In this poster, ICRP Publication 66 (HRTM) will be referred to as "HRTM" and the updated model as revised HRTM.

The revised HRTM includes partial revisions of both the deposition and clearance models. This poster focuses on two areas of limited data and a lack of scientific consensus. Revised HRTM defines nasal particle clearance from the extra-thoracic (ET) airways, and slow mucociliary clearance from the lung's conducting airways, and sets out how volunteer study results were used in updating the HRTM.

No trends were found between nasal clearance and particle size, exercise rate or any other parameter related to nasal clearance. There was significant inter- and in-subject variation of clearance rates and fractions. The fraction cleared by nose blowing was correlated with the frequency of voluntary nose blowing and therefore was a characteristic of the individual. Retention in ET was concentrated in the nose within the first day.

The average nasal clearance behaviour determined from the whole study was: 15% IETD (cleaned to the stomach within ~ 5 minutes of intake) 20% IETD (cleaned to AT with a 20 minute half-time) 45% cleaned to AT with 8.8 hour half-time 25% IETD cleaned by nose blowing with a 3.5% clearance time of 8.2 hours.

The first two fractions can be jointly modelled as 35% of IETD in ET, clearing to AT at 0.001 d, the similar clearance times (~5 h) and anterior location of the latter two fractions suggest they are competing mechanisms for clearance of particles from ET. Revised HRTM models this as 35% IETD in ET, clearing at rates of 0.5 and 100 d, respectively, and ET, respectively.

The revised HRTM adopts the appointment of total ET deposition to ET, and ET, by summing the ET, and ET, deposition fractions calculated using the HRTM 66 deposition model and repackaging a 0.01 d ET deposition from mouth inhalation is added to ET. Although the mouth has now been transferred from the HRTM to the ICRP Human Alimentary tract Model (HAM), deposition from mouth inhalation is unchanged as it is taken to occur in the lungs.

In contrast, there is no separate model of nasal clearance from the bronchial airways in HAM.

The updating of BB and BB mucociliary clearance took account of the revision of the bronchial airway (BB) clearance, such more information had already been available indicating a large long term retention fraction for inhaled material (6), the three AI compartments of HRTM 66 were redefined the human alveolar region in one (AI) with competing clearance to interstitial tissue (INT, half-time = 2 d) and bronchiolar (BB') fraction -1/2 time = 1 d. Slow clearance in the conducting airways is now considered to be associated with clearance from the bronchiolar airways, this together with firm evidence of significant long term retention in the interstitial tissue has led to a simpler thoracic model. The effect of these revisions on dose coefficients and bioassay assessment can only be properly determined when taken in conjunction with all other changes to the HRTM and the updating of other biokinetic models. For full details of the HRTV volunteer studies see references 5, 9 and 10.

Ethical Approval
All ICRP volunteer studies mentioned in this paper were conducted with external ethical approval and ARSAC certification for the administration of radionuclides. (Details available from the corresponding author – jenny.r.smith@hpa.org.uk).

References