

Evaluation of Effective Dose on Tritium (HTO) Intake for CANDU' s Worker

Kyu-Hwan Jung¹, Won-Jae Park¹, Manwoong Kim¹, Min Baek²

¹Korea Institute of Nuclear Safety, ²Ministry of Science and Technology

ABSTRACT

An evaluation of effective dose on tritium intake for CANDU nuclear power plants' worker was analytically conducted. The mathematical methods to calculate internal dose using the results of tritium bioassay with unknown intake time are derived and compared with the changes of variables such as sampling period, effective half-life of tritium, and relative concentration of tritium in urine.

An individual effective dose due to intake of tritiated water is, in general, evaluated by the results of successive bioassay using the linear interpolation method when the time of the exposure occurred is unknown. In the meanwhile, the acceptable criteria for determining the adequate evaluation model to estimate internal dose are practically applied on the basis of the upper limit of actual dose that could be received. However, the uncertainty in assessing the upper limits to the estimated dose shall not exceed 50% at the upper bound of the 95% confidence interval in accordance with the Guidelines for Tritium Bioassay[3].

In this study, a couple of mathematical methods to evaluate internal dose from the tritium bioassay with unknown time of intake are derived and the comparative evaluation of effective dose on tritium intake for CANDU nuclear power plants' worker using those methods is conducted for sampling period, effective half-life of tritium, and relative concentration of tritium in urine.

As the results of this study, it is concluded that the exponential interpolation is more accurate than the linear interpolation and the mid-point intake assumption, which is generally used in the internal dosimetry, is well adopted in the exponential interpolation method. The applied methods for evaluating internal dose from the results of tritium bioassay under the assumption of both maximum single intake and minimum single intake could overestimate or underestimate the actual dose as the case may be.