

## Caspases and Apoptosis

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### Abstract

Apoptosis is a natural guard against disorders and diseases which is performed throughout programmed cell death. The process of apoptosis involves a diversity of enzymatic mechanisms. Because of the important role for caspases, the main aim of this review is to discuss about related caspases.

In association with the present article, several review and original were searched via Google Scholar search engine and PubMed database. Simultaneously, the knowledge of the authors was used to prepare a collection of applied and invaluable data for writing the paper.

There are a wide range of caspases which are involved in apoptosis processes. But in accordance with functional aspect, there are three categories of caspases including apoptosis initiators, apoptosis executioners and inflammation mediators. The presence, lack and level of caspase enzymes show the type of disease and infection. So, detection and identification of the enzymes are valuable for diagnosis and treatment.

In conclusion, caspase enzymes have a key role in apoptotic processes and clinical diagnosis and treatment.

**Keywords:** Apoptosis, Caspase, Disease, Diagnosis

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### Introduction

The programmed cell suicide or apoptosis is a regulatory system for balancing the homeostasis situation during the growth, development and differentiation among multicellular organisms. The appearance of any type of disorders may lead to wide range of diseases including neurological, immunological, and cancerous problems [1-5].

In 1972, Kerr and colleagues described the process of apoptosis (programmed cell suicide/programmed cell death) for the first time [6-8].

Despite a very close relationship between apoptosis and the cysteine protease enzymes family of caspases; they were unknown until the middle of 1990s. Caspases are the essential elements in the process of apoptosis. The performance of a successful apoptosis process is directly associated with inducers, caspase enzymes, related genes and signaling pathways. Thus, the cascade system of caspases has a key role within all steps of the apoptosis process [7,9,10].

Previous studies have revealed that, monomeric procaspases

(proenzymes or zymogens) are able to be converted into dimerized active caspases by particular inducers or stimulators. The dimerized caspases are linked together as unite structures via proteins of adapters. The function of caspases is achieved via the cleavage of some related proteins within the cells. Simply, turned on caspases are responsible for turning off the process of cell survival [4,7,11-13].

The role of caspases within the process of apoptosis is very bold. Hence, the main goal of this review is to discuss about different members of caspases.

### General characteristics of caspases

The endoproteases of caspases are able to break down peptide bonds via cysteine residues in substrates. Caspases (cysteine dependent aspartate driven proteases) were recognized in some cell lineages of *Caenorhabditis elegans* which were undergone the process of apoptosis. So, for the first time the importance of caspases regarding to apoptosis feature was recognized in *C. elegans* [12,14,15].

There are three well-known CED (Cell Death abnormal) proteins