volume and surface sources, respectively. These values do not account for individual variations in active bone marrow content (e.g., marrow cellularity). In the adult, the bone marrow consists of red (hematopoietic) marrow and yellow (adipose) marrow. The red marrow is biologically active and is often the dose-limiting organ. The yellow marrow is biologically inert but can play important roles in marrow dosimetry as a source region (e.g., Rn). A 3D model based upon the University of Leeds chord-length distributions has been developed. Marrow cavities are modeled as a series of spheres of different radii surrounded by an endosteal layer and a cortical bone shell. Trabecular bone is modeled as a series of cylinders of different radii surrounded by an endosteal shell and a larger marrow shell. Within the marrow sections of these models, adipocytes are placed within the total marrow volume. Radiation dosimetry in each model is estimated using a user written C-code based upon range/energy relationships. Resulting values of absorbed fraction as a function of marrow cavity or trabeculae size are then convolved with the corresponding Leeds marrow or trabeculae chord-length distributions. Final estimates of alpha particle absorbed fraction as a function of alpha energy and marrow cellularity are compared to the energy-independent and cellularity-independent values from the ICRP 30 bone model.

*(This work was support by U.S. DOE NEER Grants DE-FG07-99ID13764 and DE-FG07-02ID14327 with the University of Florida.)

MPM-E.6

REVISIONS TO THE ORNL SERIES OF STYLIZED MATHEMATICAL MODELS OF THE HUMAN BODY.* E.Y. Han and W.E. Bolch (University of Florida, Nuclear and Radiological Engineering, Gainesville, FL 32611)

The development of extensions and improvements to the mathematical model series originally developed at the Oak Ridge National Laboratory is represented. These models incorporate the revised MIRD model of the head and brain and the ORNL model of the torso and legs. Other revisions included the addition of an esophagus, a prostate gland, a four-region kidney (to include a medulla, cortex, papillary, and pelvic region), a mucosal layer within walled organs (GI tract, gall bladder, and urinary bladder), and the inclusion of a rectum separate from the sigmoid colon. Extrathoracic and thoracic airways regions are additionally identified to represent the ET1 and ET2 regions of the ICRP 66 respiratory tract model. The mathematical model series are utilized to reassess photon absorbed fractions as well as to estimate electron absorbed fractions for self- and cross-organ irradiation for internal dose calculation. This effort is necessary due to changes in the model geometries noted above, as well as the lack of systematic tabulation of electron absorbed fractions. From this study, current ICRP and MIRD methodologies are shown to overestimate organ self-dose containing high-energy beta emitters. Comparisons are made to the standard assumption made by both MIRD and the ICRP that 100% of electron emission energy is locally deposited.

*(This work was supported by the CDC under grant R32/CCR416743 with the University of Florida. Portions of this research were performed in support of the activities of the Society of Nuclear Medicine's Medical Internal Radiation Dose Committee.)

MPM-E.7

THE QUANTITATIVE ANALYSIS OF URANIUM ISOTOPES IN THE URINE OF CIVILIANS AFTER OPERATION ENDURING FREEDOM IN JALALABAD, AFGHANISTAN. A. Durakovic,[1] R. Parrish,[2,3] A. Gerdes,[3] and I. Zimmerman[1] ([1]Uranium Medical Research Centre, 3430 Connecticut Avenue/11854, Washington, DC 20008; [2]University of Leicester; [3]British Geological Survey)

The purpose of this study was to determine the concentration and precise isotopic composition of four uranium isotopes (^{234}U, ^{235}U, ^{236}U, ^{238}U) in the urine specimens of the civilian population of Afghanistan following allied forces Operation Enduring Freedom. Eight male civilians from Nangarhar-Jalalabad region presenting with symptoms of fatigue, fever, musculoskeletal and neurological alterations, headaches, and respiratory impairment after inhalation of dust during the bombing raids in June, 2002, had their urine samples collected under controlled conditions and analyzed in duplicate for ^{234}U, ^{235}U, ^{236}U, and ^{238}U by multicollector inductively coupled plasma ionization mass spectrometry (MC-ICP-MS). Control samples consisting of an internal urine standard were analyzed by the same method. The analytical methodology involved pre-concentration of the uranium using co-precipitation and/or evaporation, oxidation of organic matter, purification of uranium using ion exchange chromatography, and mass spectrometry using a double focusing Thermo-Elemental Plasma54 multi-collector ICP-MS equipped with a Daly® detector for ion counting (for some of the smaller isotopes) and multiple faraday cups. Analytical blanks were negligible at less than 50 picograms U, and chemical recovery was >80% in most cases. Along with the samples, analyses were conducted of a urine internal standard (with c. 11 ng L^{-1} uranium) of natural isotopic composition (atomic ratio 137.88 for $^{238}U/^{235}U$) and certified isotopic standards of uranium, both of which returned the correct values for

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