

# RADIATION EFFECT ON HUMAN AND LIVING NATURE

## ВЛИЯНИЕ НА РАДИАЦИЯТА ВЪРХУ ЧОВЕКА И ЖИВАТА ПРИРОДА

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**Abstract:** *Radioactive and biochemical researches prove that after big reactor breakdowns nuclear explosions pastures and vegetation get polluted with radioactive iodine 131. High level of radioactive contamination has been established lucerne and other grasses, which required the prohibition of feeding farm animals with green fodder from the first slope. Milk is the most affected by the radioactive contamination of food of animal origin. Caught up in the human body radionuclides distributed in various organs, tissues and systems, they have complex kinetics, which depends on the nature of the metabolic processes. The distribution in the body depends on the manner of introduction of the radionuclide.*

**Keywords:** RADIOACTIVE ELEMENTS, HUMAN, RADIATION EFFECT , RADIONUCLIDE, FOOD PRODUCT, ISOTOPES

### 1. Introduction

Cosmic rays that reach the Earth's surface can create radioisotopes decay but compared to other naturally occurring radionuclides is extremely low and not particularly important.

With the importance of biological standpoint are thus formed in the atmosphere of carbon-14 and tritium. Carbon-14 is formed by irradiation with neutrons, nitrogen-14, and the three - of hydrogen. Radio hydrocarbon included in the organic world, follows the path of stable isotope and it helps to learn a number of processes, such as photosynthesis, decomposition of organic matter, determine the age of organic formations and others. It passes in the coal, oil, etc., and also in the inorganic carbon compounds (carbonates) and others. Tritiated also be mixed with hydrogen into the water, and other organic compounds, which enter as a component and is involved in the circulation of the substances, but its half-life is much shorter. Much of tritium and carbon-14 accumulates in ocean waters.

It is believed that the content of radioactive elements is the result of nuclear reactions in the atmosphere and in recent years 1000 constantly present in it. Naturally there is no question of radionuclides as a result of the testing of nuclear weapons and other human activity, but natural cosmogeneous radionuclides. Interest is established depending on the content of radionuclides in the atmosphere not only by the altitude but also the latitude of the globe. It was found that with the distance from the equator to the north intensity of cosmic radiation is uvelichava. Tova binds to the influence of magnetic fields on the planet.

Soil is the main source of radioactive pollution got into the biosphere through the atmosphere and in other ways. It is proved that the air radioactive pollution of plants has main significance the first days and weeks after the radioactive blast even more when plans are in the status of active vegetation. Later on when the atmosphere gets partially or fully cleansed from the radioactive particles, soil becomes the main provider of pollution to vegetation and therefore to people and animals. This phenomenon has been constituted after the period of intense testing of nuclear weapons in air in the beginning of 60's and after the stop of the tests according to Moscow contract of 1963. Polluted water continues to nourish plants with radioactive particles in those areas. This happens as result of the radioactive particles and compounds being included in the biological components of the lithosphere and soil.

### 2. Materials for Production of Prototype Parts

Radioactive and biochemical researches prove that after big reactor breakdowns nuclear explosions pastures and vegetation get polluted with radioactive iodine 131. The most polluted this this isotope milk cannot be drank after that. In those occasions, milking animals must immediately be removed from pastures and fed only

with provender from the warehouses. As in similar occasions, milk is the most affected product by radioactive pollution.

From all kinds of meat the one with highest levels of radioactive pollution is mutton. In other eatables from vegetarian and animal origin – tomatoes, pepper, cucumbers, potatoes, carrots, cabbage, beans, apples, pears, watermelons, mushrooms, cans, sausages, baby foods, etc...have been detected lower levels of radioactive pollution. This has served as reason to the Committee on the Peaceful Uses of Atomic Energy to state that main part of foods used within population doesn't seem to be radioactive and to suppose risk to health is as its lower levels. Highest levels of pollution within researched plants have been detected with leaf vegetables – salads, lettuce, green onion, parsley.

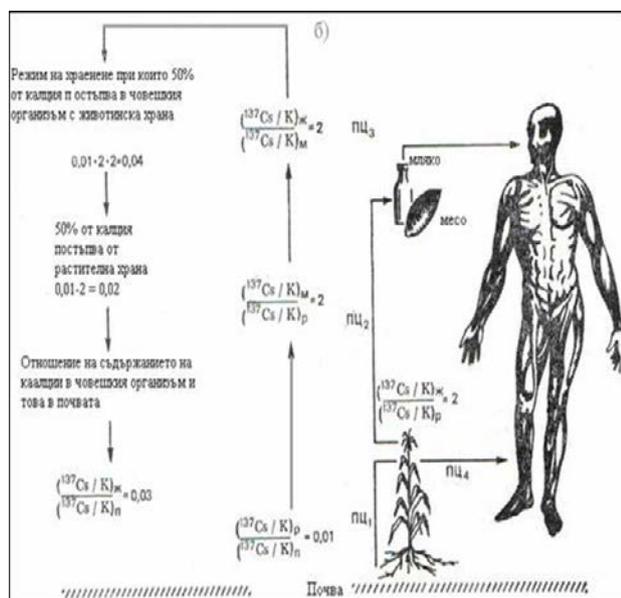
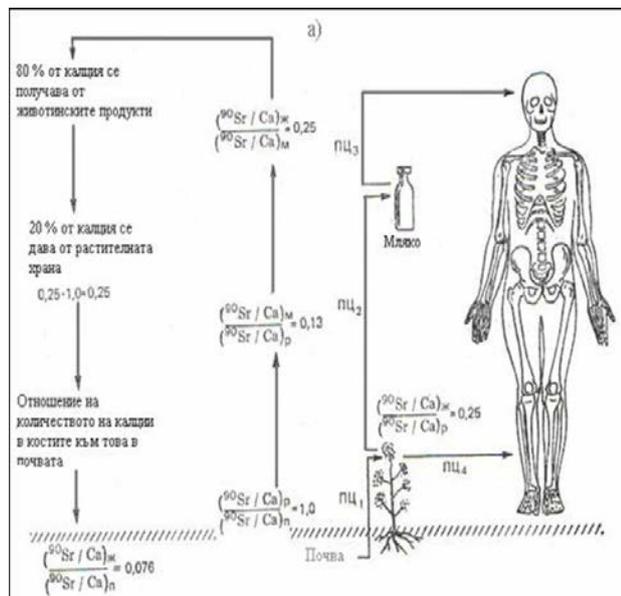
High level of radioactive contamination has been established lucerne and other grasses, which required the prohibition of feeding farm animals with green fodder from the first slope. In straw cereals is measured several times higher activity than in the classes. In the measured activity was significant participation of radio-caesium.

Radioactive contamination of plants and plant products is associated mainly with air route of administration of radionuclides and their attachment on the soil and plant organs and a further shift in the chain - food for animals and humans. Milk is the most affected by the radioactive contamination of food of animal origin.

In some cases, it can be applied and biological decontamination of radioactively contaminated areas, ie extraction of radionuclides with plants that can accumulate and neutralize them.

Picture of the path of radioactive pollution in the human food chain gives us Fig.1. It appears that up to 80% of the calcium in the human body is obtained from foods of animal origin (Figure 1), but the most radioactive element strontium -90 (Sr90), is obtained in the radioactive contamination of the soil. The ratio of calcium and strontium in the bones of a person is equal to that of the elements in the soil.

From the figure it is clear that in terms of Sr-90 the most dangerous radioactive pollution is in the milk (a). The products of plant and animal origin have equal contribution to the pollution of the human body with Cs-137 (fig.1b). The ratio of Sr-90 / Ca is equal in the tissues of plants and soil. The organisms of animals use more quickly calcium than strontium, and this ratio is less than one. At the same time it should be noted that the contribution of Cs-137 in the food chain is extremely diverse On one hand, plants extract more potassium from the soil than cesium, at the same time in animals the accumulation of cesium is more intense than calcium, and the ratio between their concentrations is above unity.



**Fig.1.** Passage of Sr-90 and Cs-137 in the human food chain, the most sensitive to pollution with these radioactive elements (in Langkam, 1965).

The internal exposure of the human body is due to the radionuclides that have fallen into the (incorporated). Incorporation may be done in several ways, in which purposes of radioecology rights are the most important two:

- oral ingestion of food or water (oral incorporation);
- inhalation of radioactive gases and aerosols (inhalation incorporation). Caught up in the human body radionuclides distributed in various organs, tissues and systems, they have complex kinetics, which depends on the nature of the metabolic processes. Some radionuclides have selective uptake, such as iodine in the thyroid gland, radium and strontium – in bones; others distributed more evenly, such as cesium and potassium muscle tissue, etc.

At some point, the body has a certain activity  $A$  [Bq], which is distributed on the body mass  $m$  [kg], determined with specific activity [Bq / kg]. But  $C$  varies with time not only in body as a whole, but in different organs and tissues. This is due to the fact that the radionuclide is allocated in the body (especially in initial stages after arrival), but even is considered as a whole,  $C$  is changing because that given radionuclide decays with a physical half-life  $T_f$ , but is also appears in the body to the strong of it is a chemical element that is involved in metabolic processes. That departure is a purely biological process and is characterized by the so-called biological half-life  $T_b$ .

The distribution in the body depends on the manner of introduction of the radionuclide. For example, after ingestion of plutonium-239 in the body is held only about 0,003%, whereas after inhalation retained part is 25%. It is seen and the complex distribution in various organs of the body. These organs, in which he goes and accumulates respective radionuclide are called critical organs.

Radioactive isotopes of any chemical element, which falls in the body are involved in the exchange of substances in the same way as the stable isotopes of an element. Biological activity of radioactive isotopes is determined by the parameters of ionizing radiation which they emit.

The radiotoxicity is called the property of radionuclides that cause various degrees pathological changes in their entry into the human body. Pure radiotoxicity cannot be separated from the chemical toxicity of a chemical element and compound and a typical example of this is uranium, which belongs to the so-called heavy metals.

Toxic effects of radionuclides caught up in the human body is determined by:

- solubility and absorption of the compounds in which they are found;
- The way of incorporation;
- character of the allocation in organs and tissues;
- speeds of input and output of the body
- Physical characteristics of emitted ionizing radiation: type of radiation, energy, etc.;
- Age of the person, in which has fallen the radionuclide and other individual characteristics.

As a result of human exposure with large doses of some symptoms showing changes in normal physiology, may occur within days, hours or minutes. On the other hand, the body can react to irradiation of clinical events after years or decades. In this connection, radiation-induced effects in humans are divided into:

- Early somatic effects, with periods of manifestation from minutes to days. They are called acute and comprise a very wide range of phenomena, starting from the radiation erythema and lead to death of the organism. Somatic name comes from the Greek word soma, which means body.
- Late somatic or somatic-stochastic, with development period of years and decades. These include radiation the induced malignancies (commonly referred to as cancer).
- Inherited or genetic effects that occur in the progeny of exposed individuals: children, grandchildren, great-grandchildren, etc. In human radiobiology or otherwise, radiation in medicine, principally define two types of effects due to the effects of ionizing radiation on humans that medicine defined as diseases:
- deterministic effects, as all of them are somatic and are characterized by a threshold of radiation impact (threshold dose of radiation), under which these effects were not observed, and above this threshold the severity (level) of the clinical expression of the effect depends on the dose;
- stochastic effects, ie somatic (cancer) or hereditary (genetic) effects that occur in the irradiated person years after exposure or in subsequent generations. These effects (diseases) have a probability (stochastic) nature; for them it is assumed that there is no threshold on the radiation dose and the their gravity is independent of dose. Stochastic effects are not specific in nature, they can not be distinguished from other similar effects induced by other factors of non-radiation nature.

This principally separation of radiationthe induced effects in humans is a result of multi-year study of the effects of ionizing radiation on both human and experimental animals (mainly mammals), starting from the molecular level through to level body as a whole and population level. On the other hand, a number of problems, both theoretical and practical, has a number of unclear incomplete data on specific patterns on the formation and progress of the corresponding radiation-induced effect.

### ***3. Conclusions:***

1. Radioactive contamination of plants and plant products is associated mainly with air route of administration of radionuclides and their attachment on the soil and plant organs and a further shift in the chain - food for animals and humans .;
2. Milk is most affected by radioactive pollution food product of animal origin and flesh at high overlay of radioisotopes was observed in sheepmeat;
3. The highest contamination of vegetation is found in leafy vegetables - spinach, salads, lettuce, green onions, parsley, etc .;
4. The most widespread isotopes that have an impact on the human body are I-131, Sr-90 and Cs-137.

### ***4. Literature:***

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