THE ROLE OF APOPTOSIS AT PRESENT

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Abstract:

Modern concepts of the mechanism of apoptosis in the course of physiological and pathological histogenesis have significantly enriched in recent years. The study of cell death is becoming a booming field of science. Understanding the mechanisms of cell death enables us to understand the causes of certain diseases (for example, malignant tumors and autoimmune diseases), and thanks to the development of the region, there are prerequisites for learning how to manage and fight them. A key characteristic of apoptosis is the absence of an inflammatory response during phagocytosis of apototic bodies. This is due to the secretion of monocyte inhibition of the secretion of proinflammatory cytokines IL-1β, IL-8, granulocyte-macrophage colony-stimulating factor, and TNF-α after phagocytosis of apoptotic cells with a simultaneous increase in the secretion of cytokines that have anti-inflammatory effects, such as TGF-1 and IL-10. Impaired utilization of apoptotic cells, in particular, in autoimmune diseases, promotes the secretion of proinflammatory cytokines.

Keywords:

Apoptosis, criteria, assessment methods, autophagy, caspase

Apoptosis (from the Greek apoptosis - falling leaves from trees) is an active process of the realization of genetically programmed cell death, initiated by the action of various factors that are not destructive in nature.

The concept of apoptosis was first put forward by J.E.R. Kerr et al. in 1972 to denote "normal cell death during the development of tissues and their renewal in a mature organism." An indication of the "normal" (physiological) significance of apoptosis for a living organism is of fundamental importance in this definition. It is an indispensable component of the life of any multicellular organism. An interesting approach to the designation of the physiological nature of the phenomenon was found by N.A. Mayansky according to which: "Apoptosis is a" conscious "decision of a cell to" quit the game "without releasing its flagogenic contents - it undergoes advanced phagocytosis." Thus, at all stages of the development of the theory of apoptosis, this process was put in opposition to pathological cell death - necrosis associated with the action of harmful agents.

In 1972, John F. Kerr, Andrew H. Willie, and Alester R. Curry coined the term "apoptosis" to denote a form of cell death in which cytoplasm shrinks, chromatin condensation, nuclear fragmentation, organelle alteration, and a "boil-like" process occur. which culminates in the formation of apoptotic bodies, while the cell membrane remains intact. After the appearance of the term, the first classification of cell death was formulated: the first type - apoptosis - morphological features are described above; the second type, autophagy, is characterized by extensive vacuolization of the cytoplasm; the third type is necrosis. This early classification is morphological, which is misleading for several reasons. Recent studies have shown that morphological and functional aspects may not be related to each other, as some types of apoptosis are manifested with necrotic external signs.

There is also a classification approach according to which cell death is divided into non-programmable (necrosis, oncosis, eryptosis) programmed (apoptosis). In turn, there is a more detailed approach to the biochemical mechanism of implementation using caspase enzymes and without the participation of these enzymes. Caspase activation is mediated by three known apoptotic signaling pathways: the intrinsic mitochondria-mediated pathway; an internal pathway mediated by the endoplasmic reticulum, and an external receptor-mediated pathway.

The key role in choosing one methodological approach or another for assessing the mechanisms of cell death should be played by the goal set for the researcher within the framework of the

experiment, as well as the technical capabilities of his laboratory. The methods mentioned in the review can be easily reproduced on flow cytometers equipped with a standard argon laser, and most of the reagents used for the formulation are available in our country. Depending on the conditions and tasks, the researcher can combine various methods of detecting apoptotic cells for a more detailed description of the stages of apoptosis of interest to him. Almost any in vitro experiment with live cell cultures must begin with an assessment of the adequacy of the culture conditions for the samples. Similarly, when assessing the biological activity of various substances (pharmacological preparations, chemical substances, as well as substances of animal or plant origin), one should start with the selection of the optimal concentration of the agents under study. In clinical practice, especially in oncological diagnostics, determination of the level of apoptosis can be a criterion for choosing a strategy for managing patients and prescribing adequate therapy.

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