

4.5 RADIATION SYNDROME

Acute radiation syndrome (also known as radiation sickness or radiation poisoning) is a collection of health effects that are caused by being exposed to high amounts of ionizing radiation in a short period of time

Symptoms can start within an hour of exposure, and can last for several months. Early symptoms are usually nausea, vomiting and loss of appetite. In the following hours or weeks, initial symptoms may appear to improve, before the development of additional symptoms, after which either recovery or death follow

The required conditions for Acute Radiation Syndrome (ARS):

1. The radiation dose must be large

The radiation dose must be greater than 0.7 Gray (Gy) or 70 rads. Mild symptoms may be observed with doses as low as 0.3 Gy or 30 rads.

2. The dose usually must be external

The source of radiation is outside of the patient's body. 3. The radiation must be penetrating

High energy X-rays, gamma rays and neutrons are penetrating radiations and able to reach organs

4. The entire body (or a significant portion of it) must have received the dose.

5. The dose must have been delivered in a short time (usually a matter of minutes) Fractionated doses are often used in radiation therapy. These are large total doses delivered in small daily amounts over a period of time.

Three classic ARS Syndromes

(1) Bone marrow syndrome

The full syndrome will usually occur with a dose between 0.7 and 10 Gy (70-1000 rads)

The survival rate of patients with this syndrome decreases with increasing dose. The primary cause of death is the destruction of the bone marrow, resulting in infection and hemorrhage

(i) Gastrointestinal (GI) syndrome

The full syndrome will usually occur with a dose greater than approximately 10 Gy (1000 rads)

Survival is extremely doubtful with this syndrome. Destructive and permanent changes in the GI tract usually cause infection, dehydration and electrolyte imbalance. Death usually occurs within 2 weeks.

(iii) Cardiovascular (CV) Central Nervous System (CNS) syndrome:

The full syndrome will usually occur with a dose greater than approximately 50 Gy (5000 rads). Death occurs within 3 days. Death likely is due to collapse of the circulatory system

as well as increased pressure in the confining cranial vault as the result of increased fluid content caused by edema, vasculitis and meningitis.

The four stages of ARS are:

1. Prodromal stage (N-V-D stage): The classic symptoms for this stage are nausea, vomiting, as well as anorexia and possibly diarrhea which occur from minutes to days following exposure.

2. Latent stage: In this stage, the patient looks and feels generally healthy for a few hours or even up to a few weeks.

Treatment of ARS

Treatment of ARS focuses on reducing and treating infections, maintaining hydration, and treating injuries and burns. Some patients may benefit from treatments that help the bone marrow recover its function.

The lower the radiation dose, the more likely it is that the person will recover from ARS

The cause of death in most cases is the destruction of the person's bone marrow, which results in infections and internal bleeding.

For survivors of ARS, the recovery process may last from several weeks up to 2 years

Cutaneous Radiation Injury (CRI) happens when exposure to a large dose of radiation causes injury to the skin. A doctor will suspect the presence of a CRI when a skin burn develops in a person who was not exposed to a source of heat, electrical current, or chemicals

