SNS COLLEGE OF ALLIED HEALTH SCIENCES- COIMBATORE 35

DEPARTMENT : RADIOGRAPHY AND IMAGNG TECHNOLOGY

SUBJECT : GENERAL PHYSICS, RADIATION PHYSICS AND PHYSICS OF DIAGNOSTIC RADIOLOGY

PAPER : PAPER II

TOPIC : RADIATION QUANTITIES AND UNITS

RADIATION QUANTITIES AND UNITS

1. DOSE

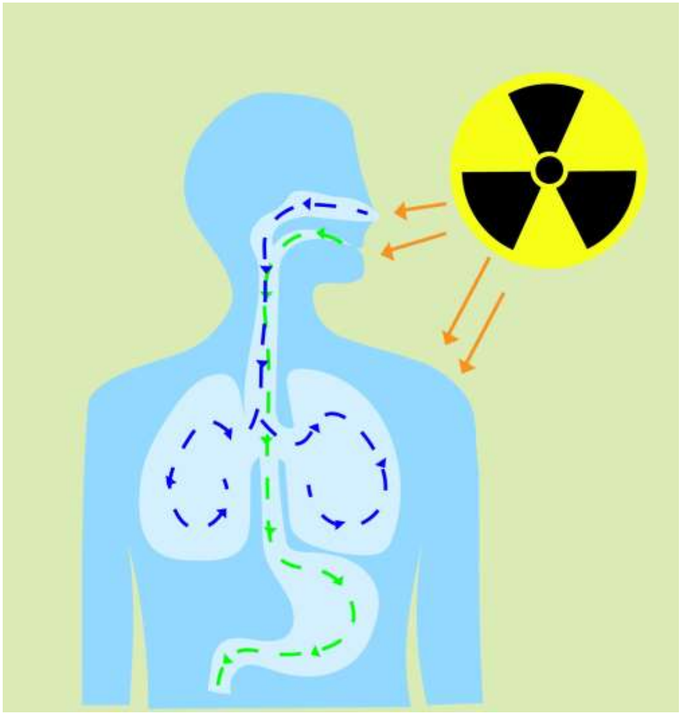
Energy transfer from one medium to another medium

Unit : gray (Gy)

2. ABSORBED DOSE

The energy imparted by ionizing radiation per unit mass of irradiated medium

Unit : gray (Gy)



RADIATION QUANTITIES AND UNITS

ACTIVITY

- The rate of disintegration (transformation) or decay of radioactive material.
- The units of activity are curie (Ci) and Becquerel (Bq)

SPECIFIC ACTIVITY (activity / gram)

- Specific activity is the activity per quantity of radionuclide.
- Thus specific activity is defined as the activity per quantity of atoms of particular radionuclide.
- It is usually given in units of Bq /g .
- Another unit of activity is the curie (Ci), allowing the definition of specific activity in Ci/g.

RADIATION QUANTITIES AND UNITS

3. KERMA

- Kerma Stands for kinetic energy released in the medium, which describes the initial interaction of photon with an atom, that takes place in the medium.
- When a radiation interacts with the matter, **the uncharged particles (photons & neutrons) transfer kinetic energy to the charged particles (electrons and proton s)**
- Kerma (K) is the measure of kinetic energy transferred to the charged particles
- The unit of Kerma is joule / kilogram (J/Kg)
- SI unit is Gray and the special unit is rad.

RADIATION QUANTITIES AND UNITS

4. CEMA (converted energy per unit mass)

- Cema differs from kerma in that cema involves the energy lost in electronic interactions by the incoming charged particles.
- An analogous quantity for charged-particle fields, cema (**converted energy per unit mass**), is defined, which quantifies the energy imparted in terms of the interactions of charged particles, disregarding energy dissipation by secondary electrons.
- The unit of cema is joule / kilogram (J/Kg).

EQUIVALENT DOSE

5. Equivalent Dose (HT)

- (ICRP report 26 (1977))
- The biological effects of radiation depend not only on absorbed dose (D). But also on the type of radiation.
- It is the absorbed dose averaged over a tissue or organ and weighted for the radiation quality that is of interest, and is given as, $\mathbf{H_T = D \times W_R}$
- Where, WR is the weighting factor for the radiation type analogous to RBE in radiobiology.

EFFECTIVE DOSE

6. Effective Dose (E)

- ICRP 26 introduced the term effective dose (E)
- The whole body exposures are not uniform and dose equivalents for various tissues may differ markedly. Hence the radiation induced effects vary with sensitivity of the organ.
- Which describes the dose to the whole body and it is derived from equivalent dose. It is defined as the

  $$E = \Sigma W_T \times H_T$$

- Where as WT weighting factor for the tissue T, HT is the mean equivalent dose received by the tissue, and E is the summed organ or tissue doses as an overall whole body dose.

INTERROGATIONS

1. It’s true that radiation travels in medium or without medium ?!
2. What is radioactivity ?
3. Explain Exposure
4. What is Exposure rate constant

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THANK YOU