

Difference Between Protease and Peptidase

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Key Difference – Protease vs Peptidase

Proteins are macromolecules. They are mainly composed of Carbon, Hydrogen, Oxygen, and Nitrogen. It's a vital nutrient due to its role in structural and functional aspects of the body. Protein digestion or proteolysis begins in the stomach, although the bulk of protein digestion takes place in the small intestine using the pancreatic enzymes. The final product of protein digestion is amino acids, which are readily absorbed in the small intestine and transported via the blood to target organs. Protein degradation is also a common procedure practiced under an industrial environment. Protein degradation is mainly done in industries such as leather, wool, and food industry. Protein degradation is an enzyme-catalyzed reaction. Hence, at present, these enzymes are produced worldwide using recombinant DNA technology. The two proteolytic enzymes Protease and Peptidase are involved in protein degradation in natural phenomena as well as in industrial scale. **Proteases are a type of hydrolases, which are involved in the cleavage of the peptide bond in proteins while peptidases are a type of proteases which are capable of cleaving the end terminals of the peptide chain.** This is the key difference between Protease and Peptidase.

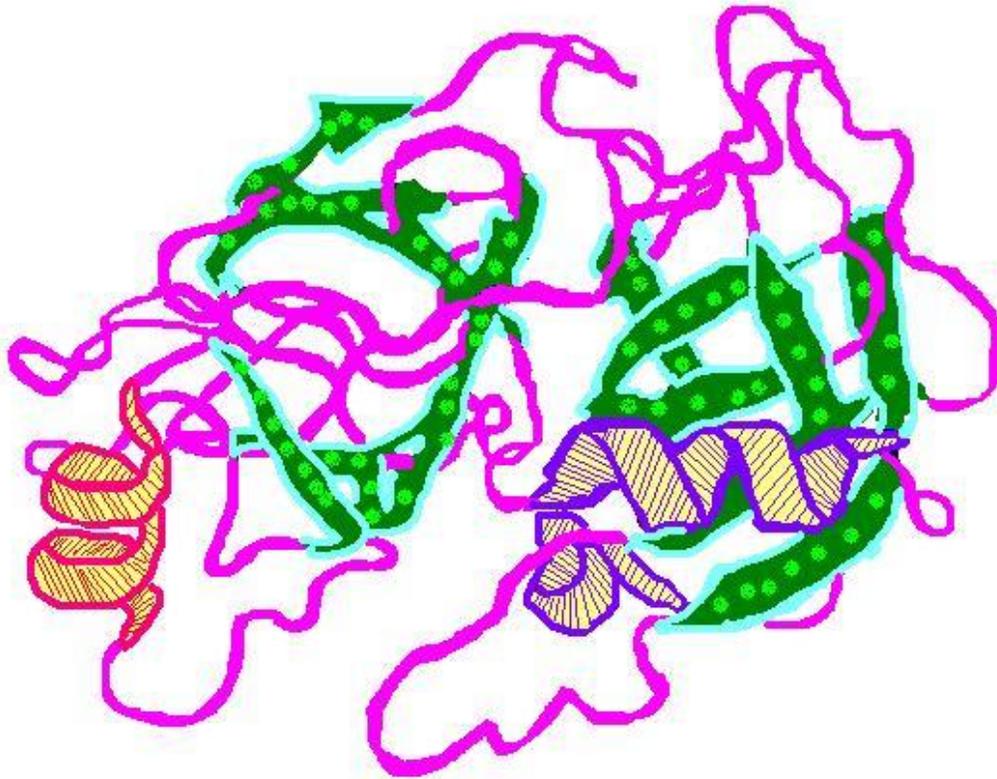
What is Protease?

Protease is a type of hydrolase which falls under the category of Enzyme commission class 3 (EC3). Protease takes part in activating a nucleophile which will attack the carbon of the peptide bond. This nucleophilic attack is followed by the formation of a high-energy intermediate. In order to stabilize this intermediate, the unstable complex will be degraded to reach stability. This degradation will result in the cleavage of peptide bond resulting two fragments of peptides. Based on this catalytic mechanism, there are four main types of proteases: aspartic proteases, cysteine proteases, aspartyl proteases and metalloproteases. The method of nucleophilic attack slightly differs in each enzyme class.

Proteases are used in two main contexts: under natural conditions in protein digestion and degradation, under industrial conditions to produce commercial products.

In the context of physiology, proteases are essential for digestion of food proteins, protein turnover, cell division, blood-clotting cascade, signal transduction, processing

of polypeptide hormones, apoptosis and the life-cycle of several disease-causing organisms including the replication of retroviruses.



Serine Protease
TRYPSIN

Figure 01: Protease

Industrial applications of Proteases are leather manufacturing, wool manufacturing, production of Klenow fragments, peptide synthesis, digestion of unwanted proteins during nucleic acid purification, use of proteases in cell culture experiments and tissue dissociation, preparation of recombinant antibody fragments for research, diagnostics, and therapy.

Proteases are further divided as exopeptidases and endopeptidases according to the site of the attack on the peptide linkage.

What is Peptidase?

Peptidase is a type of protease. The mechanism of action of peptidase is similar to a protease. Peptidase is characterized as an exopeptidase and participates in cleaving the terminal peptide linkages. The terminal peptide linkages can be either carboxy terminal ends or amino terminal ends.

Similar to proteases, peptidases also have two main applications. They are in physiology and in industrial applications.

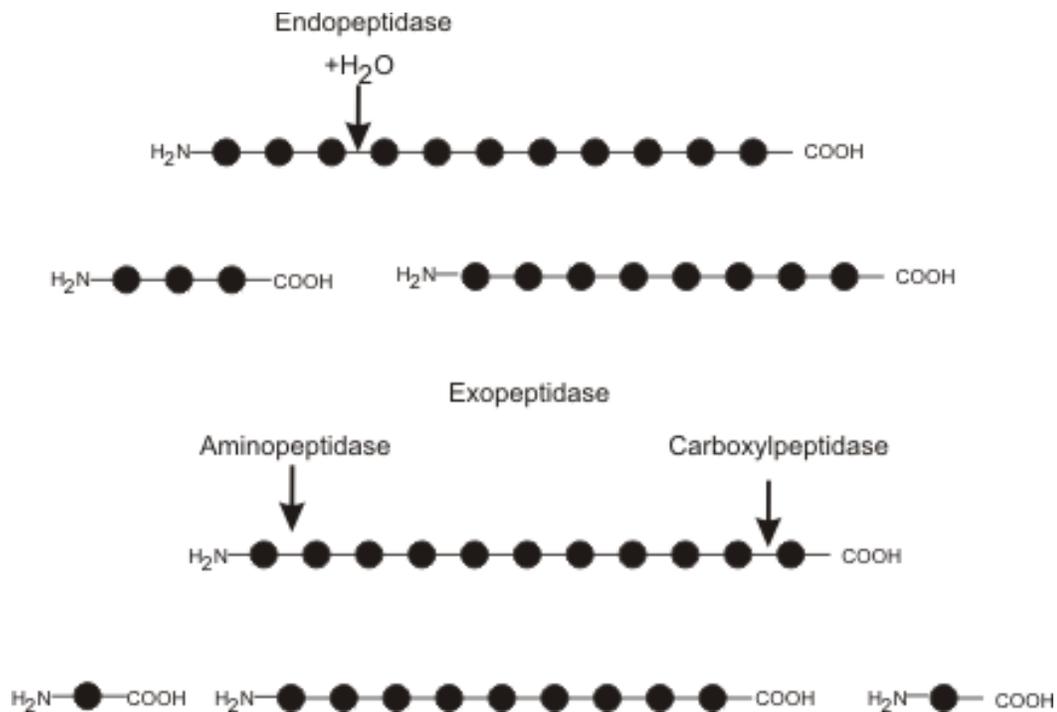


Figure 02: Peptidase Action

What are the similarities between Protease and Peptidase?

- Both are proteolytic enzymes.
- Both are hydrolase enzymes.
- Both enzymes can be produced via recombinant DNA technology.
- Both enzymes participate in cleaving the peptide bond of proteins and degrading proteins.
- Both have applications in industry – leather industry, wool industry, food industry and recombinant DNA technology and proteomics.
- In physiology, proteases and peptidases are used in the digestion process.

What is the difference between Protease and Peptidase?

Protease vs Peptidase	
Proteases are enzymes that cleave the peptide bond in proteins.	Peptidases are a type of protease that is capable of cleaving the end terminals of the peptide chain.
Action	
Protease can be endopeptidases or exopeptidases.	Peptidases are exopeptidases.

Summary – Protease vs Peptidase

Proteases and peptidases are proteolytic enzymes which have a variety of functional roles in physiology. The basic difference between proteases and peptidases is that protease can be endopeptidases or exopeptidases whereas peptidases are exopeptidases. At present, these enzymes are produced via recombinant DNA technology as it will result in a high yield and high-quality end products which are cost effective.

References:

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2. "Structural Biochemistry/Enzyme Catalytic Mechanism/Proteases." *Structural Biochemistry/Enzyme Catalytic Mechanism/Proteases – Wikibooks*, open books for an open world, [Available here](#). Accessed 15 Sept. 2017.

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