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CLASS : 4TH SEMESTER
PAPER : RADIATION PROTECTION
(AHS)

QUESTION NO :1
ANSWER:

LAW OF BERGONIE AND TRIBONDEAU:

Background:

- In 1906,one of the radiology's most important discoveries was made the law of Bergonie and Tribondeau.

STATEMENT:

- This law states that the radiosensitivity of living tissue varies with maturation and metabolism.

EXPLANATION:

- Stem cells are radiosensitive.
- Mature cells are radioresistant.
- Immature or younger cells are more radiosensitive.
- Resistance to radiation increases with increased cell maturity.
- Tissues with high metabolic activity are radiosensitive.
- High proliferation (reproductive) rate for cells and a high growth rate for tissues result in increased radiosensitivity.

PHYSICAL FACTORS THAT AFFECT RADIOSENSITIVITY:

1.LINEAR ENERGY TRANSFER:
2.RELATIVE BIOLOGIC EFFECTIVENESS:
3.PROTACTION AND FRACTIONATION:

1:LINEAR ENERGY TRANSFER (LET):

- Rate at which energy is transferred from a beam of radiation to the tissue through which it travels.
- It is another method of expressing radiation quality.
- Determining the value of the radiation weighting factor used in radiation protection.
- The LET of diagnostic x-ray is 3.

UNIT OF LET:

- It is expressed in units of kiloelectron volt of energy transferred per micrometer of track length in soft tissue.
- KeV/um

2:RELATIVE BIOLOGIC EFFECTIVENESS (RBE):

- RBE is directly proportional to LET.
- As the LET of radiation increases,the ability to produce biologic damage also increases.
- This effect is quantitatively described by the relative biologic effectiveness.
- The RBE of diagnostic x-rays is 1.

3: PROTRACTION AND FRACTIONATION:

- If the dose is delivered continuously but at a lower dose rate it is said to be protraction.
- When a dose is delivered at the same dose but in equal fractions is said to be fractionation.
- Dose fractionation is used routinely in radiation oncology.
- Dose protraction and fractionation cause less effect because time is allowed for intracellular repair and tissue recovery.

QUESTION NO :2
ANSWER:

SHORT NOTE ON:

1: IRRADIATION OF MACROMOLECULES:

- When macromolecules are irradiated in solution in vitro,three major effects occur.

1:MAIN- CHAIN SCISSION.

2:CROSS- LINKING.
3:POINT LESION.

1:MAIN CHAIN SCISSION:

- Main chain scission is the breakage of the backbone of the long chain macromolecules.
- Reduction of a long, single molecule into many smaller molecules.
- Main chain scission reduces the size of the macromolecules .
- It also reduces the size of the viscosity of the solution.
- Viscous solution is very thick and slow to flow like cold maple syrup.

2:CROSS-LINKING:

- Some macromolecules have small spurlike side structures that extend off the main chain.
- These structures behave as a sticky substance on the end, attach to neighboring macromolecule or to another segment of the same molecule.
- This process is called cross-linking.

3: POINT LESION:

- Disruption of single chemical bonds producing point Lesion.

- Point Lesion are not detectable.
- They can cause a minor modification of the molecule.
- Point lesion can result in the stochastic radiation effects observed at the whole body level.

2:RADIOLYSIS OF WATER:

- When water is irradiated it dissociates into other molecular products this action is called radiolysis of water.
- When an atom of water H2O is irradiated it is ionized and dissociates into two ions an ion pair.

3: EFFECT OF RADIATION ON CELL:

CELL TRANSFORMATION:

- Mitotic Delay
- Interference with function
- Chromosome breakage

CELL DEATH:

- Instant
- Reproductive
- Interphase death
- Mitotic or genetic death

REPAIR:

- Most common

4:FRACTIONATION AND PROTRACTION:

- If the dose is delivered continuously at a lower dose rate,it is said to be protracted.
- If the 6- Gyt dose is delivered at the same dose rate but in equal 12 fractions of 500 mGyt,all separated by 24 hours,the mouse will survive.
- The dose is said to be fractionated.
- Radiation dose fractionation reduces the effect because cells undergo repair and recovery between doses.
- Dose fractionation is used routinely in radiation oncology.

QUESTION NO :3
ANSWER:

- ***SUMMARY OF THE EARLY EFFECTS OF RADIATION ON THE HUMAN BODY:***

- After exposure to a high radiation dose,humans can experience a response within a few days to a few weeks .
- This immediate response is called a **deterministic effect.**
- Such early effects are deterministic, the severity of response is dose related,there is a dose threshold ,and the dose-response relationship.

- ***DETERMINISTIC EFFECTS OF RADIATION ON HUMANS:***

1: ACUTE RADIATION SYNDROME.

- The sequence of events that follows high dose radiation exposure leading to death within a few days or weeks is called acute radiation syndrome.
- It includes the following;

a.Hematological syndrome
b.Gastrointestinal syndrome
c.Central nervous system syndrome

- These syndromes are dose related.

2: LOCAL TISSUE DAMAGE:

- When only part of the body is irradiated,higher doses are tolerated.
- Examples of the local tissue damage includes;
  a.Effects on skin
  b.Effects on gonads
  c.Extremities

a.EFFECTS ON SKIN:

- The first manifestation of radiation injury to the skin is damage to the basal cells.
- It includes;
- **Erythema**
- **Early transient erythema**
- **Hair loss**
- **Desquamation**
- **Epilation**

b.*EFFECTS ON GONADS:*

- Radiation of the male testes result in a reduction of spermatozoa.
- A dose of 2 Gyt produces the temporarily infertility.
- A dose of 5 Gyt to the testes produces permanent sterility.

3.EFFECTS ON HEMATOLOGIC SYSTEM:

- It includes;
- **Lymphocytes**
- **Granulocytes**
- **Thrombocytes**
- **Erythrocyte**

HEMOPOIETIC SYSTEM:

- The hemopoietic system consists of bone marrow, circulating blood and lymphoid tissue.
- The principal effect of radiation on this system is fewer blood cells in the peripheral circulation.

4: CYTOGENETIC DAMAGE:

- The study of chromosome damage from radiation exposure is called cytogenetics.

- Chromosome damage takes on the following different forms:
  1.**dicentric chromosome aberration.**
  2.chromatid deletion.
  3.reciprocal translocation.

END OF PAPER..!
THANK YOU…!