Uncertainties in organ dose reconstruction from committed effective dose in Fukushima accident: The nuclear worker cohort study J-EPISODE

福島原発事故の預託実効線量から臓器線量への変換における不確かさ：原子力施設作業者コホート研究J-EPISODE

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Introduction:
The nuclear worker cohort study J-EPISODE includes 4,000 emergency workers from the Fukushima nuclear accident, many of whom were internally exposed. Due to the lack of available information, the reconstruction of organ dose from the committed effective dose assessed by employers needed to assume the followings: the intake of radionuclides took place on the day designated for emergency work, and the intake of radionuclides was proportional to the air concentration.
Methods:
The above assumptions introduced uncertainties in the estimation of organ dose conversion factors. These uncertainties were evaluated based on simulations of acute or chronic intake scenarios and cases involving short-lived Te-132.
Results:
Internal dose in March 2011 was dominated by I-131 accumulated in the thyroid gland, whose effect on colon dose was two orders of magnitude smaller than the effective dose coefficient, and the acute intake scenario was overestimated by 30-40% compared to the chronic one; Te-132 affected colon dose 10 times more than I-131 but the contribution of I-131 to organ doses was found to be limited, even after taking into account uncertainties such as the gap between the designated date and the first workday and missing air concentration data in the first week after the accident. After June 2011, the mean internal doses rapidly decreased and the intake of I-131 became negligible. Cesium-dominated internal dose contributed more to the colon conversion factor than in March, but the smaller internal dose magnitude offset this effect.
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