

Chemistry of Food—Preface

You are what you eat! Although sometimes we might wish otherwise, we know this statement carries a lot of truth. How can science, and chemistry in particular, help students understand the principles of good nutrition? The purpose of *Chemistry of Food, Volume 23* in the Flinn ChemTopic™ Labs series, is to provide high school chemistry teachers with laboratory activities that will help students identify the chemical structures and properties of the nutrients in foods. The nutrition lessons embedded in these experiments and demonstrations will build a solid foundation for students as they integrate their knowledge of chemistry and nutrition.

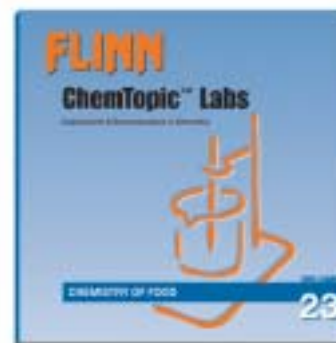
Carbohydrates, Proteins, and Fats

The Food Guide Pyramid is a familiar symbol of healthy eating and good nutrition. The recommended number of servings for different foods promotes an energy balance of carbohydrates, proteins, and fats in the diet. In the “Food Testing Lab,” students perform a series of classification tests to distinguish among these nutrients. They then test a variety of foods to identify the nutrients in different foods. The activity includes an optional, student-directed section that provides lots of ideas for independent study. In “Milk Is a Natural,” a more advanced lab, students separate the protein and carbohydrate components in skim milk and analyze their properties. They determine the amount of carbohydrates and proteins in milk and compare the results with the information provided on the Nutrition Facts label for skim milk. In “The Power of Cheese” cheese-making demonstration, students learn how the protein fraction of milk is concentrated into cheese when the milk is curdled using a bioengineered enzyme called chymosin.

Essential Vitamins and Minerals

Vitamins are essential nutrients that must be supplied in the diet. They are needed by the body in trace amounts to help catalyze the reactions that make our bodies work. In “Vitamin C Analysis,” students perform a microscale titration to determine the amount of Vitamin C in fruits and fruit juices. The titration is based on an oxidation–reduction reaction of Vitamin C and teaches students about the antioxidant function of Vitamin C. In a second microscale titration experiment called “Boning Up on Calcium,” students use the complex-forming reaction of calcium ions

with EDTA to measure the amount of calcium in milk. Once again, enthusiasm runs high as students verify their findings with the nutritional label information.



Food Additives

Are food additives healthy or unhealthy? This is a controversial topic in society today. Many people associate food additives with highly processed convenience foods. But not all additives are unhealthy. Two demonstrations examine the chemistry of two important food additives that have had a positive impact on public health. In “Nails for Breakfast,” students may be surprised to discover that the iron in their favorite iron-fortified breakfast cereals is supplied in the form of elemental, metallic iron. How can this metallic iron possibly be absorbed by the body? A little chemistry helps! A simulated reaction with “stomach acid” demonstrates the conversion of metallic iron to the iron(II) state that can be absorbed by the body. Potassium iodide, the first additive to be approved by the federal government for use in foods, has been added to salt since the 1920s. The presence of potassium iodide in iodized salt is highlighted in the “Iodized Salt” demonstration. Although the additive is present in only trace amounts, chemistry allows students to detect the additive and see how it can be transformed in the body to produce the iodine needed for proper thyroid function.

Integrating Science Standards

The experiments and demonstrations in *Chemistry of Food* provide an excellent introduction to the role of chemistry in good nutrition. Building connections between the sciences and integrating all aspects of science content are important goals of science education, and indeed these goals are formally incorporated in the National Science Education Standards. The experiments and demonstrations in this book allow students to build essential connections linking previous knowledge in biology, chemistry, and nutrition. All of the activities in *Chemistry of Food* have been thoroughly tested and retested. You know they will work! Use the experiment summaries and concepts on the following pages to locate the concepts you want to teach and to choose experiments and demonstrations that will help you meet your goals.