Abstract for ORAL presentation:

Estimating risk at low levels of ionizing radiation – the value of nuclear workers studies

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Radiation protection standards for environmental and occupational exposures to ionizing radiation are mainly based on cancer risk estimates derived from populations exposed to relatively high doses at high dose rates, in particular the Japanese A-bomb survivors. Risk assessment therefore requires extrapolation from relatively high dose-rate acute or fractionated exposures to the lower dose, low dose-rate protracted exposures of public health concern, as well as transportation of risk between populations with very different underlying cancer risks. Current extrapolation models are based on the so-called linear-no-threshold (LNT) model, but this model is subject to substantial uncertainty and controversy.

Direct estimation of radiation effects at low doses and low dose rates can in principle be made from studies of populations with such exposures, which could serve as a test of the adequacy of the LNT model. Such studies should include large populations, followed up over many years, with precise and accurate individual dose/exposure estimates.

Workers in the nuclear industry are a particularly suitable population: they form large, relatively stable populations with relatively well-measured and well-recorded external radiation doses. The 15-country study of nuclear workers has recently published its results, and so have studies of other large, directly relevant populations, including the Techa River residents and the Chernobyl liquidators. The risk estimates from these studies are generally somewhat higher than, but statistically compatible with, the linear extrapolation from the A-bomb survivors. These studies have limitations, however, most importantly concerning dosimetry and confounding. These limitations preclude definitive conclusions about the adequacy of extrapolation models at this stage.

This paper will review the value of epidemiological studies of nuclear workers and other populations with low-dose ionizing radiation exposure directly relevant for radiation protection, and provide indications for future research needs.

KEYWORDS: epidemiology; low-dose risks; nuclear workers

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