

AbstractID: 1370 Title: Influences of Elemental Composition of Body Tissues on Photon Absorbed Fractions for Nuclear Medicine Dosimetry

Previously in internal dosimetry studies using mathematical anatomic models, one of only three body tissue compositions developed at the Oak Ridge National Laboratory (ORNL) were utilized: soft tissue (1.04 g/cm^3), lung tissue (0.293 g/cm^3), and skeletal region tissue (1.4 g/cm^3). Recently, ICRP Publication 89 specifies extended tissue compositions suitable for use in evaluating the transport of radiation within the body and its energy deposition in the various organs. The element data for soft tissues are largely adopted from ICRU Report 46 (ICRU, 1992) and that of the skeleton is from ICRP Publication 70. The compositions of gender-specific tissues are also given in ICRP 89. In this study, photon absorbed fractions have been compared and analyzed between the ORNL tissue compositions and the extended tissue compositions of ICRP 89. For this calculation, the general purpose Monte Carlo code MCNP5 has been used with 23 different tissue compositions. In addition, a modified series of mathematical anatomic models based on the ORNL pediatric model series has been developed. As an example, when a 10-keV photon source is uniformly distributed in the left breast (0.94 g/cm^3) the percent errors in the photon absorbed fraction of the left breast, right breast, muscle and skin are 3%, 9%, 37% and 39%, respectively, when applying a uniform soft tissue composition of 1.04 g/cm^3 . Consequently, the absorbed fraction differences are larger especially for low photon energy sources. It is important to reevaluate current photon and electron absorbed fraction values based upon improved material composition values.