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Q1 Describe the role of radiation protection officer in radiology department?

Role of Radiation protection officer:
A radiation protection officer is a specialist in radiation safety and compliance matter and is an appointed position within university Health and safety services.

The role involves:
1 Acting as the point of contact within the university for the external Radiation protection Advisers.

2 Acting as the point of contact within the university for regulators relevant to ionising radiations compliance. i.e the Environment Agency (EA) and the Health and safety Executive.

3 Prepare periodic status reports on radiation safety and management for purposes of university governance.

4 Manging Environment Agency permits including,

- Make application for new or variation to existing EA permits.
- Manage the collation of waste records and make pollution inventory returns to EA.

5 preparing periodic status reports on radiation safety and management for purposes of university governance

6 Monitoring site activity against Environment Agency permit conditions, including

- Expert inspection and auditing of storage and disposal facilities.
- Auditing holdings and usage records.
- Auditing waste accumulation in stores.
- Performing waste sampling when required by the Regulator.

7 Arranging for disposal of radioactive waste to authorised contractors.

8 Managing facility or site decommissioning

9 Manging the security of radioactive sources according to current national requirements and carry out periodic security audits.

10 managing a system for the provision of personal dosimetery and associated record - keeping.

Q2 Elaborate the radiation protection measure in a safe radiology department?

Following are the protection measure in a Radiology department.

- Protective X-Ray tube housing :-
  - protective housing to reduce leakage radiation.
  - must be less than 100mR/hr at a distance of 1m from protective housing.

- Control panel :-
  - must show exp conditions and when tube is energized.

- SID Indicator :-
  - Indicator must be present.

- Collimation :-
  - Light field, Valiable apeture.
  - x-ray beam and light filed must coincide w/in 2% of SID.

- PBL - Positive Beam Limitation :-
  - Auto collimation circa 1974 - 1994.
  - must be accurate w/in 2% of SID.

- Beam Alignment :-
  - How do we know the tube is aligned

with the image receptor.

Filtration:-
Inherent plus added.
- Total must be at least 2.5mm above 70kvp.

Reproducibility:-
- Constant output radiation intensity.
- Should not exceed 5% through same technique.

Linearly:-
- Constant output for varied mA settings while time is adjusted to keep mAs the same.

Portable / Fluoro protection:-
- operator sheild.
  - It must not be possible to expose in a room outside of the operator booth.
  - portable x-ray must have >2m tether for exposure.

- Fluoroscopic Protection:-
  - SSD source to skin distance.
- Divergence of x-ray beam means the ESE or entrance skin exp is lessened for the required exit exposure as SSD is increased.
  - SSD must be not less than 38 cm on stationary fluoroscopes and not less than 30 cm on mobile fluoroscopes.

Additional Fluoro protection:
- Primary protective Barriel.
- Filtration.
- Collimation.
- Exposure control.
- Bucky slot Cover / protection Curtain.
- Cumulative Timer.
- Intencity.

Protective Barriers:
Primary protective Barriel
- protects against the primary ~~bucky~~ beam.
- floor,
- wall behind an upright bucky.

Secondary Barriers.
- protects against secondary radiation.
- Control booth.
- wall without upright bucky.

Radiation Detection & Measurement:
Instruments are Designed to.
- Detect radiation.
- measure radiation.
- Both detect and measure radiation.

Three Effective strategies:
Time:
Minimize the time and you will minimize the dose.

Sheilding:-

Position Shielding between yourself and the source of radiation at all permissible times. Take advantage of permanent Shielding.

- select appropriate Shielding material during the planning stages of the procedure.

Q3 What are radiation hazards that one should be beware off?

Radiation Hazards:-

- Radiation injury causes changes in the living tissue causing radiation sickness
- Somatic effects: harmful to the person.
- Genetic effects - Reflected in the offspring.

1 Radiation decomposition i.e Splitting of water into H^+ and OH^- and also Splitting of other solvents of the body

2 kinetic energy of the incident photons heats up the molecules of the living tissues.

3 Incident radiation when traveling through the body tissues knock out the bound electrons free from

their parent atoms or molecules. These free electrons are highly unstable and interact with other atoms and molecules within the irradiated system.

- Ionization is another process where the radiations interact with matter to form ions.

- High-energy electromagnetic radiation and particle radiation are capable of producing ions in their passage through matter.

- Types of ionizing radiation include alpha and beta, x-rays, gamma rays etc. x-ray machine and Radioisotopes are the two important & potential sources of ionizing radiation.

- The biological effect are enhanced by the presence of oxygen which is always present in the cells.

- The early effect of radiation is a result of direct injury to the tissues, simultaneous and considerable destruction to the radiosensitive cells led to radiation sickness. These effects appear within days or weeks after exposure and include.
nausea, vomiting, malaise, diarrhea, fever, hemorrhage, loss of appetite etc.

delayed effects of radiation includes shortening of life span, leukemia, malignant tumors, cataract. These appear after months or even many years of exposure.

Types of Radiation Source Health effects:

UV radiation:

- UV tanning equipment (sun lamp, beds booths)
- short term - sunburn.

- Infra-red radiation:
- Infra-red heat lamps used in deep heat treatments.
- Infra-red hair dryers.
- Conjunctivitis.
- long term - premature skin aging, skin cancer and cataracts.

- Lasers:
- beauty industry treatments such as skin exfoliation and hair removal.
- skin damage.
- eye damage including blindness.

Ultrasound:

- beauty industry heat treatment and skin exfoliation.
- overheating and burning of body tissue.
- The unit Rad (radiation absorbed dose) is used as the unit of absorbed dose following exposure to any type of

ionizing radiation. one rad is equal to the radiation necessary to deposit energy of 100 ergs in 1g of irradiated material. (100 ergs)

- The radiation dose is measured in terms of Roentgen.

  It is the quantity of X-rays or gamma radiation which produces one electrostatic unit in one c.c of dry air after its ionization at 0 degree centigrade and 760mm Hg pressure.

Indirect effects

- Since 80% of the biological tissue is water.

- most of the incident radiation energy is absorbed by the water molecules and these are broken into very unstable and reactive components. These then react with body molecules and cause the cell damage.

- The biological effects are enhanced by the presences of oxygen which is always in the cells.

Q4 How a radiation technologist can protect himself/herself from radiation what is annual occupational dose?

Protection :-
X-rays rooms have bullied walls and windows that keep exposure inside the room. During these imging procedures radiologic technicians leave the room & stand behind a protective shield, such as a curtain, that is designed to keep at radiation, at all possible time.

MEASURE YOUR Radiation dose dosimeter:-
use to measure the occupational dose equivalent from X-ray, gamma, and energy beta emitters. Dosimeters cannot detect radiation from low energy beta emitters.

As Low As Reasonably Achievable:-
⇒ Always practice ALARA.
⇒ As Low As reasonably achievable.
⇒ Move the item worked on away from the radiation area, if possible.

Three effective Strategies Shielding:-
⇒ Position Shielding b/w yourself and the source of radiation at all permissible times. take advantage of permanent shielding.

=> select appropriate shielding material during the planning stages of the experiment.

=> plexiglas, plywood and lead are effective in shielding radiation exposure use the proper shielding for the type of radioactive material present.

Room Shielding:
=> Lead lined plaster board.
=> Lead glass ~~for~~ viewing window.

Personal protective Equipment:
=> protective clothing shall be worn when working with radioactive materials this includes laboratory coats, gloves and safety glasses.

Three Effective strategies:
TIME:
=> Minimize the time and you will minimize the dose.

=> pre-plan the experiment ~~to~~ minimize exposure time.

DISTANCE:
=> Doubling the distance from the source can reduce your exposure intensity by 25%.

=> use forceps, tongs and trays to ~~reduce~~ increase your distance from

radiation source.

-> use time, distance and shielding to your self.

- puting distance and sheilding b/w you and a radiation source is the immediately effective way of reducing your expsure.

Technologist protect ourself from radiation by:

MINIMIZE EXPOSURE:

When working with radioactive material remember to minimize your exposure.

Annual occupational dose:

	rem	mrem
Whole body	5	5,000
Eye	15	15,000
Shallow	50	50,000
Minors & Declared Pregnant workers	10%	10%

Whole body = Total effective Dose Equivalent General public limit = 2 mrem/hr or 0.1 rem/yr.