

Title: Reconstruction of Organ Dose from Emergency Work Dose at Fukushima: J-EPISODE

Authors: Hiroshige Furuta, Shin'ichi Kudo and Shin Saigusa

Radiation Effects Association, Japan

Abstract:

J-EPISODE, a Japanese nuclear worker cohort study, has developed organ dose conversion coefficients from dosimeter readings for normal work dose, following the established methods adopted by International Agency for Research on Cancer 15-Country Collaborative Study. Emergency work doses derived from Fukushima Daiichi Nuclear Power Plant accident occurred in March 2011 were provided as the sum of external and internal emergency doses by fiscal year (FY; April to March) and worker. Challenges for reconstructing organ dose for risk analysis were as follows; 1) partitioning into external and internal doses, 2) disaggregation of internal doses evaluated in committed doses into doses derived from intake of I-131 and Cs-137, and 3) conversion from committed doses to annual internal doses. Partitioning was conducted using sample of ad-hoc lifting designation records, which included detailed dose history, but were not available for those keeping to work. ICRP CD1, Database of dose coefficient, was used for conversion from committed doses to annual internal doses. To compliment lack of information, several assumptions were employed; 1) for external exposure, the photon energy and geometry distribution was the same as those of normal work, 2) intake of I-131 and Cs-137 was conducted at the first day of emergency work based on the conservative acute exposure scenario by the Ministry of Health, Labour and Welfare; on 12 March 2011 for committed doses in FY 2010 and on the first April 2011 for those in FY2011, and 3) the amount of intake of I-131 and Cs-137 were proportional to those concentration in the air. As a result, emergency work external dose was halved from 19 mSv in FY2010 to 11 mSv in FY2011, and the internal dose was reduced by about one-tenth, from 10 mSv to 0.7 mSv. The internal dose in March 2011 was mostly derived from I-131, and since most of it was accumulated in the thyroid gland after inhalation, the effect on other tissues/organs doses was smaller than the effective dose coefficient by two orders of magnitude. Except for the thyroid gland, the contribution of emergency work doses on the specific cumulative organ-absorbed doses was limited. J-EPISODE will use organ-absorbed doses including both normal and emergency work doses for the coming risk analysis. This study was funded by Nuclear Regulation Authority, Japan.