



# Medicinal Chemists

## ... Explore the unknown

Medicinal chemistry is the application of chemical research techniques to the synthesis of pharmaceuticals. During the early stages of medicinal chemistry development, scientists were primarily concerned with the isolation of medicinal agents found in plants. Today, scientists in this field are equally concerned with the creation of new synthetic drug compounds, possibly based on newly discovered mechanisms. The focus on development of new synthetic drug compounds has resulted in the incorporation of many other disciplines, such as biochemistry and molecular biology, into medicinal chemistry. Medicinal chemistry is almost always geared toward drug discovery and development.

## ... Develop guidelines

Chemists at the U.S. Food and Drug Administration (FDA) review new drug applications from pharmaceutical companies and are also responsible for reviewing the processes by which the substances are made. These chemists do not work in a laboratory, but their role in medicinal chemistry is important. The Office of Drug Evaluation for the FDA is the largest regulatory group in the world, employing more than 9000 people. There are about 900 chemists employed in various capacities throughout the FDA. Ten percent of these are chemists who review new drug applications for entirely new therapeutic entities. An equal number of chemists review additional new drug applications that are for generic formulas or over-the-counter dosages.

## FACT FILE: Medicinal Chemists

**WORK DESCRIPTION** ► Medicinal chemists apply their chemistry training to the process of designing and synthesizing new pharmaceutical candidates. They also work on improving the process by which other pharmaceuticals are made. Most medicinal chemists work with a team of scientists from different disciplines, including biologists, toxicologists, pharmacologists, theoretical chemists, microbiologists, and biopharmacists. Together, this team uses sophisticated analytical techniques to synthesize and test new drug products and to develop the most cost-effective and environmentally friendly means of production.

**WORK CONDITIONS** ► Medicinal chemistry offers a variety of lab opportunities. Most chemists in this field use their research skills to formulate, produce, and analyze new compounds. However, each lab environment is unique—daily activities and career opportunities differ with each one. In academe, chemists explore a compound's different mechanisms in basic research, as well as teach at least one full course. In government, laboratory work is not always required, especially at the FDA, where reviewing new drug applications is the primary focus. Industry, on other hand, offers chemists a choice of moving into management or staying in the lab.



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**PLACES OF EMPLOYMENT** ► Though a wide array of positions exists for chemists in medicinal chemistry, the availability of these jobs depends upon the economy, shifting government regulations, and research grants. Employment options include the academic environment, pharmaceutical companies, and government agencies. Biotechnology organizations also employ chemists in this area. Industry provides the opportunity to choose between a traditional laboratory career and a nonlaboratory chemistry career in management. The government also may offer a choice between lab work and a nonlab position such as drug application reviewer.

**PERSONAL CHARACTERISTICS** ► Medicinal chemists must enjoy varied activities and must be receptive to exploring the unknown. A good imagination and persistence are also two important qualities one should have when considering a career in medicinal chemistry. Being a team player and having good writing and verbal communication skills are invaluable assets when interacting with scientists from other disciplines.

**EDUCATION AND TRAINING** ► Generally, pharmaceutical companies hire only people with research experience; advanced degrees, especially in organic chemistry; and at least two years of postdoctoral experience. Most chemists in traditional research careers have Ph.D.s, whereas those with B.S. degrees generally serve as research technicians. You can place yourself in a competitive position by getting as much experience as possible with a strong background in organic chemistry and biochemistry. A number of universities have formed medicinal chemistry programs within the past 20 years.

**SALARY RANGE** ► The starting salary for a B.S. chemist ranges from the high \$30,000- to the high \$40,000-per-year range. Master's degree holders earn salaries in the high-\$40,000 to mid-\$50,000-per-year range. The salary for Ph.D. chemists ranges from mid- to high-\$60,000 to mid-\$90,000-per-year.

**JOB OUTLOOK** ► Because of the ever-changing economy and government health care reform regulations, the job outlook for medicinal chemists in today's market is mixed. Many changes are taking place within the pharmaceutical industry. Companies have been decreasing the size of their research labs or merging with other companies. Therefore, the job outlook is somewhat uncertain for medicinal chemists. While industry is downsizing, some government agencies are looking for chemists to fill nonlaboratory chemistry positions. A job surplus does not exist in academe either. Some chemists are optimistic that this downturn is only cyclical, as much research remains to be done.

#### **FOR MORE INFORMATION**

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**WHAT YOU CAN DO NOW** ► Undergraduate students should maintain a high degree of scholarship and get as much experience as possible. Internships provide valuable experience and are the best way to see if a career in medicinal chemistry in a pharmaceutical lab appeals to you. Undergraduate research in university laboratories is another way to gain experience, as well as become familiar with the day-to-day activities in academe. Chemists advise undergraduate students to get a strong background in the basic chemistry courses and, if a research position in this area is desired, pursue an advanced degree.