

Difference Between Autophagy vs Apoptosis

www.differencebetween.com

Key Difference – Autophagy vs Apoptosis

Cell death is a natural phenomenon occurring in all living cells. It is a type of defense mechanism and is mediated by [immune responses](#). Cell death can take place mainly in two different forms: programmed cell death or cell death resulting from harmful components such as [radiation](#), infectious agents or different chemicals. Programmed cell death is a resultant injury of cellular components like cellular organelles, cellular proteins, and other cellular biomolecules. This is an irreversible process. The cells lose its structural and functional properties upon programmed cell death and cannot be retrieved. Autophagy and Apoptosis are two methods of programmed cell death. Both processes are important in development and normal physiology. **Autophagy is the cell death process mediated by [lysosomes](#), which termed as lysosomal degradation. Apoptosis is the programmed cell death that takes place when the cells commit suicide by activating an intracellular death program.** This is the key difference between autophagy and apoptosis.

What is Autophagy?

Autophagy is a [catabolic](#) mechanism during which cells degrade the dysfunctional and unnecessary cellular components by a lysosome-mediated action. During autophagy, the organelles to be degraded are surrounded by a double membrane, forming a structure called the autophagosome. The autophagosome then fuses with the lysosomes in the [cytoplasm](#) and form the autolysosome. Then the degraded organelles trapped inside the autolysosome are degraded by the activity of lysosomal hydrolases. This type of autophagy is known as macrophagy.

There are two other types of autophagy: micro-autophagy, and chaperone-mediated autophagy. In micro-autophagy, an autophagosome is not formed. Instead, the autolysosome is directly formed. In chaperone-mediated autophagy, targeted proteins are subjected to degradation via chaperone proteins. This is a specific type of autophagy.

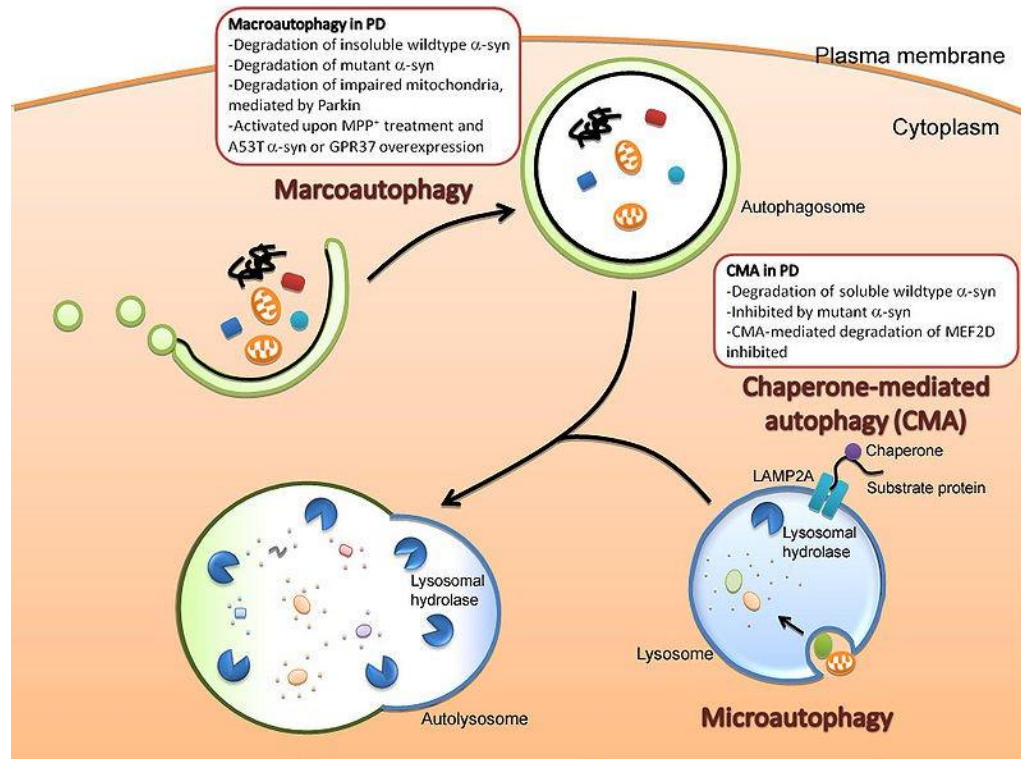


Figure 01: Autophagy

Autophagy is regulated by a signaling pathway mediated by tyrosine kinase and is largely driven by nutrient-deprived conditions and [hypoxia](#).

Autophagy is much studied at present due to its role in health and physiology of cancer, heart diseases, and autoimmune diseases.

What is Apoptosis?

Apoptosis is programmed cell death. A cell undergoes apoptosis without causing any damage to other cells or other cellular components. During apoptosis, the cell begins to shrink and condense which is followed by the degeneration of the cytoskeleton. This results in the disassembly of the nucleus and nuclear DNA is degraded upon exposure. In most apoptotic pathways, the cell membrane is destroyed and the cell become fragmented. Then [phagocytic cells](#) such as [macrophages](#) identify fragmented cell parts and remove them from the tissues.

The apoptotic intracellular machinery is mediated by a cascade of protein-mediated reactions. This apoptotic mechanism is dependent on a special family of proteases, [enzymes](#) that degrade proteins. These proteins are termed as Caspases. Caspases have a characteristic [cysteine](#) amino acid at their active site. Caspases also have a characteristic cleavage site which consists of the [amino acid](#), aspartate. Procaspases are the precursors of caspases, and the procaspases are activated by the cleavage at aspartate sites. Activated caspases can then cleave and degrade other proteins in the cytoplasm as well as in the nucleus, resulting in cellular apoptosis. There are two main types of apoptotic Caspases: initiator caspases and effector caspases. Initiator caspases are involved in commencing the cascade of reactions. Effector Caspases are involved in the disassembly of the cell and completion of the apoptotic pathway.

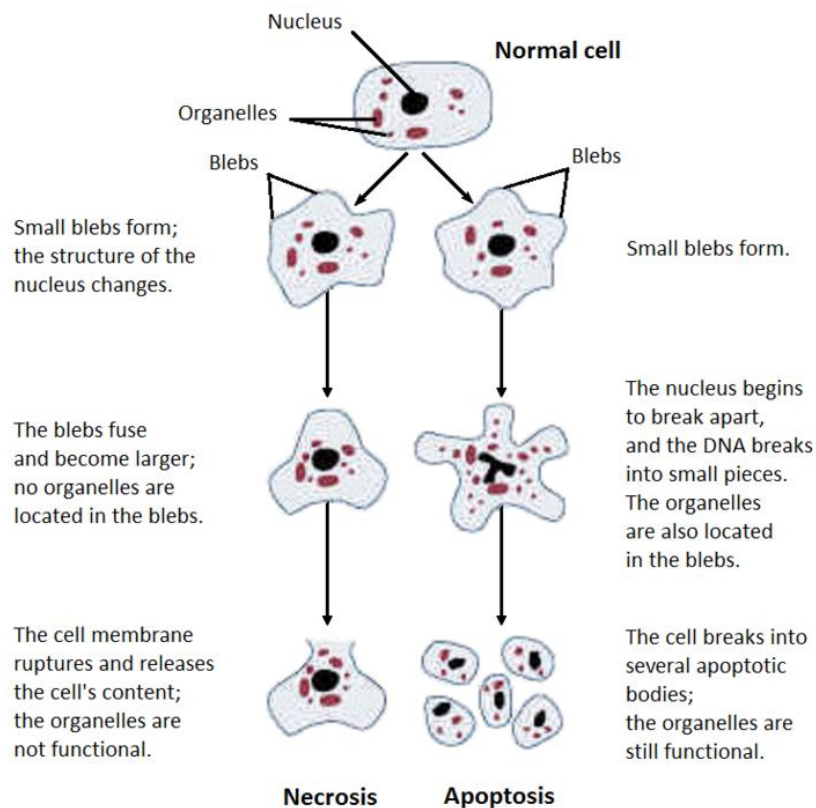


Figure 02: Apoptosis

What are the similarities between Autophagy and Apoptosis?

- Both result in programmed cell death.
- Both are natural phenomena.

- Both processes do not cause damage to other cells or cellular components.
- Both are important in development and normal physiology.
- Both are important in understanding the cellular basis of different pathological conditions including cancer and immune system related disorders.

What is the difference between Autophagy and Apoptosis?

Autophagy vs Apoptosis	
Autophagy is the cell death process mediated by lysosomes.	Apoptosis is programmed cell death mediated by proteases known as Caspases.
Subtypes	
Macrophagy, Microphagy, and Chaperon mediated autophagy are types of autophagy.	Apoptosis does not have subtypes.
Action	
Autophagy occurs via lysosome degradation by lysosomal hydrolases.	Apoptosis occurs through proteases known as Caspases which include the initiator Caspases, and effector Caspases degrade the proteins.
Special Features	
Autophagy process forms autophagosome, autolysosome or chaperone bound complexes during the process.	The cells begin to condense and shrink followed by destruction which is catalyzed by Caspases in apoptosis.
Regulation	
Regulation of autophagy occurs by a signaling pathway mediated by tyrosine kinase.	Many different proteins are involved in the regulation of apoptosis.

Summary – Autophagy vs Apoptosis

There are many challenges in understanding the underlined mechanisms of both autophagy and apoptosis, especially the regulatory mechanisms. Autophagy involved

in lysosomal degradation, whereas apoptosis is programmed cell death mediated by proteases. This is the difference between autophagy and apoptosis. Both participate in cell death and protect other cells and organs from oxidative stress caused by damaged cells.

References:

1. Alberts, Bruce. "Programmed Cell Death (Apoptosis)." *Molecular Biology of the Cell*. 4th edition., U.S. National Library of Medicine, 1 Jan. 1970, [Available here](#). Accessed 13 Sept. 2017.
2. Glick, Danielle, et al. "Autophagy: cellular and molecular mechanisms." *The Journal of pathology*, U.S. National Library of Medicine, May 2010, [Available here](#). Accessed 13 Sept. 2017.
3. Rhorburn, Andrew. "Apoptosis and Autophagy: regulatory connections between two supposedly different processes." *Apoptosis: an international journal on programmed cell death*, U.S. National Library of Medicine, Jan. 2008, [Available here](#). Accessed 13 Sept. 2017.

Image Courtesy:

1. "Autophagy" By Cheung and Ip – *Molecular Brain*, Biomed Central (CC BY 3.0) via [Commons Wikimedia](#)
2. "Structural changes of cells undergoing necrosis or apoptosis" By National institute on alcohol abuse and alcoholism (NIAAA) – File:Structural changes of cells undergoing necrosis or apoptosis.gif; (pubs.niaaa.nih.gov), (Public Domain) via [Commons Wikimedia](#)

How to Cite this Article?

APA: Difference Between Autophagy and Apoptosis. (2017, September 21).

Retrieved (date), from <http://differencebetween.com/difference-between-autophagy-and-vs-apoptosis/>

MLA: "Difference Between Autophagy and Apoptosis " *Difference Between.Com*. 21 September 2017. Web.

Chicago: "Difference Between Autophagy and Apoptosis." *Difference Between.Com*. <http://differencebetween.com/difference-between-autophagy-and-vs-apoptosis/> accessed (accessed [date]).



Copyright © 2010-2017 Difference Between. All rights reserved