Cylindrical Representations of Recycling Biokinetic Models

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In 2018, the USTUR developed a cylindrical representation of the Leggett et al. (2005) recycling model describing the biokinetics of systemic plutonium. That visualization is updated to incorporate the International Commission on Radiological Protection (ICRP) human alimentary tract model (HATM) in place of the “GI Tract” compartment, which required assuming that uptake from the small intestine goes into the Blood 2 compartment rather than the Blood 1 compartment. New cylindrical visualizations are presented for recycling models for uranium and americium based on the ICRP publication series on occupational intakes of radionuclides (OIR). The OIR publications or drafts currently show these models with “GI Tract” compartments; in this work, the HATM has been used in place of the GI tract in the uranium and americium models. Extensions of the models to include an explicit compartment for brain have also been developed, since the effects of high-linear energy transfer radiation on the brain are of interest to those studying the effects of space radiation on astronauts. The insights provided by these novel representations are discussed.

USTUR-0521-19A