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**Q1=**

**Ans=**

 **LAW. OF. BERGONIE. AND. TRIBONDEAU. ;;;**

* **1906** , two French scientist , Bergonie and , tribondeau , theorized and observed that radiosensitiviry was a function state of the tissue being irradiated.
* **The**  law of Bergonie and Tribondeau is that the radiosensitivity of a biological tissue is directly proportional to the mitotic activity and inversely proportional to the degree of differentiation of its cells
* **Basically** the law state that the radiosensitivity of living tissue varies with maturation and metabolism;;
1. Stem cells are radiosensitive . More mature cells are more resistant
2. Younger tissues are more radiosensitive
3. Tissues with high metabolic activity are highly radiosensitive.
4. High proliferation and growth rate , high radiosensitivity.
* **This** law is principally interesting as a historical note in the deevelopment of radiobiology.
* **It** has found some application in radiation oncology.
* **The** law of Bergonie and Tribondeau emphasized the link b/w proliferation and radiosensitivity.

**Radiosensitivity**

 Radiosensitivity is the rekation susceptibility of cells , tissues , organs , or organisms , to the harmful effect of ioniing radiation.

**PHYSICAL FACTORS. EFFECTING. RADIOSENTIVITY**

1. **Linear energy transfer**
* Linear energy transfer is a measure of the rate at which energy is transferred from ionizing radiation to soft tissue.
* Linear energy transfer is expressed in units of kiloelectron volt of energy is transferred per micrometer of track length in soft tissue ( KeV/ um)
* LET of diagnostic x ray is 3 KeV/um.
1. **Relative. Biological. Effectiveness**
* As the LET of radiation increase the ability to produce biologic damage also increase.

 . **RBE=** Dose of standard radiation necessary to produce a given effect

 Dose of test radiation necessary to produce the same effect

* Diagnostic x ray have an RBE of 1.
* Whereas radiation with lower LET than diagnostic x ray have an RBE less than 1, radiation with highet LET have a higher RBE.
* As linear eneegy transfer increases relative biologic effectiveness also increases but a maximum value is reached followed by a lower RBE because of overkill.
* We can control LET and RBE by adjusting KVP.
1. **Fractionation. And. Protraction ;;**
* If a dose of radiation is delivered over a long period of time rather than quickly the effect of that dose less.

**Protraction;;**

If the dose is delivered continuously but at a lower dose rate it is said to be protracted.

* Six gray delivered in 3 minutes at a dose of 2Gyt/ min is lethal for a mouse . However when 6Gyt is delivered at the rate of 10mGyt/hr for a total time of 600 hours the mouse will survive.

**Fractionation;;**

If the 6 Gyt dose is delivered at the same dose rate but in 12 equal fractions of 500 mGyt , all separated by 24 hours the mouse will survive in this situation the dose is said to be fractionated.

* Radiation dose fractionation reduces effect because cells undergo repair and recovery between doses
* Dose fractionation is used routinely in radiation oncology.

 **Q2=**

 **Ans =**

 **EFFECT. OF. IRRADIATION. OF. MICROMOLECULES;;;**

* Three major effect occur due to radiation on micro molecule
1. **Main. Chain. Scission=**

 Main chain scission is the breakage of the backbone of the long chain micro molecule.

* The result is the reduction of a long single molecule into many smaller molecules, each of which may still be micro molecular.
1. **Cross Linking;;**

 Some micro molecules have small spur like side structures that extent off the main chain.

* This side structures can behave is through they had a sticky substance on the end and they are attached to the neighbourIng micro molecules or the another segment of the same molecule this process is called crosslinking.
1. **Point lesions ;;**

 Radiation Interaction with micro molecule also can result in disruption of single chemical bonds producing point lesions.

* Point lesions are not detectable but they can cause a minor modification of the molecular which in turn can cause it to malfunction with in the cell.

**RADIOLYSIS. OF. WATER;;**

* The human body is in equation solution that contain approximately 80% water molecules.
* When water is a irradiated it dissociate into other moleculer produucts; this action is called radiolysis of water.
* Exposure of cells to ionizing radiation induced high energy radiolysis of H2O water molecule into H positive and OH negative radical.
* These radicals themselves are chemically reactive and in turn

Combine to produce a series of highly reactive combination such as **superoxide** (HO2) and **peroxide (**H2O2) that produce oxidative damage to molecules with in the cell.

**EFFECT. OF. RADIATION. ON. CELL; ;;**

**Introduction ;;**

 Projection damage to cells can either occur directly or indirectly.

* Most of the damage occur to the cell DNA.

**Direct rediation damage ;;**

 Indirect action the DNA is hit by radiation directly result in damage.

* When DNA molecule are directly exposed to UV radiation the energy absorbed by the light make the molecules more reactive.

**Indirect radiation damage;;**

 In indirect damage radiation hits water and other organic molecules generating free radicals.

* These medical can react with DNA molecule and causes structural damage .
* This damage is very common.

**FRACTIONATION. AND. PROTRATION;;**

 FRACTIONATION in the context of radiotherapy is the process of dividing a dose of radiation into multiple “fraction”.

* This practice seeks to maximize the destruction of malignant cells while minimizing damage to healthy tissues.

**Protraction; ;**

If the dose is delivered continuously but at a lower dose rate it is said to be protracted.

**Q3=**

**Ans=**

 **Summary of the early effect of radiation on human body;;**

1. Early radiation of response are described is deterministic those that increase diversity with increasing radiation dose.
2. It is also called deterministic effect.
3. Early effect causes damage of normal cell in the body.
4. It is also called acute effect.
5. Mechanism of cell killing.
6. Threshold dose.
7. Deterministic in nature.
8. High dose.
9. Can be completed avoided.
10. Adequate dose
11. Radiation sickness.
12. Severity increase with dose.
13. Radiation syndromes.
* CNS syndromes
* Damage organ
* Death
* Immediate effect
* It is chert period of time.
* It is also called non stochastic effects.
* This effect depend on dose rate, dose fractionation, irradiation volume ,type of irradiation.
* It is also called acute radiation syndrome.

**Example; ;**

* Hair loss
* Skin damage
* Headaches
* Fatigue
* CNS syndrome
* Haematopietic syndrome
* Vomiting
* GI syndrome.