

# Research Studies on Biological Effects from Tritium

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## Abstract

Age-specific dose coefficient for six age groups of 3 months, 1, 5, 10, and 15 years and adult were calculated using metabolic data from previous commissioned research studies, dietary references to intakes of Japanese and Americans diets published by government agencies, and hydrogen balance data in each age group published by the International Commission on Radiological Protection (ICRP). The estimated realistic dose coefficients ranged from approximately 80 to 90%. The findings suggest that the ICRP's dose coefficients are moderately conservative.

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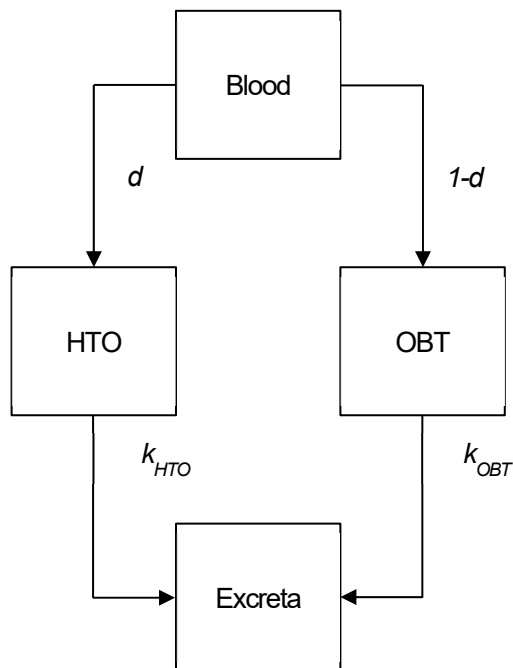


Fig.1 Schematic showing the developed models for OBT ingestion;  $d$ , distribution factor;  $k$ , excretion rate constant.

Table 1 Distribution factor  $d$  to HTO compartment

Nutrient	Examined	$d$
Carbohydrate	Glucose	0.81
	Leucine	0.33
	Phenylalanine	0.25
	Alanine	0.9
	Glycine	0.29
Fat	Glutamic acid	0.61
	Palmitic acid	0.41
	Oleic acid	0.35
	Linoleic acid	0.29

Table 2 Half-life of tritium (d)

Age	HTO	OBT
3 m	3.0	8.0
1 y	3.5	15
5 y	4.6	19
10 y	5.7	26
15 y	7.9	32
Adult	10	40

Table 3 Estimated age-specific dose coefficients ( $\times 10^{-11}$  Sv Bq $^{-1}$ ) for ingested organically bound tritium (OBT) according to the dietary reference intakes for Japanese and Americans.

Age group	ICRP		Japanese diet		American diet		
		Mean	SD	Ratio (%)*	Mean	SD	Ratio (%)*
3 m	11	9.5	2.1	86	9.7	2.0	88
1 y	11	8.8	1.9	80	9.0	1.9	82
5 y	7.0	5.5	1.2	78	5.6	1.2	81
10 y	5.5	4.3	0.9	77	4.4	0.9	80
15 y	4.1	3.2	0.7	78	3.3	0.7	81
Adult	4.1	3.2	0.7	79	3.3	0.7	81

ICRP, International Commission on Radiological Protection. Japanese diet, according to the dietary reference intakes of Japanese, 2020, by the Ministry of Health, Labor and Welfare of Japan. American diet, nutrient intakes from food and beverages, 2020, by the U.S. Department of Agriculture. SD, standard deviation; \*, ratio to ICRP.

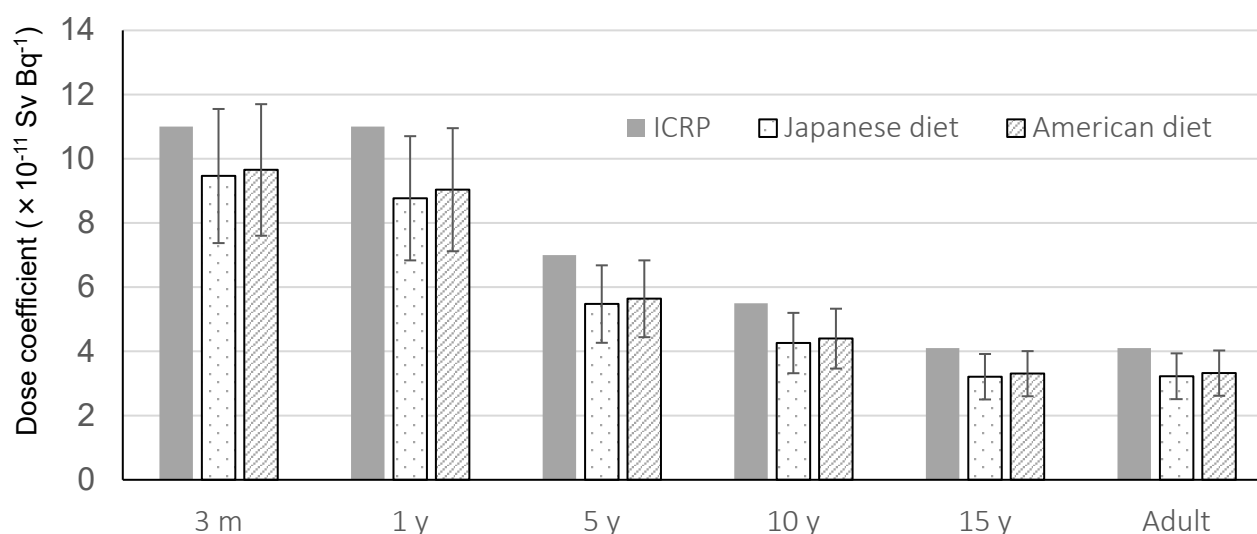


Fig.2 Estimated age-specific dose coefficients for ingested organically bound tritium (OBT) according to the dietary reference intakes for Japanese and Americans. ICRP, International Commission on Radiological Protection. Japanese diet, according to the dietary reference intakes of Japanese, 2020, by the Ministry of Health, Labor and Welfare of Japan. American diet, nutrient intakes from food and beverages, 2020, by the U.S. Department of Agriculture. Error bar shows the standard deviation.