



# Food and Flavor Chemists

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## ... Take chemistry from the farm to the plate

Food chemistry focuses on the chemistry of foods, their deterioration, and the principles underlying the improvement of foods for consumers. It applies chemistry to developing, processing, packaging, preserving, storing, and distributing foods and beverages to obtain safe, economical, and aesthetically pleasing food supplies.

Few people recognize the science behind the food they consume. While food science involves chemistry, biology, physics, biochemistry, microbiology, nutrition, and engineering, the major portion of a food science curriculum is chemistry. Food chemists develop and improve foods and beverages; analyze methods of heat processing, canning, freezing, and packaging; and study the effects of processing on the appearance, taste, aroma, freshness, and vitamin and mineral content of food. These chemists also test samples to make sure foods and beverages meet food laws and labeling requirements and experiment with new foods, additives, and preservatives. Food chemistry encompasses everything from agricultural raw materials to consumer end-use products.

## ... Understand the science of food

Consider a pudding that would be sold in the refrigerated section of the supermarket. To make it, you begin with milk, which provides liquid and protein. Then you add starch to thicken the formulation. As starch expands, it traps liquids to help create the pudding texture. But after two or three days, the expanded starch molecules start coming back together and the starch leaks water, which, for a consumer product, is undesirable. Thus, food chemists use chemically modified starches to prevent this from happening.

Strong food science students are those with a solid background in chemistry and related disciplines. Many people get an undergraduate degree in chemistry or chemical engineering and a master's in food science. A Ph.D. is necessary mainly if you are interested in teaching or detailed research. Training as a food scientist prepares you to work in almost any area of the food business. The cumulative knowledge gained working with a range of food chemistries can even lead to breakthroughs and entirely new products.

## ... See chemistry as an art

Food scientists often talk about their work as an art form. In the flavor industry, training is geared toward developing creativity as well as acquiring knowledge of the chemistry of flavor ingredients and the instrumental analysis techniques involved in making flavors.

Prospective flavorists usually have an undergraduate or graduate degree in chemistry, biology, or food science. They start out as lab assistants, doing compounding and general lab work under the tutelage of a senior or master flavorist. During a five-year training period, they maintain "tasting" notebooks and learn characteristics of flavor materials individually and in blends. Then they are eligible to be sponsored for apprentice membership in the Society of Flavor Chemists and undergo an interview that includes an assessment of their knowledge and skills. After two more years, apprentices may apply and be re-interviewed for an upgrade to become certified flavorists. With this rigorous training, it is not surprising that few trained flavorists leave the field. Many love the challenge, creativity, and variety of their work.

## ... Tell how ingredients work together

Some food scientists work for ingredient supply companies that provide food processors with many key components of food products—flavors, thickeners, and stabilizers. Knowing how ingredients function, these scientists develop prototypes to show how products function together and how they can solve food-processing problems. Because downsizing in the industry has shifted much research work from food processors to ingredient suppliers, insiders say that may be where most job opportunities lie.

Even in tough economic times, people need to eat, so the food business is more stable than many other industries. While less basic research is conducted on food than in the past, there is more focus on applications research today. Recent trends, such as the effort to reduce fat content, are keeping industry job growth steady. Career ladders in the food industry mirror most other research and product-based industries. Individuals trained in science can advance on a research track or go into management.



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## FACT FILE: Food and Flavor Chemists

**WORK DESCRIPTION** ► Food scientists are mainly concerned with the chemistry of food products. In basic research, they examine properties of proteins, fats, starches, and carbohydrates, as well as microcomponents such as additives and flavorants, to determine how each works in a food system. In applications research, they often come up with new ways to use ingredients or new ingredients altogether, such as fat or sugar replacements. Flavor chemists use natural or artificial ingredients, sometimes in combination, to develop flavors.

**WORKING CONDITIONS** ► Most food scientists conduct their work in the lab, but they may travel to work with customers. Labs are often set up like kitchens, with blenders, ovens, and other heat-processing equipment. This means food scientists do many things the same way we do when preparing food at home, but their goal is understanding the chemistry involved. Food scientists often say their work is not a nine-to-five job and requires the same dedication as any other creative research field.

**PLACES OF EMPLOYMENT** ► Food scientists are employed mainly by industry, both in food-processing and ingredient supply companies. Food chemists also work for the government—at the Food and Drug Administration or U.S. Department of Agriculture—and in academia. Academia conducts most of the basic research, while industry carries out more applications work. Food chemists who work for the government do basic research as well as study foods' nutritional value and food safety.

**PERSONAL CHARACTERISTICS** ► Food and flavor chemists describe themselves as curious, outgoing people who were attracted by the creative aspect of the field. Motivation and tenacity are important qualities, along with better-than-average senses of smell and taste. A good odor memory is also helpful. For flavorists, creativity is essential. They say that much of it is instinctive and cannot be learned.

**EDUCATION AND TRAINING** ► The Society of Flavor Chemists has designed a rigorous training process for flavorists, as described in this brief. However, the education needed to be a food scientist is more accessible. The Institute of Food Technologists has approved 50 schools with food science programs. Many food scientists start with an undergraduate degree in chemistry or biology and enter a food science program at the master's level. A Ph.D. may be required for those who wish to teach or conduct fundamental research. Well-known food science programs include those at the Universities of Wisconsin, Michigan, Iowa, and Minnesota, as well as at Cornell University (NY), Rutgers (NJ), and the University of California–Davis.

**JOB OUTLOOK** ► Food scientists are optimistic about future job prospects despite significant downsizing in the industry. Trends in processed foods, such as developments in nutraceuticals and functional foods, should keep the demand for trained food scientists steady. Food ingredient supply companies are likely to have more jobs available than those that process food, since the processors have been shifting research responsibilities to their suppliers.

**SALARY RANGE** ► Food and flavor chemists with bachelor's degrees often start in the low \$30,000 range; master's degree chemists may earn in the low \$40,000s, and Ph.D.s may earn between \$50,000 and \$100,000 per year. Salaries for food scientists average between \$65,000 and \$90,000 per year. Salaries for flavor chemists tend to be higher, averaging between \$75,000 and \$100,000.

### FOR MORE INFORMATION

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**WHAT YOU CAN DO NOW** ► Becoming involved with the Institute of Food Technologists is a good way to learn about the business and connect with professionals in the field. Food scientists also recommend summer internships that offer exposure to the industry. One food chemist says working in industry after his sophomore year in college made him aware of the work he would be doing if he went into the business with a bachelor's degree, prompting him to consider earning a master's degree.