NCRP Releases Report No. 164,
Uncertainties in Internal Radiation Dose Assessment

NCRP Report No. 164, *Uncertainties in Internal Radiation Dose Assessment*, discusses the major sources of uncertainty in various types of internal dose assessments in occupational, environmental and medical settings. The Report also discusses the Bayesian and other statistical methods used to evaluate uncertainties and to arrive at an estimate of the distribution of the uncertainty in the absorbed dose in an organ or tissue. A number of practical examples are included to illustrate some of the methods described.

Assessments of radiation doses from exposure to internally-deposited radionuclides rely on mathematical models established in many cases from sparse or inconsistent data, especially in the occupational and environmental settings. Given the generally incomplete state-of-knowledge about the behavior of a radionuclide in the human body, evaluation of uncertainties is an important step in assessment of internal doses. Uncertainties in doses can affect the outcome of an epidemiologic study, impact the remediation of contaminated sites and the outcome of legislatively-mandated compensation programs, and influence the radiation diagnosis and treatment plans for patients. Disclosure of uncertainties can increase the credibility of the assessment results when these results are communicated to interested parties. In addition, an uncertainty analysis can be used to identify areas of research.

This Report is not a procedures manual for how to estimate the uncertainty in the absorbed doses resulting from all types of irradiation by incorporated radionuclides to radiation. However, NCRP Report No. 164 does provide the reader with the information required to understand the various sources of uncertainty, the magnitude and range of the likely uncertainties, and methods to combine these uncertainties to obtain an estimate of overall uncertainty of the absorbed dose in an organ or tissue. The most important models used in the estimation of the absorbed doses from internal irradiation are described in detail and the parameter values used in these models are thoroughly discussed for a number of radionuclides. The discussions in this Report should be useful to investigators involved in estimating and reporting absorbed doses and their uncertainties in retrospective as well as in prospective situations.

- In the case of prospective dose assessments to unspecified individuals, substantial efforts are made in this Report to evaluate the overall uncertainties in the absorbed doses per unit intake for a variety of conditions involving specific radionuclides.
- In the case of retrospective dose assessments, doses and uncertainties are usually estimated for specific individuals. The Report describes both Classical and Bayesian methods for determining the intake or dose from a set of bioassay measurements performed on specific individuals.

Serious consideration of uncertainties of internal doses is relatively new. Currently, it is usually not required for regulatory practices or in the medical setting. In the future, however, consideration of internal dose uncertainty will become more commonplace as a realistic assessment of uncertainties in the dose estimates increases their credibility and often leads to their improvement.

The Report is available in PDF ONLY from the NCRP website, http://NCRPpublications.org. For additional information contact David A. Schauer, ScD, CHP at schauer@NCRPonline.org, 301.657.2652 (x20) or 301.907.8768 (fax).