

Lecture 8

8.1. Cancer

Is abnormal growth of cell and spread to other parts of the body. When normal cell got defection in their genetic material by environmental or inherited factors, defected cell will undergo to over growth with imbalance function and lead to death.

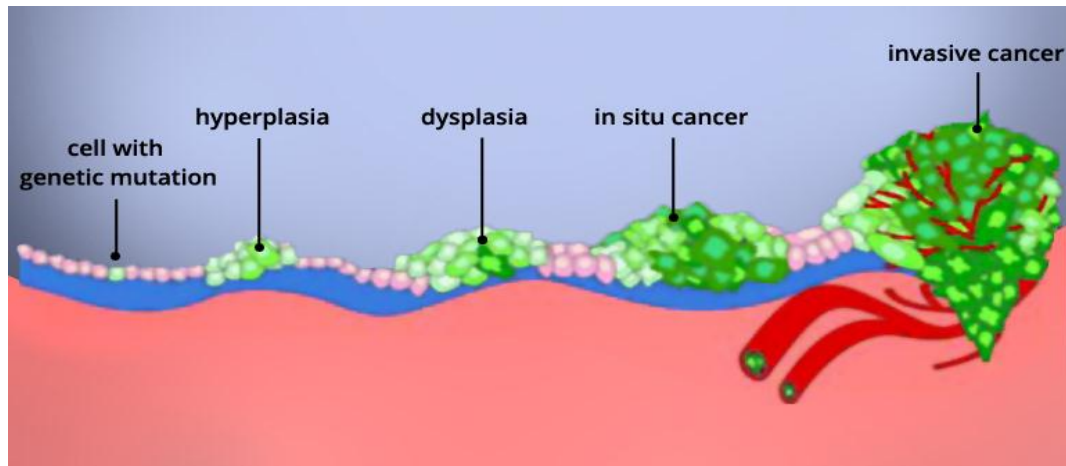
Normal cell	Cancer cell
Controlled proliferation	uncontrolled proliferation
Differentiation	undifferentiating
Balanced functions	imbalanced functions
Stable genome	Instable genome

8.2. Causes of Cancer

- 1- Environmental factor: 90-95% of cancer cases are caused environmentally (physicals, chemicals and biological) that able to cause genetic mutation and cancer.
- 2- Inherited factor: 5-10% only of cancer cases caused by inherited disease from parents.

8.3. Stage of Cancer

- 1- Mutation: Defect of genetic material of the cell with normal shape.
- 2- Hyperplasia: increase of cell size with defection of genetic material.
- 3- Dysplasia: increase the size of cell with increase the number of defected cells.
- 4- In situ cancer: increase of number of defected cells and starts to spread to near regions.
- 5- Invasive cancer: spread defected cells to far distance to other parts of body.



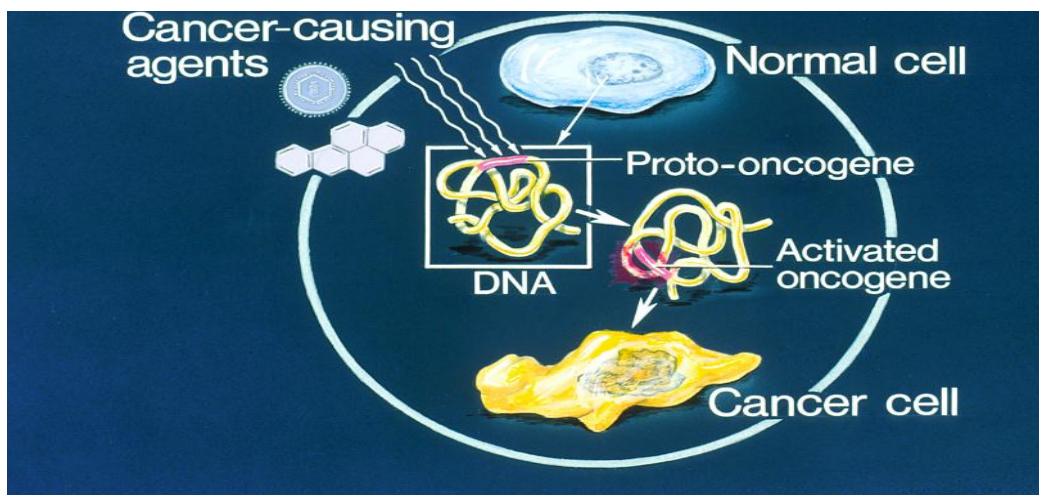
8.4. Proto-Oncogene

A normal gene which, when altered by mutation, becomes an oncogene that can contribute to cancer. Proto-oncogenes may have many different functions in the cell. Some proto-oncogenes provide signals that lead to cell division. Other proto-oncogenes regulate programmed cell death (apoptosis).

8.5. Oncogene

An oncogene is defined as a gene that encodes a protein that is capable of transforming normal cell to abnormal cell, or inducing cancer in animals.

Proto-oncogenes are genes that normally help cells grow. When a proto-oncogene mutates (changes), it becomes a "bad" gene that can become permanently activated and turns the cell growth out of control and lead to cancer.



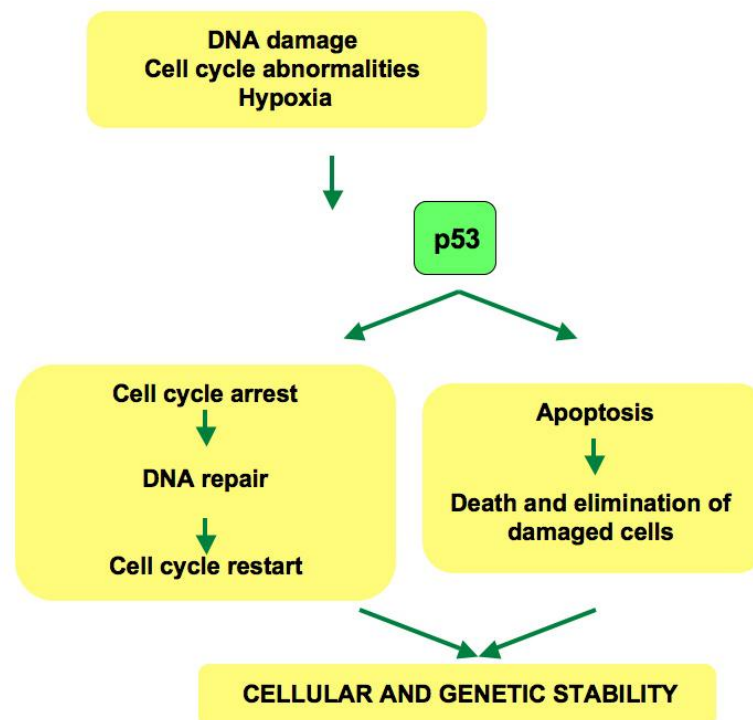
8.6. Tumor suppressor genes

Tumor suppressor genes are normal genes that slow down cell division, repair DNA mistakes, or tell cells when to die (a process known as apoptosis or programmed cell death). When tumor suppressor genes don't work properly, cells can grow out of control, which can lead to cancer.

An important difference between oncogenes and tumor suppressor genes is that oncogenes result from the activation (turning on) of proto-oncogenes, but tumor suppressor genes cause cancer when they are inactivated (turned off).

I- *P53* tumor suppressor gene

P53 is a gene that codes for a protein that regulates the cell cycle and hence functions as tumor suppression. *P53* has been described as "the guardian of the genome", referring to its role in conserving stability of the genome by preventing mutation.



II- Retinoblastoma tumor suppressor gene (*Rb* gene)

is a tumor suppressor gene that encode the protein able to dysfunctional many type of cancer. One function of *Rb* gene is to prevent excessive cell growth by inhibiting cell cycle progression until a cell is ready to divide.

