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RADIOACTIVE PARTICLES TRANSPORT AND ABSORBED DOSES DISTRIBUTION IN THE RATS' GASTROINTESTINAL TRACT

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The radioactive ("hot") particles (HP) production can occur in different nuclear accidents. To date, a large amount of scientific data on radiation exposure of humans and other mammals has been accumulated, but information on radiative effect on the gastrointestinal tract (GIT) by HP is not enough.
The aim of the study was to simulate the HP transfer in the gastrointestinal tract (GIT) of laboratory rodents (namely, rats) and estimate doses of internal irradiation. It should be noted that monogastric rodents are widespread in nature and can be used as reference organisms to evaluate the radiative effect on the environment. Besides, their GIT is morphologically similar to the human one.
To study the HP radiative effect on laboratory rodents, the rats of Wistar breed weighing from 200 to 300 g were used. In the experiments the silicate fused radioactive particles gage 80-160 μm got by "uranium", "three-component" and "rhenium" models were used because their radiation characteristics are similar to ones of instantaneous fission products of 10-15 hours age. At the time of the HP intake in animals, the HP specific activity ranged from 3.7 to 7.4 GBk/g (100-200 MCi/g). Figure 1 shows the experimental data on time-depended radiation for all kinds of HP.
The one-compartmental model of HP transfer was applied to estimate time-dependent activity in rat's stomach. Then, dose rates in stomach and intestines were evaluated by two calculation techniques:
a) traditional, using simple semiempirical model;
b) more precise one, based on RADAR rat phantom [1].
Dose rates and accumulated doses were received in 1) source localization, i.e. fundus ventriculi; 2) small intestine; 3) thick intestine. In General, the best consistency of accurate and semi-empirical results is achieved at the source localization point. On the periphery, as you would expect, the discrepancy of results is greater. Here doses are many times less.

1. E.N. Denisova, Yu.A. Kurachenko. Med. Phys., No. 2(90), 2021. P. 66-72.

The speaker is a student or young scientist

No

Section

1. Nuclear technology and methods in medicine, radioecology

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