7. SUMMARY

Bioassay is the final measurement used to assure adequate protection of workers from internal radiation exposure. Intake retention functions that are based upon Reference Man metabolic models can be used in the design and conduct of a bioassay program. Programs designed in this way will help to ensure that significant internal exposures are detected, properly investigated, and recorded. Intake retention functions provide a way to make a rapid initial assessment of the significance of bioassay results in terms of an estimated intake. This assessment is needed to identify those exposures that require further investigation and action. The intake that is estimated from the quotient of the measured content of a bioassay compartment and the value of the compartment's intake retention function can be compared to either the current NRC quarterly intake limit or the ICRP Publication 30 Annual Limit on Intake in order to determine the significance of the bioassay result. The quotient of the estimated intake of a radioelement by its respective stochastic ALI value when multiplied by 5 rem gives an estimate of the committed effective dose equivalent of an exposed worker, which then can be added to the worker's external effective dose equivalent in order to determine his total radiation exposure status. In cases of significant exposures, follow-up bioassay procedures should be used to confirm and make better estimates of the intake. Follow-up bioassays help to improve the accuracy of dose estimates. Routine bioassays help to identify trends in the internal exposure of the worker; trends that may indicate either a need for greater control of the working environment or the need for requalification training of individual workers.

When a number of bioassay measurements are used to evaluate an internal radiation exposure incident, an intake retention function derived from ICRP Publication 30 or other current metabolic models can be used as the expectation fitting function. The amount of the intake is that which gives the best fit of the individual measurements to their respective expectation values. A simple fitting procedure, which relies on an expectation function derived from Reference Man metabolic models, provides an estimate of the intake. Because of the usually poor and limited bioassay data that are normally available in an exposure incident and because of the complex pattern associated with (1) uptake from compartments in the respiratory and GI tracts, (2) the recycling of a radionuclide in systemic compartments, and (3) final excretion from the body, generally it will not be possible to resolve an individual's metabolic parameter values from the bioassay data. However, a series of bioassay measurements may help in determining the most appropriate ICRP lung classification, as well as the effective AMAD of inhaled aerosols, which can be used to improve the accuracy of the estimated intake and associated committed effective dose equivalent. Another helpful measure in assigning the appropriate lung classification is the fecal to urine ratio of activity, and this may be compared to the 24-hour IRFs for feces and urine, which are listed in the tables.

In serious exposure cases, more detailed evaluations may be required. In such cases or when exposures might provide bioassay data that can be used to validate or improve the models used in this guide, users of this report are encouraged to make such detailed evaluations even if the estimated doses may not warrant such evaluations. To avoid undue concern regarding exposures, the purpose of such evaluations and all other pertinent information should be communicated to workers prior to the initiation of such special bioassay.