In previous units, the topic of the biological effects that radiation exposure has on the body and the units used to measure these exposures was addressed. Unit 8 will review those units and expand in to detail on the specifics of the biological effects of radiation exposure or rather *over-exposure*.

The Biological Effect of radiation poisoning or over-exposure to the whole body are divided into three general categories by the USNRC and they are:

1. **Somatic Effects:** a person receiving somatic effects might exhibit **prompt** symptoms such as minor to severe skin burns, cataracts on the eyes, and even severe internal organ and blood damage. A person might also experience **delayed** somatic effects such as cancer due to damaged and mutating cells in the body.
2. **Genetic Effects:** a person can experience genetic mutations and changes in their DNA that can be passed on to their offspring, although in some radiation exposure cases the victim becomes sterile and unable to reproduce.
3. **Teratogenic Effects:** this is when a developing embryo (baby) is expose to radiation and the result can be malformation of organs including various levels of mental retardation.

This effect differs from genetic effects in that the radiation caused damage to the baby after fertilization of the embryo as opposed to before to the parents (mother or father) DNA.

There is no question ionizing radiation exposure must be kept to a minimum and it is imperative for radiographers to be fluent in “radiation safety”, prepared to keep themselves and everyone safe and to practice ALARA.

The Median Lethal Dose (MLD) is that radiation dose expected to cause death to 50 percent of an exposed population within 30 days (MLD 50/30). Typically, the MLD 50/30 is in the range from 400 to 450 rem (4 to 5 Sieverts) received over a very short period. Table 8-A displays the Annual Dose Limits as established by the NRC. It is interesting to note the different doses allowed based on age and body parts.

**Table 8-A: Annual Dose Limits**

**Adult ($18 yrs)**

**Minor (< 18 yrs)**

**Whole body\***

**5000 mrem/yr**

**500 mrem/yr**

**Lens of eye**

**15000 mrem/yr**

**1500 mrem/yr**

**Extremities**

**50000 mrem/yr**

**5000 mrem/yr**

**Skin**

**50000 mrem/yr**

**5000 mrem/yr**

**Organ**

**50000 mrem/yr**

**5000 mrem/yr**

**Table 8-B** below is similar to table 7-B in the previous chapter with a little variation in the Biological Effects of **Acute** Exposure on a human.

|  |  |
| --- | --- |
| **Dose (Rads\*)** | **Effects** |
| **25-50** | First sign of physical effects (drop in white blood cell count) |
| **100** | Threshold for vomiting (within a few hours of exposure)  |
| **320 - 360** | ~ 50% die within 60 days (with minimal supportive care) |
| **480 - 540** | ~50 % die within 60 days(with supportive medical care) |
| **1,000** | ~ 100% die within 30 days  |