Proteins in Food: An Introduction

INTRODUCTION

Proteins are the most abundant molecules in cells, making up 50% or more of their dry weight. Every protein has a unique structure and conformation or shape, which enables it to carry out a specific function in a living cell. Proteins comprise the complex muscle system and the connective tissue network, and they are important as carriers in the blood system. All enzymes are proteins; enzymes are important as catalysts for many reactions (both desirable and undesirable) in foods.

All proteins contain carbon, hydrogen, nitrogen, and oxygen. Most proteins contain sulfur and some contain additional elements; for example, milk proteins contain phosphorus and hemoglobin and myoglobin contain iron. Copper and zinc also are constituents of some proteins.

Proteins are made up of amino acids. There are at least 20 different amino acids found in nature, and they have different properties depending on their structure and composition. When combined to form a protein, the result is a unique and complex molecule with a characteristic structure and conformation and a specific function in the plant or animal where it belongs. Small changes, such as a change in pH or simply heating a food, can cause dramatic changes in protein molecules. Such changes are seen, for example, when cottage cheese is made by adding acid to milk or when scrambled eggs are made by heating and stirring eggs.

Proteins are very important in foods, both nutritionally and as functional ingredients. They play an important role in determining the texture of a food. They are complex molecules, and it is important to have an understanding of the basics of protein structure to understand the behavior of many foods during processing. This chapter covers the basics of amino acid and protein structure. Individual proteins, such as milk, meat, wheat, and egg proteins, are covered in the chapters relating to these specific foods.

1 For use with subsequent Protein food chapters
AMINO ACIDS

General Structure of Amino Acids

Every *amino acid* contains a central carbon atom to which is attached a carboxyl group (COOH), an amino group (NH$_2$), a hydrogen atom, and another group or side chain R specific to the particular amino acid. The general formula for

![Diagram of various amino acids]

**Figure 8.1** Examples of amino acids classified according to the nature of their R groups (only the side groups are shown).