

## Physics of radiation therapy

أستاذ المادة : المدرس ناهدة حمود الجراح

-Brachy therapy

-LD<sub>50</sub>

-Rad

-Roentgens

-Gray

Brachy therapy:-

A short distance therapy .Radium source is put into or on the surface of tumors.

**Advantage:** - of brachy therapy is that gives a very large dose to the tumors with minimum radiation to the surrounding tissue.

**Disadvantage:-**is the non-uniformity of the dose since the radiation is much more intense near the source .Concerns radiation safety .The therapist is close to the source and to the patient(another source).

Physics of radiation therapy:-

There is evidence that an error of (5-10)% in radiation dose to tumor can have a significant effect on the results of the therapy .Too little radiation does not kill the entire tumor;while too much can produce serious complications in normal tissue.

The basic principle of radiation therapy is to maximize damage to the tumor while minimizing damage to normal tissue.This is generally accomplished by directing a beam of radiation at the tumor from several directions, so that the maximum dose occurs at the tumor.

**Some normal tissues are more sensitive to radiation than others. Ionizing radiation ,such as x-rays and  $\gamma$ -rays, tearing electrons off atoms to produce (+ve)and (-ve)ions.**

**It also breaks up molecules; the new chemicals formed are no use to the body and can be considered a form of poison.**

**The units are used to measure the amount of radiation to the patient:-**

**1-Erythematic dose :- the quantity of x-rays that caused redding of the skin.**

**2-Exposure (Roentgens (R) ),see ch16.4**

**$1R=2.58 \times 10^{-4}$  c/kg of air.**

**3-Absorbed dose (rad).The (rad) is defined as 100 ergs/g. that is a radiation beam that gives 100ergs of energy to 1g of tissue an absorbed dose of 1(rad) or gray =100(rad).**

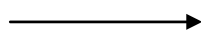
**🧠 The (rad) can be used for any type of radiation in any material;the roentgen ( R ) is defined only for x-rays and  $\gamma$ -rays in air.**

### **RBE(Relative Biological Effect)**

**The ratio of the number of gray of 250 KVp x-rays needed to produce a given biological effect to the number of grays of the test radiation needed to produce the same effect.**

### **LD50:-**

**The quantity of radiation that will kill half of the organisms in a population (cells,mice,people,.....etc) is called the lethal dose for 50% or LD<sub>50</sub>.**



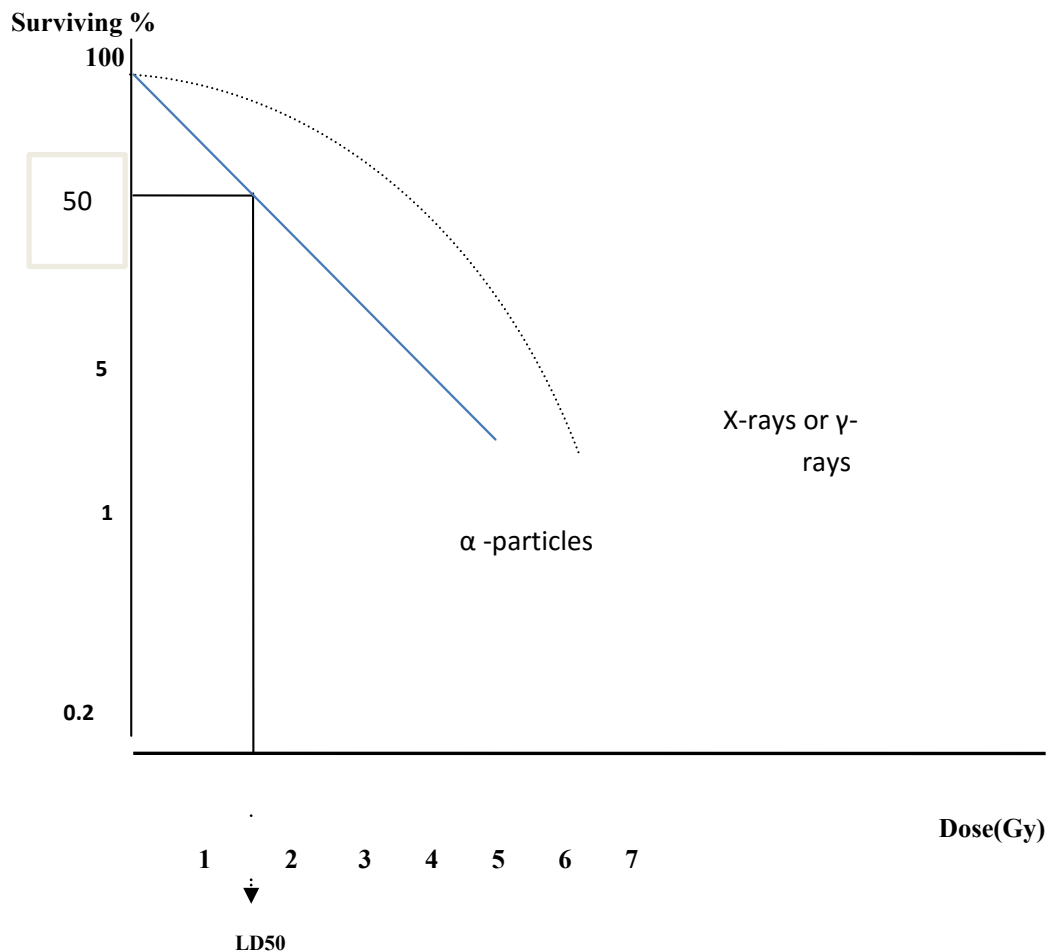
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LD<sub>50/30</sub>

Kill 50% in 30 days

LD<sub>50</sub> \_\_\_\_\_

kill 50%



**Oxygen effect:**-tumor cell is high resistance to radiation without oxygen and it is more sensitive to radiation with oxygen. So that if you treat the cancer cell by radiation you should treat it by oxygen firstly to become sensitive to radiation and this reduce the does is used.

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**Summary:**

Brachy therapy is short distance therapy and it has advantages and disadvantages. LD<sub>50</sub> is the lethal dose to kill fifty percent of cells exposed to radiation.