Algebraic functions to Approximate the Fractions of Energy Absorbed by Target Tissues in the 1994 ICRP Respiratory Tract Model

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The 1994 ICRP human respiratory tract model identifies specific target tissues to which dose should be calculated. Therefore, in order to develop the new model, it was necessary to calculate the fractions of energy absorbed in each of these target tissues from transformations in each source within the respiratory tract. A set of absorbed fractions (Afs) were thus developed for alpha and beta (ß+, ß-) particles and monoenergetic electrons. In order to aid implementation of the model, these Afs were approximated by simple algebraic functions of energy. These approximations appeared in an early draft of the Task Group report and were incorporated in software (LUDEP 1.0) to implement the model. The Afs have since been recalculated using a more rigorous method and incorporated in the final published version of the respiratory tract model (Publication 66).

This report summarizes the method by which the new Afs were calculated, and gives new algebraic expressions which approximate them to well within 1% over the entire energy range. The report contains a detailed description of the effect of different error assumptions on the fitted algebraic expressions. The quality assurance procedure used to verify the approximations is also described. It is shown how these functions can be implemented, and some dose calculations are included to assess the effect of using these new Afs.

These new Afs have now been incorporated in a new version of DUDEP (version 1.1).

USTUR-0045-95