Chapter 12

Amino Acids, Peptides, and Proteins

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INTRODUCTION

The ingestion of amino acids, peptides, and proteins from a variety of food sources is essential for maintaining health. Humans, as do other animals, use protein chiefly for its amino acid content. Proteins are converted to large and small peptides and individual amino acids by gastric and duodenal proteases (Castro 1991). Large peptides are hydrolyzed to small peptides, usually di- and tripeptides, by intestinal peptidases. Amino acids, dipeptides, and tripeptides leave the intestine and enter the hepatic portal system, but the peptides leave the liver and enter the peripheral blood as amino acids. The blood transports the amino acids to individual cells where they are placed in a cytosolic "pool." They are utilized from the "pool" to synthesize proteins essential for growth and maintenance of healthy tissue. The continual hydrolysis and synthesis of proteins is central to their utilization. However, certain proteins and their hydrolytic products also carry out important functions unrelated to their primary metabolic mission.
Recent advances in biomedical research have helped reveal some of the complex relationships between nutrition and disease. This research has suggested that food proteins, peptides, and amino acids may be useful in the treatment of a number of pathological conditions arising from disease or injury.

The recognition of a health restoration role of dietary proteins, apart from their traditional health maintenance role, has become a popular research and marketing endeavor in Japan and, to a lesser extent, in Western Europe and the United States. In Japan and Western Europe, these food proteins are but one class of health-enhancing ingredients collectively called "functional foods." In the United States they are sometimes referred to as "nutraceuticals." In both cases, they are defined as substances that provide medical or health benefits, including the prevention and/or treatment of certain diseases. Although Western Europe and the United States have contributed considerable knowledge to recognizing specific proteins as functional foods and elucidating their mechanism of action, the Japanese have been quick to utilize this knowledge to begin marketing these products.

This chapter will focus on the consideration of amino acids, peptides, and proteins from dietary sources as functional foods. The purpose of the review is to highlight several of the most active research areas in terms of what is being done and how the knowledge can be used for therapeutic purposes.

AMINO ACIDS

Amino Acids as Therapeutic Agents

Nutritionally, only the essential amino acids (His, Ile, Leu, Lys, Met, Phe, Thr, Trp, Val) are required from exogenous sources. The others can be synthesized in vivo. Inadequate levels of essential amino acids result in depression of food intake and retardation of growth. These consequences may be seen among the world’s poor where protein deficient diets are common.

Although the beneficial effects of amino acid supplementation for individuals with protein deficient diets are well known, little if any evidence conclusively demonstrates the physiological benefits of amino acid supplementation of the diets of healthy individuals. In a typical U.S. diet, about 100 g of protein are consumed daily. If we assume that this diet consists, on average, of an intake of "moderate