Development of Computer Program for Assessment of Internal Dose due to Inhalation of Airborne Particulates Containing NORM: ALARA-NORM

CK Choi1, SW Ji1, YG Kim1, BC Koo2, and KP Kim1

1 Kyung Hee University, 1732 Deokyoungdaero, Giheung-gu, Yongin, Gyeonggi-do, Korea

2Korea Institute of Nuclear Safety, Gusongro, Yuseong, Deajeon, Korea

kpkim@khu.ac.kr

Assessment of internal dose due to inhalation of airborne particulates need complicated calculation process considering particulate physicochemical properties, inhalation rate, intake of radionuclide, radioactivity concentration, etc. Therefore generally inhalation doses are calculated using computer programs. Specialized knowledge and expertise about radiation dosimetry is required to use the dose calculation programs. Generally, safety officers in the NORM industry are not familiar with radiation dosimetry. The objective of the present study was to develop a computer program to assess inhalation dose to worker in NORM industry. We developed a new computer program, ALARA-NORM, based on inhalation dose coefficient database which were generated by applying ICRP-66 human respiratory tract model, ICRP-30 GI tract, and ICRP-56, 67, 69, 71 biokinetic models. The input parameters for deriving inhalation dose coefficients were inhalation rate, particulate properties (particulate size distribution, density, shape, lung solubility), radioactivity concentration, etc. ALARA-NORM was developed to apply site-specific information of particulate properties. A graphical user interface (GUI) was designed to obtain user input parameters efficiently. Through these input parameters, organ doses and effective doses were displayed as results. Compared with other computer programs, ALARA-NORM has the following advantages. It is user friendly. The program can be used without specialized expertise on radiation dosimetry. Site-specific particulate properties as well as ICRP default properties can be used as input parameters. Calculate time is short. It can calculate inhalation dose for uranium and thorium series and K-40 together. It also shows results graphically. The computer program developed in this study is useful to NORM industry in their consideration of radiological protection programs. *This work was supported by Korea Institute of Nuclear Safety.

Keywords: ALARA-NORM, inhalation dose, NORM, dose coefficient.

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[2] International Commission on Radiation Protection, (1994). Dose coefficients for intakes of radionuclides by workers, ICRP Publication 68.