

# Radiation sickness

Template:Infobox - disease **Radiation sickness**, **acute radiation syndrome** or **radiation poisoning**. These terms refer to tissue damage caused by excessive exposure of an individual to ionizing radiation. The term is used for both acute and chronic problems caused by a certain dose of radiation. Symptoms are caused by damage to the cell cycle. The first confirmed cases of health problems caused by radiation were among the German chemist Giesel, Marie Curie-Sklodowska and Henri Becquerel.

## Mechanism of action

The mechanism of action of ionizing radiation is twofold. As the particles pass through the tissues, radiation can be completely or partially absorbed by the cells. The amount of energy absorbed is characterized by the quantity **absorbed dose** (D). In practice, the unit used is **gray** (Gy). The effect of radiation can be direct if the ionization takes place directly in the DNA molecule. An indirect effect is mediated by water radicals, which subsequently damage DNA strands. Radicals are created by the dissociation of molecules under the action of ionizing radiation. These two effects are manifested macroscopically by morphological and functional changes in the tissue. Tissues with rapidly dividing cells (bone marrow, gonads, intestinal epithelium) are most at risk. Conversely, tissues that divide slowly or do not divide at all (myocardium, nerve cells) are resistant.

## Clinical manifestations

If the absorbed dose exceeds the threshold values for the given tissue, acute manifestations of damage to the organism will occur. These effects of ionizing radiation are called **deterministic (non-stochastic)**. There belong:

- acute radiation sickness – whole body irradiation with a dose of 1 Gy;
  - hematological form – whole-body irradiation with a dose of 2-10 Gy;
  - gastrointestinal form – whole-body irradiation with a dose of 10-50 Gy;
  - cardiovascular form;
  - neuropsychic form – whole-body irradiation with a dose of more than 50 Gy;
- acute localized disability;
  - erythematous dermatitis;
  - desquamative dermatitis;
  - necrotic dermatitis;
- suppression of hematopoiesis;
- cataract.

At lower, subthreshold, doses of ionizing radiation, acute damage to the organism will not occur. However, the probability of the occurrence of malignant tumors and genetic mutations in the affected individual increases. We call these effects **stochastic**.

## Prevention

The principles of protection against the danger of any kind of ionizing radiation lie in the complete avoidance of deterministic effects and the effort to limit stochastic effects as much as possible. This means preventing acute manifestations caused by an above-threshold dose of radiation and also preventing the effects of subthreshold doses that add up over time.

## Protection

- by distance – the received radiation energy decreases with the square of the distance;
- by shielding – lead plates, materials containing dispersed lead, barite wall plasters;
- over time - shortening the exposure to the risk of radiation;
- limiting (preventing) intake and increasing the elimination of the radionuclide.

## Links

### Related articles

- Physical Carcinogenesis
- Ionizing radiation
- Teratogenesis

## External links

- Akutní radiační syndrom

## Used literature

- KUPKA, Karel – KUBINYI, Jozef – ŠÁMAL, Martin. *Nukleární medicína*. 1. edition. 2007. 185 pp. ISBN 978-80-903584-9-2.