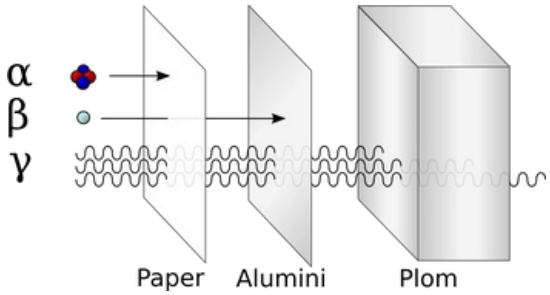
Shielding and protection from gamma radiation

Although it has γ radiation high penetration through the environment, it is possible to protect oneself from it safely.

There are many ways to reduce the effects of γ radiation on the body:

- **by reducing the exposure time to the necessary minimum**,
- '*by distance* - radiation intensity decreases inversely proportional to the square of the distance from the source,
- **limiting radiation scattering** - modifying the source, adding shielding surfaces,
- **shielding** - when we insert a barrier made of material between the source and the patient, which Absorps radiation.



Comparison of α, β, γ radiation.

This barrier should be placed as close as possible to the source and serves us to reduce the intensity or to completely absorb the radiation.

Materials with high proton number and high density are most suitable. lead, concrete, magnetite, steel, tungsten, and barite are most commonly used. These materials are used in construction (they are added to exterior paints, plasters or bricks). They have a high ability to absorb γ radiation and a low value half-thickness, which is the value that determines the thickness of the material in which 50% of the radiation is absorbed. For example, lead has a half-thickness value of 1 cm and concrete 6 cm.

Establishing low radiation exposure limits for people who work with radiation on a daily basis

The maximum dose for radiation workers is set at **50 mSv per year and 100 mS per 5 years** (for the rest of the population, 1 mSv per year).

A personal dosimeter, which workers always carry with them at work, helps to monitor the values of the applied radiation. This device then adds up the daily radiation exposures and allows us to check whether the limit for a certain time unit is met or not.

Observance of safety rules and use of protective equipment

Inspections of the **State Institute of Nuclear Safety** are regularly carried out at all workplaces where radiation is used. The technical condition of the equipment, safety measures, knowledge of safety instructions and their compliance are checked. During performances, the amount of released radiation is measured dosimetrically.

Patient protection during therapeutic procedures

In general, the therapeutic benefit must be greater or at least comparable to the possible risk of harm to health from radiation. So we have to give such an amount of radiation that has a **sufficient therapeutic effect** but what about the **smallest effects** on the patient's health. The chosen dose of radiation is different for each patient and must be adapted to their height, weight and gender. For pregnant women, if they are indicated for the procedure at all, a smaller dose must be chosen than that which would endanger the health of the fetus. The amount of radiation administered is then recorded in the patient's therapeutic documentation.

Links

Related Articles

- Ionizing Radiation
- Gamma radiation in medicine

References

- NAVRÁTIL, Leoš, et al. *Medical Biophysics.* 1 (reprint 2013) edition. Grada Publishing, 2005. 524 pp. ISBN 978-80-247-1152-2.
- ULLMANN, Vojtěch. *Nuclear Physics and Physics of Ionizing Radiation* [online]. [cit. 2014-11-29]. <http://astronuklfyzika.cz/Fyzika-NuklMed.htm>.