Major Conclusions

TG91 Workshop

Radiation Risk Inference at Low-Dose and Low-Dose-Rate Exposure for Radiological Protection Purposes

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The Report – Content and Major Points

MAIN POINTS

- This report evaluates the current **scientific evidence** on low-dose and low-dose-rate biological effects of ionising radiation, in terms of the **low dose effectiveness factor (LDEF)** and the **dose rate effectiveness factor (DREF)**. The report reviews results on **endpoints related to the risk of all solid cancer**, at sub-cellular, cellular, tissue and organism, and population levels. In this report, **low doses are those below 100 mGy**, and low dose rates are those **below 0.1 mGy min^{-1} when averaged over about an hour**, for **low linear energy transfer** (LET) exposures.

- The concept of **DDREF** (combination of LDEF and DREF)), which basically represents an approach to be applied for radiological protection purposes, **is not the focus of this report**. In particular, the rationale behind this approach and its implication for the system of radiological protection is not discussed here.

The Report – Content and Major Points

- For somatic cell mutation, cell transformation and cytogenetic endpoints, numerical evaluations of both DREF and LDEF provide **values of around 4 and below**.

- Recent **pooled analyses** of data from **experimental animals** mostly suggest an **LDEF close to 1** and **DREF between 1 and 2** for life-shortening and for all solid cancers combined, with considerable variation depending on tumour type.

- Recent **meta-analyses of epidemiological data** for all solid cancers point toward **DREF values between about 1 and 3**, taking account of the uncertainties involved in these estimates.

The Report – Content and Major Points

- Analyses on **curvature in the incidence and mortality data from the Japanese atomic bomb survivors** find consistent evidence of curvature, so that evaluated population risks per Gy for all solid cancer mortality evaluated at 1 Gy are about twice those evaluated at 0.01 Gy. They tend to support a **sex-averaged LDEF value of between 1 and 2 for all solid cancers combined**, with some indication of variation between different cancer sites.

- While **considerable uncertainties remain**, the **ranges of LDEF and DREF values obtained here are narrower** than those obtained in previous evaluations. The **overall conclusion** of this report is that, based on current scientific evidence, **LDEF and DREF values much larger than 3 or less than 1 are unlikely**. These ranges appear largely consistent for the various sources of data reviewed in this report.

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