drugs and monitor patients during clinical trials. Often, these medical scientists also spend



*Research conducted by medical scientists has resulted in advanced treatments for many diseases.*

## Projections data from the National Employment Matrix

Occupational Title	SOC Code	Employment, 2008	Projected Employment, 2018	Change, 2008-2018	
				Number	Percent
Medical scientists, except epidemiologists .....	19-1042	109,400	153,600	44,200	40

(NOTE) Data in this table are rounded. See the discussion of the employment projections table in the *Handbook* introductory chapter on *Occupational Information Included in the Handbook*.

time working in clinics and hospitals. Medical scientists are not usually exposed to unsafe or unhealthy conditions; however, those scientists who work with dangerous organisms or toxic substances must follow strict safety procedures to avoid contamination.

Medical scientists typically work regular hours in offices or laboratories, but longer hours are not uncommon. Researchers may be required to work odd hours in laboratories or other locations, depending on the nature of their research.

### Training, Other Qualifications, and Advancement

A Ph.D. in a biological science is the minimum education required for most prospective medical scientists. However, some medical scientists also earn medical degrees in order to perform clinical work. A period of postdoctoral work in the laboratory of a senior researcher is becoming increasingly common for medical scientists.

**Education and training.** A Ph.D. in the biological sciences typically qualifies people to research basic life processes or particular medical problems and to analyze the results of experiments. Some medical scientists obtain a medical degree, instead of a Ph.D., but do not become licensed physicians, because they prefer research to clinical practice. It is particularly helpful for medical scientists to earn both a Ph.D. and a medical degree.

Students planning careers as medical scientists should pursue a bachelor's degree in a biological science. In addition to required courses in chemistry and biology, undergraduates should study allied disciplines, such as mathematics, engineering, physics, and computer science. General humanities courses are also beneficial, as writing and communication skills are necessary for drafting grant proposals and publishing research results.

Once students have completed undergraduate studies, there are two main paths for prospective medical scientists. They can enroll in a university Ph.D. program in the biological sciences; these programs typically take about 6 years of study, and students specialize in one particular field, such as genetics, pathology, or bioinformatics. They can also enroll in a joint M.D./Ph.D. program at a medical college; these programs typically take 7 to 8 years of study, where students learn both the clinical skills needed to be a physician and the research skills needed to be a scientist.

In addition to formal education, medical scientists usually spend some time in a postdoctoral position before they apply for permanent jobs. Postdoctoral work provides valuable laboratory experience, including experience in specific processes and techniques such as gene splicing, which is transferable to other research projects. In some institutions, the postdoctoral position can lead to a permanent job.

**Licensure.** Medical scientists who administer drug or gene therapy to human patients, or who otherwise interact medically

with patients—drawing blood, excising tissue, or performing other invasive procedures—must be licensed physicians. To be licensed, physicians must graduate from an accredited medical school, pass a licensing examination, and complete 1 to 7 years of graduate medical education. (See the statement on physicians and surgeons elsewhere in the *Handbook*.)

**Other qualifications.** Medical scientists should be able to work independently or as part of a team and be able to communicate clearly and concisely, both orally and in writing. Those in private industry, especially those who aspire to consulting and administrative positions, should possess strong communication skills so that they can provide instruction and advice to physicians and other healthcare professionals.

**Advancement.** Advancement among medical scientists usually takes the form of greater independence in their work, larger budgets, or tenure in university positions. Others choose to move into managerial positions and become natural science managers (see engineering and natural sciences managers elsewhere in the *Handbook*). Those who pursue management careers spend more time preparing budgets and schedules.

### Employment

Medical scientists held about 109,400 jobs in 2008. About 31 percent of medical scientists were employed in scientific research and development services firms. Another 27 percent were employed in educational services; 13 percent were employed in pharmaceutical and medicine manufacturing; and 10 percent were employed in hospitals.

### Job Outlook

Medical scientists are expected to grow much faster than average over the coming decade. Those with both a Ph.D. and M.D. are likely to experience the best opportunities.

**Employment change.** Employment of medical scientists is expected to increase 40 percent over the 2008-18 decade, much faster than the average for all occupations. Medical scientists have enjoyed rapid gains in employment since the 1980s—reflecting, in part, the growth of biotechnology as an industry. Much of the basic biological and medical research done in recent years has resulted in new knowledge, including the isolation and identification of genes. Medical scientists will be needed to take this knowledge to the next stage—understanding how certain genes function within an entire organism—so that medical treatments can be developed for various diseases. Even pharmaceutical and other firms not solely engaged in biotechnology have adopted biotechnology techniques, thus creating employment for medical scientists. However, job growth will moderate from its previous heights as the biotechnology industry matures and begins to grow at a slower rate. Some companies may also conduct more of their research and development in lower-wage countries, further limiting employment growth.

Employment growth should also occur as a result of the expected expansion in research related to illnesses such as AIDS, cancer, and avian flu, along with growing treatment problems, such as antibiotic resistance. Moreover, environmental conditions such as overcrowding and the increasing frequency of international travel will tend to spread existing diseases and give rise to new ones. Medical scientists will continue to be needed because they greatly contribute to the development of treatments and medicines that improve human health.

The Federal Government is a major source of funding for medical research. Large budget increases at the National Institutes of Health in the early part of the decade led to increases in Federal basic research and development expenditures, with research grants growing both in number and dollar amount. However, the increase in expenditures slowed substantially in recent years. Going forward, the level of Federal funding will continue to impact competition for winning and renewing research grants.

**Job prospects.** Medical scientists with both doctoral and medical degrees are likely to experience the best opportunities. Workers with both a biological and professional medical background will have a distinct advantage in competing for research funding, as certain opportunities are only open to those with both qualifications.

Medical scientists are less likely to lose their jobs during recessions than workers in many other occupations because they are employed on long-term research projects. However, a recession could influence the amount of money allocated to new research and development, particularly in areas of risky or innovative medical research. A recession also could limit extensions or renewals of existing projects.

### Earnings

Median annual wages of medical scientists, except epidemiologists, were \$72,590 in May 2008. The middle 50 percent of these workers earned between \$51,640 and \$101,290. The lowest 10 percent earned less than \$39,870, and the highest 10 percent earned more than \$134,770. Median annual wages in the industries employing the largest numbers of medical scientists were:

Drugs and druggists' sundries	
merchant wholesalers .....	\$90,640
Pharmaceutical and medicine manufacturing .....	87,500
Scientific research and development services .....	79,210
General medical and surgical hospitals .....	74,230
Colleges, universities, and professional schools .....	52,880

Earnings are lower and benefits limited for medical scientists in postdoctoral placements; workers in permanent positions typically receive higher wages and excellent benefits, in addition to job security.

### Related Occupations

Other life science research occupations include:

- Agricultural and food scientists
- Biological scientists
- Epidemiologists
- Teachers—postsecondary

Other health specialists with similar levels of education include:

- Dentists
- Pharmacists
- Physicians and surgeons
- Veterinarians

### Sources of Additional Information

For general information on medical scientists, contact:

- Federation of American Societies for Experimental Biology, 9650 Rockville Pike, Bethesda, MD 20814. Internet: <http://www.faseb.org>

For information on and a listing of M.D./Ph.D. programs, contact:

- National Association of M.D./Ph.D. Programs. Internet: <http://www.aamc.org/students/considering/research/mdphd/>

For information on pharmaceutical scientists, contact:

- American Association of Pharmaceutical Scientists (AAPS), 2107 Wilson Blvd., Suite 700, Arlington, VA 22201. Internet: <http://www.aapspharmaceutica.org>

For information on careers in pharmacology, contact:

- American Society for Pharmacology and Experimental Therapeutics, 9650 Rockville Pike, Bethesda, MD 20814. Internet: <http://www.aspet.org>

Information on obtaining a medical scientist position with the Federal Government is available from the Office of Personnel Management through USAJOBS, the Federal Government's official employment information system. This resource for locating and applying for job opportunities can be accessed through the Internet at <http://www.usajobs.opm.gov> or through an interactive voice response telephone system at (703) 724-1850 or TDD (978) 461-8404. These numbers are not toll free, and charges may result. For advice on how to find and apply for Federal jobs, see the *Occupational Outlook Quarterly* article "How to get a job in the Federal Government," online at <http://www.bls.gov/opub/ooq/2004/summer/art01.pdf>.

The Occupational Information Network (O\*NET) provides information on a wide range of occupational characteristics. Links to O\*NET appear at the end of the Internet version of this occupational statement, accessible at <http://www.bls.gov/ooh/ocos309.htm>