Chapter 11

Activities of Proteolytic Enzymes
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11–1 INTRODUCTION

11–1.1 Classification, Reactions, and Ecological Functions of Proteases

Proteases, also known as proteinases or proteolytic enzymes, are a large group of hydrolyases that catalyze the cleavage of peptide bonds in proteins to produce peptides and/or amino acids.

Classification of proteolytic enzymes is based on three major criteria: (i) type of reaction catalyzed, (ii) functional group of the active site, and (iii) type of molecular structure and evolutionary relationship among the various enzymes (Rao et al., 1998). According to the Nomenclature Committee of the International Union of Biochemistry and Molecular Biology (NC-IUBMB), the proteolytic enzymes can be grouped into proteases and peptidases on the basis of their nature of attack.

Proteases can catalyze the hydrolysis of the terminal amino acid of polypeptide chains (exopeptidases) or the internal peptide bond (endopeptidases, synonymous with proteinases). The exopeptidases act at the N or C terminals. Those capable to remove one, two and three amino acids from the N terminus are called aminopeptidases, dipeptidyl-peptidases, and tripeptidyl-peptidases, respectively. Those that liberate one and two amino acids away from the C terminus are carboxypeptidases and peptidyl-dipeptidases, respectively (Table 11–1). The carboxypeptidases are further subdivided based on catalytic mechanism (serine-type carboxypeptidases, metallocarboxypeptidases, and cysteine-type carboxypeptidases). Endopeptidases (proteinases) are recognized on the basis of the chemical nature of the groups responsible for catalytic activity. As shown in Table 11–1, four distinct classes of proteinases have been identified: serine, cysteine, aspartic, and metalloendopeptidases. According to the optimal pH, they are classified as acidic, neutral, or alkaline proteinases. A fifth class (EC 3.4.99) also has been assigned for those of unknown catalytic mechanisms and for those that do not fit clearly into one of the four other groups.