

Session 6.5

The Science of Estimating Individual Risk – Steps Beyond Effective Dose

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In the practice of radiological protection, management of radiation exposure is implemented through constraints and limitations on the effective dose – a dose quantity defined by the International Commission on Radiological Protection (ICRP). Calculation of the effective dose requires two types of weighting factors: (1) w_R which is specific to the type of radiation external to the body or emitted from within the body following radionuclide intake, and (2) w_T which is specific to the individual tissue or organ irradiated. Value of w_T are based upon relative values of radiation detriment which in turn stem from models of cancer incidence, cancer mortality, and heritable effects. Values of w_T are given by ICRP only for individual tissues as averaged across both sexes, all ages of exposure, and even different world populations. Furthermore, for standardization purposes, the organ doses themselves must be calculated using idealized reference phantoms representing 50th percentile height/weight individuals at one of six subject ages – newborn to adult. These later requirements, while appropriate for prospective radiological protection, can be viewed as limitations on the assessment of individualized risk. In this presentation, we will look at alternatives to the use of effective dose as a metric for individualized risk, and explore the use of organ-specific cancer risk models and new libraries of computational phantoms that explicitly permit consideration of individual body size and shape on organ dosimetry. Future advancements are briefly discussed such individualized biokinetic models and the use of genetic profiling to further inform and individualize the risk estimate.