www.FirstRanker.com www.FirstRanker.com

www.FirstRanker.com

Cell

www.FirstRanker.com www.FirstRanker.com

Learning objectives

- To know about Apoptosis
- To know about Cancer

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

Apoptosis-Programmed cell death

- When cells are no longer needed or become a threat to the organism, they undergo a suicidal programmed cell death or apoptosis.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- This involves **a specific proteolytic cascade** that causes the cell to shrink and condense, to disassemble its cytoskeleton and alters its cell surface so that neighbouring macrophage can attach to CM and digest it.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- Apoptosis is initiated by activation of a family of proteases called CASPASES.
- These are enzymes that are synthesized and stored in cell as inactive PROCASPASES.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- Mechanism of activation of caspases are complex but when activated they cleave and activate other procaspases.
- A cascade is triggered which breaks down protein in cell.
- Cell dismantles and its remains are ingested by neighboring phagocytic cells.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- Mostly apoptosis occurs in tissues that are remodeled during development.
- It is balanced with formation of new cells in healthy adults.
- Otherwise body tissues would grow or shrink excessively.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- Abnormalities of apoptosis results in neurodegenerative diseases like Alzheimer's disease, cancer, autoimmune disorders etc
- Some drugs which are used in cancer chemotherapy induce apoptosis in cancer cells.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

Necrosis

- When cell die as a result of acute injury, it results in swelling and bursting due to loss of CM integrity.
- This process is called necrosis.
- Necrotic cells spill their contents, causing inflammation and injury to neighboring cells.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

Cancer

- It is caused by mutation or abnormal activation of cellular genes that control cell growth and mitosis.
- Abnormal genes are called Oncogenes.
- 100 different oncogenes have been discovered.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- In cells antioncogenes are also present, which suppress the specific oncogenes.
- Loss of or inactivation of antioncogenes leads to cancer.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

Why cancer does not develop after every mutation

1. Mutated cells have less survival capability and die.
2. Most mutated cells have normal feed back controls that prevent excessive growth.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

3. Potentially cancerous cells are often destroyed by body's immune system before they grow into cancer.

Mutated cells form abnormal proteins, these results in formation of Abs which destroys them.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

4. Usually several different activated oncogenes are required simultaneously to cause cancer.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- Not every one develops cancer although new cells are forming and mutation must be taking place in them.
- It is b/c of **precision with which DNA chromosomal strands are replicated and also proofreading process** which cuts and repairs abnormal DNA strands.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- **Probability of mutation increases several folds when person is exposed to certain chemical, physical or biological factors including following:-**

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

1. **Ionizing radiation** like x-rays, gamma rays, radioactive substances, uv light predispose to cancer.

- Ions formed in these cases are highly reactive and can rupture DNA strands causing mutation.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

2. **Chemical substances** are capable of mutation , such substances are called CARCINOGENS.

E.g cigarette smoke causes about one quarter of all cancer deaths.

Workers in plants producing aniline dye derivatives are likely to develop cancer.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

3. **Physical irritants**, like some types of food causes continued abrasion of the lining of intestinal tract.

It can lead to rapid mitotic replacement, which increases the chances of mutation.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

4. **Hereditary tendency**, one or more cancerous genes are already mutated in inherited genome.

Only few additional mutations are required to develop cancer.

www.FirstRanker.com

5.Certain viruses can cause cancer.

In case of DNA viruses, DNA strand of virus insert directly into one chromosome, causing mutation.

In case of RNA viruses, some carry enzyme called **REVERSE TRANSCRIPTASE**.

www.FirstRanker.com www.FirstRanker.com

Invasive characteristic of cancer cell

- The major differences b/w cancer cell and normal cell are:-

1. Cancer cell does not respect usual cellular growth limits b/c they do not require same GF that are necessary for growth of normal cell.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

2. Cancer cells have less tendency to adhere to oneanother and wander through tissues, to enter blood stream and transported through out the body.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

3. Some cancers produce angiogenic factors which causes growth of new blood vessels into cancer which supply nutrients to cancer growth.

www.FirstRanker.com

www.FirstRanker.com www.FirstRanker.com

- Cancer cell competes with normal tissues for nutrients and normal tissue gradually suffer nutritive death.
- As they continue to proliferate indefinitely, their number goes on multiplying day by day.

www.FirstRanker.com