



**College of Health and Medical Techniques
Department of Radiological Techniques**

Radiobiology

The first stage

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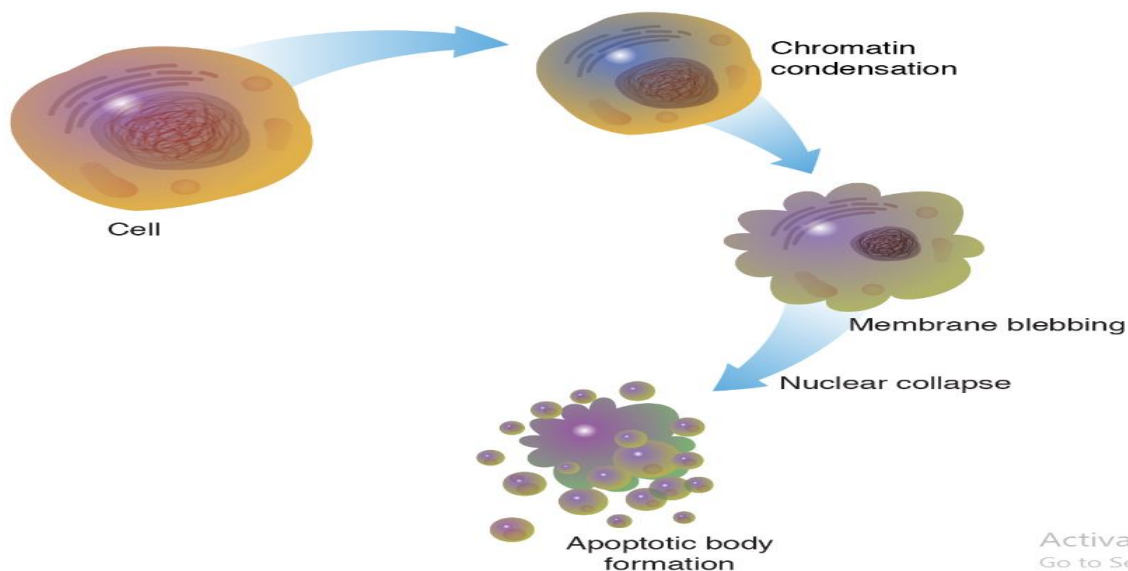
Msc. Zahraa Hamza merza

Lecture No.3

Cell death after irradiation

Apoptosis

- ❖ It is the process of programmed cell death.
- ❖ It is used during early development to eliminate unwanted cells
- ❖ In adults, **apoptosis** is used to rid the body of cells that have been damaged beyond repair.
- ❖ **Apoptosis** also plays a role in preventing cancer.
- ❖ If **apoptosis** is for some reason prevented, it can lead to uncontrolled cell division and the subsequent development of a **tumor**.

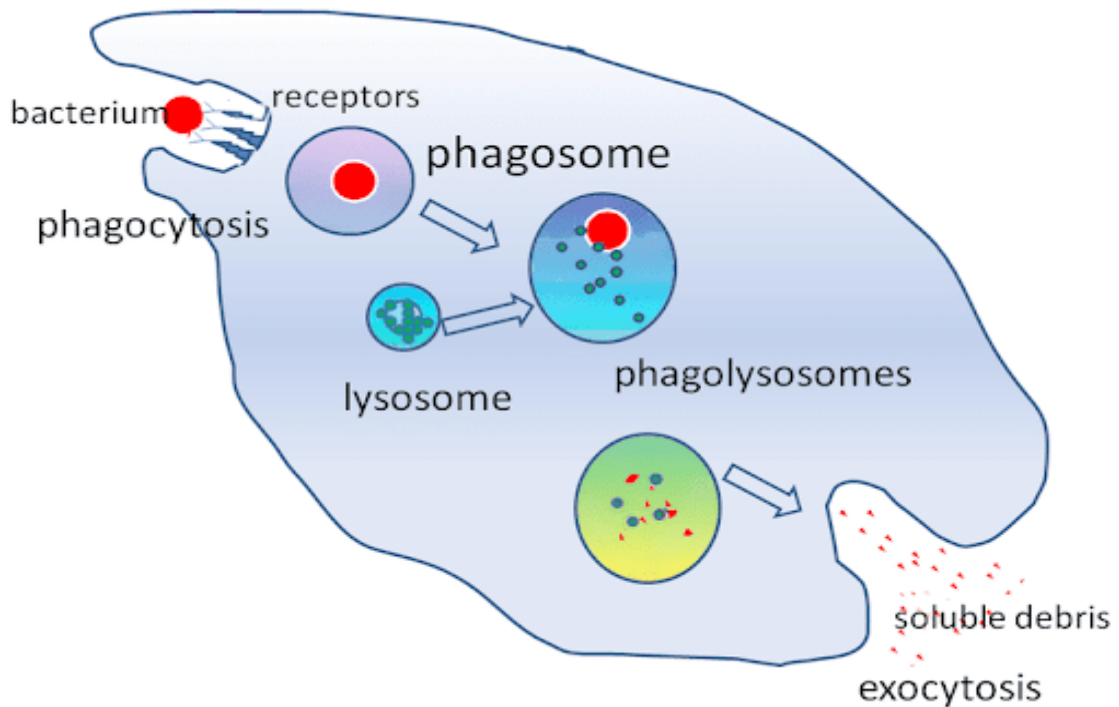


Programmed cell death (PCD)

- ❖ Sometimes referred to as **cellular suicide** is the death of a cell as a result of events inside of a cell, such as **apoptosis** or **autophagy**.
- ❖ **PCD** is carried out in a biological process, which usually confers advantage during an organism's lifecycle.

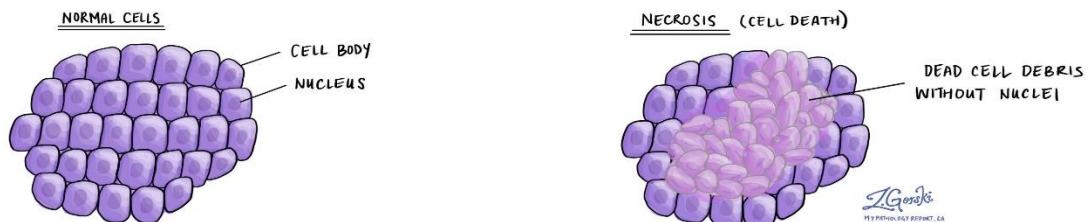
Autophagy (or auto phagocytosis)

- ❖ Is the natural, conserved degradation of the cell that removes unnecessary or dysfunctional components through a lysosome-dependent regulated mechanism.
- ❖ It allows the orderly degradation and recycling of cellular components.



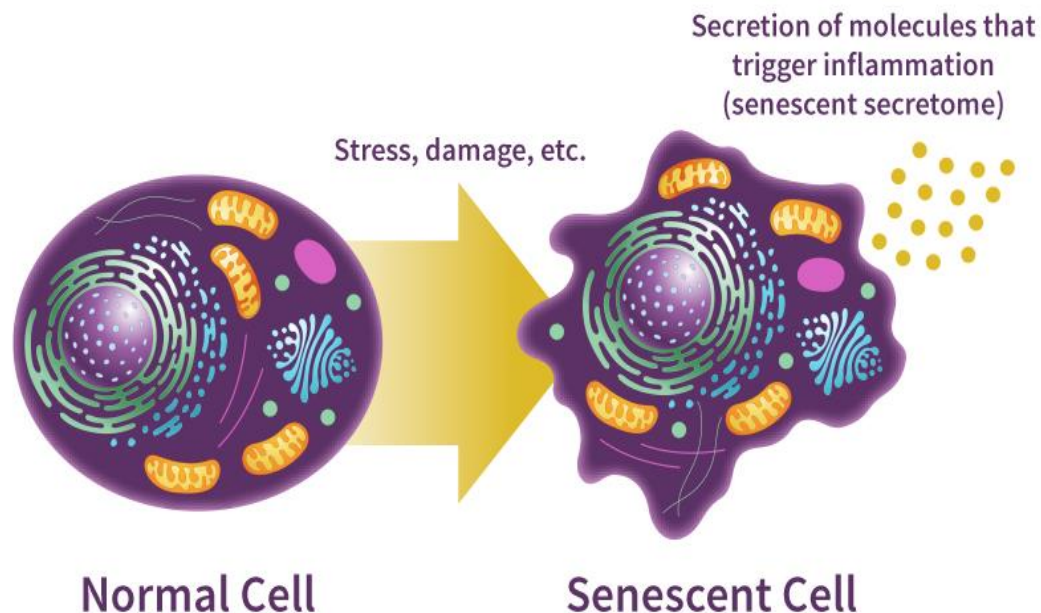
Necrosis

- ❖ **Necrosis** is the death of body tissue.
- ❖ It occurs when too little blood flows to the tissue.
- ❖ This can be from injury, **radiation**, or chemicals. **Necrosis** cannot be reversed.



Senescence

- ❖ The process of growing old. In biology, **senescence** is a process by which a cell ages and permanently stops dividing but does not die.
- ❖ Over time, large numbers of old (or senescent) cells can build up in tissues throughout the body.
- ❖ **Senescent** cells are characterized by morphological and metabolic changes, chromatin reorganization, altered gene expression, and adoption of a pro-inflammatory phenotype
- ❖ **DNA** damage triggers the **DNA** repair machinery, **apoptosis**, or **senescence** depending on the extent of damage and physiological context.
- ❖ **Senescent** cells are characterized by a persistent DNA damage response (**DDR**)



Mitotic catastrophe (MC)

- ❖ Has long been considered as a mode of cell death that results from premature or inappropriate entry of cells into **mitosis** and can be caused by **chemical** or **physical** stresses.
- ❖ It initially was depicted as the main form of cell death induced by **ionizing radiation**.
- ❖ **Mitotic** catastrophe results from **aberrant** mitosis and can produce giant, multinucleated **aneuploid** cells that remain metabolically active.

- ❖ **Mitotic catastrophe** is associated with deficiencies of the **G2** and **mitotic** spindle checkpoints that function to limit the abnormal division of cells with damaged **DNA** and **chromosomes**.

