Method of measuring high-LET particles dose

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In Boron Neutron Capture Therapy (BNCT), the total absorbed dose is the sum of four dose components with different RBE: boron dose; high-LET dose from the $^{14}N(n,p)^{14}C$ reaction ("nitrogen" dose); fast neutron dose; gamma-ray dose. *"The first two dose components cannot be measured in principle"*, as previously was written in [1, p. 279]. The methods for measuring the fast neutron dose for BNCT are absent also, as the energy of neutrons, as a rule, is obviously lower than 1 MeV and, for example, fission ionization chambers are not applicable. Quite a lot of proven approaches are existed only for measuring gamma-ray dose. We present a new approach for measuring boron dose, nitrogen dose and fast neutron dose in BNCT [2].

The idea of approach for measuring dose from high-LET particles is the following. The cell lines are exposed to g-radiation and mixed radiation (neutrons and g-radiation) measuring the dose of g-radiation. The doses of g-radiation which cause the same effect, for example cell surviving, are compared. The equivalent dose of high-LET particles was calculated by the formula: $D_n = D_{\gamma\ standard} - D_{\gamma\ mixed}$, where D_n – the equivalent dose of high-LET particles; $D_{\gamma\ standard}$ – the dose of g-radiation when the cells were exposed to g-radiation; $D_{\gamma\ mixed}$ – the dose of g-radiation when the cells were exposed to mixed radiation.

The work presents the results demonstrating the applicability of the new proposed approach for measuring the dose components due to neutrons: nitrogen dose, and fast neutron dose.

Keywords:
boron neutron capture therapy; absorbed dose; high-LET particles

References:

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