MICRODOSIMETRY OF HOT PARTICLES IN LUNG INTERSTITIUM

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The radiobiological significance of inhaled local α-emitting particles ("hot" particles) was the central point for number of researches. We evaluated the relative carcinogenic effectiveness of "hot" particles with the help of microdosimetry. According to microdosimetry concept the dose-dependent microdistribution of deposited energy in irradiated tissue, $f_D(z)$ is the physical base for prediction of stochastic tissue response on irradiation of different quality. The method of moments was used to approximate $f_D(z)$ in case of α-irradiation of lung interstitium (*LI*) (1). Two sets of sources were investigated. The first one is the set of randomly distributed stationary local emitters ("hot" particles). The second one is the set of α-emitters spread uniformly in LI (the case of uniform irradiation of the tissue). The penetration of α-particles through LI was examined with computer model of 3-d stochastic structure of lung interstitium (2). For the purposes of this model one describe the lung alveoli as a spherical shell with fluctuated inner diameter and thickness of wall.

The term of dispersion of $f_D(z)$, which is affected by spatial correlation of points of α-decay was found (3). For the set of local emitters that term depends on their average activity, energy of α-particles and spatial structure of irradiated tissue. According to our results the spatial microdistribution of α-emitters in irradiated LI affects the dose-response relationship for radiation induced cancer at low doses. In some instances at the same organ dose high local concentration of α-radioactive material in "hot" particles found greater effective carcenogenically than α-emitters spread uniformly. That fact conflicts with judgement of ICRP Recommendations 1990 (4) about relative hazard of the nonuniform irradiation.

The quantitative definition of notion "hot particle", based on microdosimetry approach is proposed.

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