**TAQ 2**

**1. Explain why radiation is dangerous to humans, and explain the different effects on adults and foetuses.**

Ans.

The radioactive decay has two ways of harming the body that is exposed to it. Namely, by directly killing cells of human tissue, and by causing mutations in the DNA.

Exposure to radiation also reduces our body's ability to produce blood platelets. Hence, radiation also increases the risks of serious internal bleeding. When compared with adults foetuses are more sensitive to exposure to radiation because of its fast growth from a single cell.

Effects of radiation exposure on adults includes, hair loss because the radiation damages the hair roots and renders them unable to grow more hair. Skin redenning (like sunburn) because of high energy transfered to the skin tissue from radiation particles. Breakdown of the intestinal lining due to tissue damage

All of the above mentioned effects of radiation exposure on adults depends on the dose and the duration of exposure.

Exposure to radiation on foetuses are, great tissue damage which leads to miscarriage, DNA damage which results in birth defects and mental retardation. Leukemia is also caused by radiation poisoning.

The effects of radiation exposure on foetuses depends upon the gestational age and the dose of radiation.

Reference List

[ARPANSA. (2017). Health effects of ionising radiation. [online] Available at: https://www.arpansa.gov.au/understanding-radiation/what-is-radiation/ionising-radiation/health-effects [Accessed 8 Aug. 2017].](https://www.arpansa.gov.au/understanding-radiation/what-is-radiation/ionising-radiation/health-effects)

Physicscentral.com. (2017). Ionizing Radiation and Humans – The Basics. [online] Available at: http://physicscentral.com/explore/action/radiationandhumans.cfm [Accessed 8 Aug. 2017].

Anon, (2017). [online] Available at: https://vmw-oesoapps.duhs.duke.edu/radsafety/fdose/fdrisk.asp [Accessed 8 Aug. 2017].

**2. Explain and evaluate the measures to protect patients and clinicians from radiations that are incorporated into the procedure for taking ordinary x-ray images.(200)**

Ans.

The the equipment in the lab must be periodicaly inspected, caliberated and maintained. The staff should be monitored and checked for exposure atleast quaterly. If the patient to be X-rayed is female, she must be checked for pregnancy before exposure. Radiation protection apron and thyroid and gonad shileds for staff and patient should be worn and regularly tested. Records indicating the radiation dosimetry tools and staff radiation exposure for last one year must be maintained for future references.

Tests are done annually for safety:

* + Half value layer test to determine if enough radiation is produced by system to produce quality diagnostic image without exposing the patient to more than necessary radiation.
  + Alignment of x-ray to control area of body exposed to radiation.
  + Automatic exposure control, to terminate radiation when a pre-detemined dose of radiation has been given.

Speciality institutes and organizations are encouraged to improve upon the existing safety protocols and measures. The facilities which provide radiation imaging are also expected to have a madical physicist to help the clinicians to optimizing process to reduce exposure to both patient and clinician and develop methods to estimate total radiation exposed to the patient and the clinician. These estimates are then used to predict and plan the safety plans for the patients.

Reference List

Radman.co.uk. (2017). dental-radiography-and-x-ray. [online] Available at: https://www.radman.co.uk/resources/dental-radiography-and-x-ray.aspx [Accessed 8 Aug. 2017].

Fda.gov. (2017). Recording Information In The Patient's Medical Record That Identifies The Potential For Serious X-Ray-Induced Skin Injuries. [online] Available at: https://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/MedicalX-Rays/ucm117030.htm [Accessed 8 Aug. 2017].

**3. Explain the additional health risks to a patient undergoing a CT scan as compared to an ordinary x-ray photograph.**

Ans.

A single session of CT scan emits very powerful doses of radiation, in some cases, it can go upto 200 times of a chest x-ray. In other words, this is the amount of radiation a normal person would be exposed to naturally over a time period of seven years.

Such high doses of radiation exposure can do tissue damage ,create free radicals in human cells, damage the DNA and create mutations. Usually human body is able to repair the damages easily, but repeated exposures to high radiation by CT scan can lead to an unrepairable damage. This can then lead to cancer in human body.

Reference List

[Mayo Clinic. (2017). CT scan Risks. [online] Available at: http://www.mayoclinic.org/tests-procedures/ct-scan/basics/risks/prc-20014610 [Accessed 8 Aug. 2017].](http://www.mayoclinic.org/tests-procedures/ct-scan/basics/risks/prc-20014610)

Raysahelian.com. (2017). X-ray, CT scan, MRI health risks, dangers, cancer. [online] Available at: http://www.raysahelian.com/xray.html [Accessed 8 Aug. 2017].

Anon, (2017). [online] Available at: https://www.radiologyinfo.org/en/info.cfm? [Accessed 8 Aug. 2017].

**4. What is the effective dose for an external source in a case where the absorbed dose is 860 J/kg and the radiation is in the form of beta particles, assuming an RBE value of 1.8.**

Ans.

Given Data:

Absorbed dose = 860 J/kg

RBE = 1.8

Unknown :

Effective dose

We are familiar with the relation between effective dose and absorbed dose as described in equation given below,

Effective Dose = Absorbed Dose **\*** RBE

Converting absorbed dose from J/kg to Gy.

Absorbed dose = 860 J/kg = 0.86 Gy

Substituting the values from given data to find out the unknow.

Effective Dose = 0.86 Gy \* 1.8

= 1.548 Sv