

**FACT SHEET ON DOSE CONVERSION FACTORS AND RESRAD PATHWAY
SENSITIVITY FOR URANIUM ISOTOPES U-238, U-235, U234**

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Dose Conversion Factors:

- ICRP 72 (DCF's for Members of the Public) lists only one choice for an **ingestion** DCF for each uranium isotope. (Age specific - different values for age categories 3 months, 1 year, 5 year, 10 years, 15 years, and adult.)
- ICRP 72 lists 3 choices (F, M, and S) based on fast medium and slow absorption from the lung to the blood for **inhalation** DCF's for each uranium isotope. (Age specific as above.) The most conservative DCF's for all uranium isotopes (i.e. highest dose per picocurie inhaled) are those of the S Absorption Type.
- Per ICRP 71 guidance, chemical form alone is not to be used as a sole basis for selection of absorption type in the case of environmental exposure. The studies cited for animals suggest that UO₂ behaves as Type S, other uranium oxides (e.g. UO₃, U₃O₈) show variability between Types M and S, and most other compounds show variability between Types M and F. **The recommended default Type in the absence of site specific information is Type M.**

Isotope	DCF Type	DCF Adult (mrem/pCi)	DCF Child (1) (mrem/pCi)
U-238	ingestion	.000165	.00044
	inhalation (M)	.0106	.035
	inhalation (S)	.03	.092
U-235	ingestion	.000172	.00048
	inhalation (M)	.011	.037
	inhalation (S)	.031	.095
U-234	ingestion	.00018	.00048
	inhalation (M)	.013	.04
	inhalation (S)	.035	.106

Action
Review list of parameters
by Nov 29 meeting
Review Area Factor
get binder to Dixon

- Although there is a significant difference in the value of DCF between the M and the S Absorption Types for each uranium isotope, there is very little impact on dose calculations using RESRAD. Typically 99% of the dose computed in residential scenarios is due to external gamma exposure and plant ingestion, with less than 1% due to inhalation.

Pathway and Parameter Sensitivity - preliminary scoping:

Deterministic RESRAD runs were done using a residential scenario (external, inhalation, soil and plant ingestion, irrigation water but no drinking water - also no cover was assumed). Single isotope RSALs were calculated for each of the 3 isotopes using ICRP 72 DCF's (Type M for inhalation), and varying the area of the contaminated zone between 100 and 1000 m². The majority of RESRAD parameters were default values. The following were observed:

- Year 1 gives the lowest RSALs using the default erosion rate and hydrological parameters.
- The calculation is most restrictive for U-235, suggesting that the degree of uranium enrichment will be quite significant.
- For U 238 and U235, the external exposure pathway dominates (60-98% of dose in first year), with the plant ingestion pathway making up essentially the rest. Over 1000 years the plant ingestion pathway becomes more significant, particularly for the 1000 m² case. (Up to 65% of dose at 1000 years.) This is, of course, a function of travel times to groundwater used for irrigation.
- For U 234, the plant ingestion pathway dominates (80 -90%) throughout the time frame, followed by soil ingestion (10%) and inhalation (7%).
- When the plant ingestion pathway is significant, it is sensitive to the area of the contaminated zone in the range tested. (You need a big enough garden to grow contaminated produce.) However, the external gamma pathway is pretty much saturated at small areas.

Isotope	RSAL for Area 100 m ²	RSAL for Area 1000 m ²
U-238	358	216
U-235	66	55
U-234	5028	549

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