RBE of thermal neutrons for induction of chromosome aberrations in human lymphocytes.

Abstract:
The induction of chromosome aberrations in human lymphocytes irradiated in vitro with slow neutrons was examined to assess the maximum low-dose RBE (RBE(M)) relative to (60)Co \(\gamma\)-rays. For the blood irradiations, cold neutron beam available at the prompt gamma activation analysis facility at the Munich research reactor FRM II was used. The given flux of cold neutrons can be converted into a thermally equivalent one. Since blood was taken from the same donor whose blood had been used for previous irradiation experiments using widely varying neutron energies, the greatest possible accuracy was available for such an estimation of the RBE(M) avoiding the inter-individual variations or differences in methodology usually associated with inter-laboratory comparisons. The magnitude of the coefficient \(\gamma\) of the linear dose-response relationship \((\gamma = 0.400 \pm 0.018 \text{ GY}^{-1})\) and the derived RBE(M) of 36.4 \pm 13.3 obtained for the production of dicentrics by thermal neutrons confirm our earlier observations of a strong decrease in \(\gamma\) and RBE(M) with decreasing neutron energy lower than 0.385 MeV (RBE(M) = 94.4 \pm 38.9). The magnitude of the presently estimated RBE(M) of thermal neutrons is-with some restrictions-not significantly different to previously reported RBE(M) values of two laboratories.