

The proportion of childhood leukemia incidence in the UK that may be caused by natural background ionising radiation

Richard Wakeford¹, Gerald M Kendall², Mark P Little³

¹Dalton Nuclear Institute, University of Manchester, Pariser Building, PO Box 88, Sackville Street, Manchester, M60 1QD, UK email Richard.Wakeford@Gmail.com

²Childhood Cancer Research Group, 57 Woodstock Road, Oxford, OX2 6HJ, UK email Gerald.Kendall@ccrg.Ox.ac.uk

³Department of Epidemiology and Public Health, Imperial College, London W2 1PG, UK, tel +44 (0)20 7594 3312; fax +44 (0)20 7402 2150; email mark.little@imperial.ac.uk

Abstract

Background

The aetiology of childhood leukemia remains generally unknown, although exposure to moderate and high levels of ionising radiation, such as experienced during the atomic bombings of Japan or from radiotherapy, is an established cause.

Methods

The recently published BEIR VII and UNSCEAR 2006 models are used together with estimates of natural background radiation red-bone-marrow doses in the UK received by children to predict the proportion of the cases of childhood leukemia that are due to natural background radiation

Results

For both BEIR VII and UNSCEAR 2006 models about 20% of the cases of childhood leukemia in the UK are predicted to be attributable to natural background radiation. However, for one of these sets of risk models this attributable fraction is materially dependent on how the radiation-induced risk is assumed to be transferred between the Japanese A-bomb survivors and Western children. Over a range of annual doses representing the range (0.5-2.5 mSv /year) experienced by most populations, the attributable proportion for the preferred risk transfer model varies between 8 and 30%, with small deviations from a linear relationship that are largely due to the saturation of the model, although again this range of attributable fractions depends upon the assumed transfer of risk between populations.

Conclusions

Both BEIR VII and UNSCEAR 2006 models predict that a substantial fraction (about 20%) of the cases of childhood leukemia are attributable to natural background radiation. The implications for this for studies of leukemia in relation to natural background radiation will be discussed.