Investigating cellular effects following neutron radiations

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Chromosome aberration scoring has recently started for in-house fast- and thermal-neutron dose response curves. Currently, only data from 0 Gy to 0.1 Gy is available for both neutron modalities.

For this work, peripheral blood lymphocytes were irradiated, cultured and scored according to IAEA's EPR-Biodosimetry-2011 guidelines (1). However, for the thermal neutron irradiations, sodium citrate was used as an anticoagulant to avoid adding extraneous Nitrogen. The major dose delivery route is through proton and carbon recoil nuclei following a thermal neutron capture reaction of nitrogen: 14N(p,n)14C. Sodium heparin was used as the anticoagulant for the 252Cf irradiations. To enumerate dose, dicentric and ring chromosome aberrations were recorded.

Fast neutrons were obtained from a 252Cf source (average energy of 2.1 MeV), while the thermal neutrons were obtained from AECL's National Research Universal (NRU) reactor, in collaboration with the Canadian Neutron Beam Centre (CNBC).

Our experiments indicate that the relative biological effectiveness (RBE) of 252Cf neutrons analyzed using the dicentric chromosome assay is 21.04, while the RBE of thermal neutrons was found to be 10.82.

References

[1] International Atomic Energy Agency (2011) EPR-Biodosimetry, 247.
[2] International Commission on Radiological Protection (2007) ICRP Publication 103, Ann. ICRP 37 (2-4).

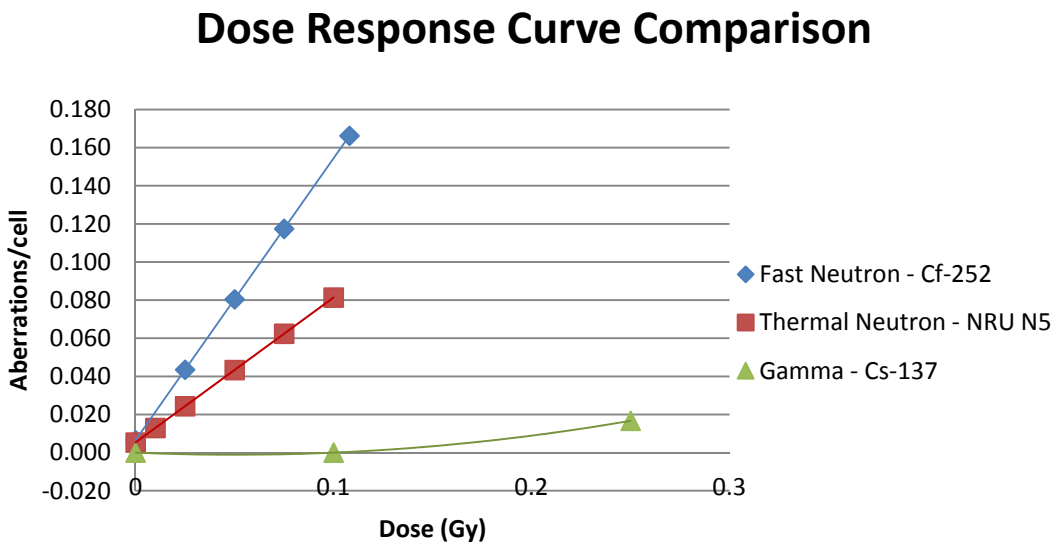

Figure 1 Comparison between dose response curves.