

## Errata

# Errata to: Doses to infants from ingestion of radionuclides in mothers' milk (ICRP *Publication 95*, Ann. ICRP 34(3/4))

The Publisher and ICRP regret the omission of Hans Dörfel and Joyce Lipsztein from the list of members of the Task Group on Internal Dosimetry on page 6 of *Publication 95* (ICRP, 2004).

The Publisher and ICRP also regret that there are some errors in the information in *Publication 95* concerning technetium ( $^{99m}\text{Tc}$ ) and concerning thorium and uranium isotopes, as detailed below.

### Technetium

The review of available data on the transfer of technetium (Tc) in breast milk given in Section 5.18 of *Publication 95* concludes that insufficient information is available to derive a compartmental model for Tc in breast milk, and therefore a simple assumption is adopted, namely that 10% of the activity reaching maternal blood is transferred to the infant in breast milk. However, this assumption was not correctly implemented in the Tables of fractional transfer (Table 5.18.1) and dose coefficients (Tables 5.18.2, public; A.18, worker) for the single radioisotope of technetium considered, i.e.  $^{99m}\text{Tc}$ . Corrected versions of these Tables are given below.

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Table 5.18.1. Fraction of  $^{99m}\text{Tc}$  transferred to the infant in breast-milk following maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion
	Type F, $f_1 = 0.8$	Type M, $f_1 = 0.1$	Type S, $f_1 = 0.01$	$f_1 = 0.5$
<b>Acute</b>				
c-26	0.0E+00	0.0E+00	0.0E+00	0.0E+00
c+5	0.0E+00	0.0E+00	0.0E+00	0.0E+00
c+15	0.0E+00	0.0E+00	0.0E+00	0.0E+00
c+35	0.0E+00	0.0E+00	0.0E+00	0.0E+00
b+1	3.4E-02	3.6E-03	1.5E-04	3.6E-02
b+10	3.4E-02	3.6E-03	1.5E-04	3.6E-02
b+20	3.4E-02	3.6E-03	1.5E-04	3.6E-02
<b>Chronic</b>				
Pregnancy	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Lactation	3.4E-02	3.6E-03	1.5E-04	3.6E-02

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table 5.18.2. Dose coefficients (Sv Bq $^{-1}$  intake by the mother; public) for infants consuming breast-milk containing Tc-99m ( $T_{1/2} = 6.02$  h) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion
	Type F, $f_1 = 0.8$	Type M, $f_1 = 0.1$	Type S, $f_1 = 0.01$	$f_1 = 0.5$
<b>Acute</b>				
c-26	<1E-15	<1E-15	<1E-15	<1E-15
c+5	<1E-15	<1E-15	<1E-15	<1E-15
c+15	<1E-15	<1E-15	<1E-15	<1E-15
c+35	<1E-15	<1E-15	<1E-15	<1E-15
b+1	6.8E-12	7.2E-13	3.0E-14	7.2E-12
b+10	6.8E-12	7.2E-13	3.0E-14	7.2E-12
b+20	6.8E-12	7.2E-13	3.0E-14	7.2E-12
<b>Chronic</b>				
Pregnancy	<1E-15	<1E-15	<1E-15	<1E-15
Lactation	6.8E-12	7.2E-13	3.0E-14	7.2E-12

Note: Dose coefficients less than 1E-15 Sv Bq $^{-1}$  are shown as '<1E-15'.

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.18.1. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing Tc-99m (T<sub>1/2</sub> = 6.02 h) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation		Ingestion
	Type F, $f_1 = 0.8$	Type M, $f_1 = 0.8$	$f_1 = 0.8$
<b>Acute</b>			
c-26	<1E-15	<1E-15	<1E-15
c+5	<1E-15	<1E-15	<1E-15
c+15	<1E-15	<1E-15	<1E-15
c+35	<1E-15	<1E-15	<1E-15
b+1	9.8E-12	5.6E-12	1.3E-11
b+10	9.8E-12	5.6E-12	1.3E-11
b+20	9.8E-12	5.6E-12	1.3E-11
<b>Chronic</b>			
Pregnancy	<1E-15	<1E-15	<1E-15
Lactation	9.8E-12	5.6E-12	1.3E-11

Note: Dose coefficients less than 1E-15 Sv Bq<sup>-1</sup> are shown as '<1E-15'.

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

### Thorium and uranium

Dose coefficients (dose to the infant per unit intake by the mother) for the offspring of female workers were given in Annex A of *Publication 95 (ICRP, 2004)*. In keeping with the dose coefficient for workers given in *Publication 68*, the Activity Median Aerodynamic Diameter (AMAD) for intakes by inhalation was taken to be 5 µm. However, dose coefficients for isotopes of thorium and uranium were erroneously calculated using an AMAD of 1 µm. The correct results, based on 5 µm, are given below. Dose coefficients for intakes by ingestion were not in error, but are repeated here for completeness. The Table numbers from *Publication 95* are also used here for clarity.

Table A.30.1. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing Th-228 (T<sub>1/2</sub> = 1.91 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation		Ingestion	
	Type M, $f_1 = 5E-4$	Type S, $f_1 = 2E-4$	$f_1 = 5E-4$	$f_1 = 2E-4$
<b>Acute</b>				
c-26	4.0E-08	1.4E-09	3.4E-10	1.3E-10
c+5	4.9E-08	1.4E-09	4.3E-10	1.7E-10
c+15	5.1E-08	1.3E-09	4.7E-10	1.9E-10
c+35	5.2E-08	1.3E-09	5.5E-10	2.2E-10
b+1	5.4E-08	1.5E-09	1.1E-09	7.3E-10
b+10	3.6E-08	1.1E-09	9.2E-10	6.6E-10
b+20	1.6E-08	6.4E-10	7.0E-10	5.7E-10
<b>Chronic</b>				
Pregnancy	5.1E-08	1.3E-09	4.9E-10	1.9E-10
Lactation	3.0E-08	9.7E-10	8.5E-10	6.3E-10

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.30.2. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing Th-230 (T<sub>1/2</sub> = 7.70E+04 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation		Ingestion	
	Type M, $f_1 = 5E-4$	Type S, $f_1 = 2E-4$	$f_1 = 5E-4$	$f_1 = 2E-4$
<b>Acute</b>				
c-26	8.3E-10	9.4E-11	5.0E-12	2.0E-12
c+5	1.4E-09	1.1E-10	5.1E-12	2.0E-12
c+15	1.9E-09	1.1E-10	5.0E-12	2.0E-12
c+35	3.8E-09	1.3E-10	4.2E-12	1.7E-12
b+1	1.0E-08	2.1E-10	1.0E-10	4.0E-11
b+10	8.9E-09	1.7E-10	1.0E-10	4.0E-11
b+20	7.2E-09	1.1E-10	9.8E-11	3.9E-11
<b>Chronic</b>				
Pregnancy	2.3E-09	1.2E-10	5.0E-12	2.0E-12
Lactation	8.2E-09	1.5E-10	9.8E-11	3.9E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.30.3. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing Th-232 (T<sub>1/2</sub> = 1.40E+10 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation		Ingestion	
	Type M, $f_1 = 5E-4$	Type S, $f_1 = 2E-4$	$f_1 = 5E-4$	$f_1 = 2E-4$
<b>Acute</b>				
c-26	3.8E-09	3.6E-10	2.8E-11	1.1E-11
c+5	4.6E-09	3.1E-10	2.8E-11	1.1E-11
c+15	5.0E-09	2.9E-10	2.8E-11	1.1E-11
c+35	6.7E-09	2.9E-10	2.7E-11	1.1E-11
b+1	1.3E-08	3.6E-10	1.5E-10	6.5E-11
b+10	1.1E-08	2.7E-10	1.4E-10	6.2E-11
b+20	8.1E-09	1.3E-10	1.1E-10	4.4E-11
<b>Chronic</b>				
Pregnancy	5.4E-09	2.9E-10	2.8E-11	1.1E-11
Lactation	1.0E-08	2.3E-10	1.3E-10	6.0E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.30.4. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing Th-234 (T<sub>1/2</sub> = 24.1 d) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation		Ingestion	
	Type M, $f_1 = 5E-4$	Type S, $f_1 = 2E-4$	$f_1 = 5E-4$	$f_1 = 2E-4$
<b>Acute</b>				
c-26	<1E-15	<1E-15	<1E-15	<1E-15
c+5	3.8E-15	<1E-15	<1E-15	<1E-15
c+15	3.8E-14	1.9E-15	<1E-15	<1E-15
c+35	5.1E-12	1.4E-13	3.5E-15	1.4E-15
b+1	6.4E-11	9.8E-13	9.2E-13	3.7E-13
b+10	6.4E-11	9.7E-13	9.2E-13	3.7E-13
b+20	6.1E-11	9.0E-13	9.1E-13	3.7E-13
<b>Chronic</b>				
Pregnancy	1.2E-12	3.4E-14	2.4E-15	<1E-15
Lactation	6.2E-11	9.2E-13	9.1E-13	3.6E-13

Note: Dose coefficients less than 1E-15 Sv/Bq are shown as '<1E-15'.

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.31.1. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing U-232 (T<sub>1/2</sub> = 72.0 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion	
	Type F, $f_1 = 0.02$	Type M, $f_1 = 0.02$	Type S, $f_1 = 0.002$	$f_1 = 0.02$	$f_1 = 0.002$
<b>Acute</b>					
c-26	1.9E-09	3.8E-09	4.2E-10	1.4E-10	1.4E-11
c+5	2.1E-09	3.8E-09	2.6E-10	1.5E-10	1.5E-11
c+15	2.2E-09	3.7E-09	2.1E-10	1.6E-10	1.6E-11
c+35	4.7E-09	4.0E-09	1.6E-10	3.3E-10	3.3E-11
b+1	3.7E-08	8.3E-09	2.8E-10	2.6E-09	2.6E-10
b+10	3.6E-08	7.0E-09	2.3E-10	2.5E-09	2.5E-10
b+20	3.4E-08	5.4E-09	1.7E-10	2.4E-09	2.4E-10
<b>Chronic</b>					
Pregnancy	2.8E-09	3.8E-09	2.1E-10	2.0E-10	2.0E-11
Lactation	3.5E-08	6.4E-09	2.1E-10	2.5E-09	2.5E-10

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.31.2. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing U-233 (T<sub>1/2</sub> = 1.58E+05 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion	
	Type F, $f_1 = 0.02$	Type M, $f_1 = 0.02$	Type S, $f_1 = 0.002$	$f_1 = 0.02$	$f_1 = 0.002$
<b>Acute</b>					
c-26	1.1E-11	2.9E-11	7.7E-12	7.9E-13	7.9E-14
c+5	2.9E-11	9.9E-11	9.5E-12	2.1E-12	2.1E-13
c+15	5.7E-11	1.5E-10	1.0E-11	4.0E-12	4.0E-13
c+35	4.5E-10	4.0E-10	1.5E-11	3.2E-11	3.2E-12
b+1	5.4E-09	1.1E-09	3.5E-11	3.8E-10	3.8E-11
b+10	5.3E-09	1.0E-09	3.1E-11	3.8E-10	3.8E-11
b+20	5.1E-09	8.0E-10	2.4E-11	3.6E-10	3.6E-11
<b>Chronic</b>					
Pregnancy	1.5E-10	2.1E-10	1.1E-11	1.1E-11	1.1E-12
Lactation	5.2E-09	9.2E-10	2.8E-11	3.7E-10	3.7E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.31.3. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing U-234 (T<sub>1/2</sub> = 2.44E+05 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion	
	Type F, $f_1 = 0.02$	Type M, $f_1 = 0.02$	Type S, $f_1 = 0.002$	$f_1 = 0.02$	$f_1 = 0.002$
<b>Acute</b>					
c-26	1.1E-11	2.8E-11	7.5E-12	7.7E-13	7.7E-14
c+5	2.9E-11	9.6E-11	9.2E-12	2.0E-12	2.0E-13
c+15	5.5E-11	1.5E-10	1.0E-11	3.9E-12	3.9E-13
c+35	4.4E-10	3.9E-10	1.4E-11	3.1E-11	3.1E-12
b+1	5.2E-09	1.1E-09	3.4E-11	3.7E-10	3.7E-11
b+10	5.2E-09	9.7E-10	3.0E-11	3.7E-10	3.7E-11
b+20	5.0E-09	7.8E-10	2.4E-11	3.5E-10	3.5E-11
<b>Chronic</b>					
Pregnancy	1.5E-10	2.0E-10	1.1E-11	1.1E-11	1.1E-12
Lactation	5.0E-09	8.9E-10	2.8E-11	3.6E-10	3.6E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.31.4. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing U-235 (T<sub>1/2</sub> = 7.04E+08 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion	
	Type F, $f_1 = 0.02$	Type M, $f_1 = 0.02$	Type S, $f_1 = 0.002$	$f_1 = 0.02$	$f_1 = 0.002$
<b>Acute</b>					
c-26	1.0E-11	2.7E-11	7.1E-12	7.3E-13	7.3E-14
c+5	2.7E-11	9.1E-11	8.8E-12	1.9E-12	1.9E-13
c+15	5.2E-11	1.4E-10	9.5E-12	3.7E-12	3.7E-13
c+35	4.1E-10	3.7E-10	1.3E-11	2.9E-11	2.9E-12
b+1	5.0E-09	1.0E-09	3.2E-11	3.5E-10	3.5E-11
b+10	4.9E-09	9.2E-10	2.8E-11	3.5E-10	3.5E-11
b+20	4.7E-09	7.4E-10	2.3E-11	3.3E-10	3.3E-11
<b>Chronic</b>					
Pregnancy	1.4E-10	1.9E-10	1.0E-11	1.0E-11	1.0E-12
Lactation	4.8E-09	8.4E-10	2.6E-11	3.4E-10	3.4E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.31.5. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing U-236 (T<sub>1/2</sub> = 2.34E+07 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion	
	Type F, $f_1 = 0.02$	Type M, $f_1 = 0.02$	Type S, $f_1 = 0.002$	$f_1 = 0.02$	$f_1 = 0.002$
<b>Acute</b>					
c-26	1.0E-11	2.7E-11	7.1E-12	7.3E-13	7.3E-14
c+5	2.7E-11	9.1E-11	8.7E-12	1.9E-12	1.9E-13
c+15	5.2E-11	1.4E-10	9.5E-12	3.7E-12	3.7E-13
c+35	4.1E-10	3.7E-10	1.3E-11	2.9E-11	2.9E-12
b+1	5.0E-09	1.0E-09	3.2E-11	3.5E-10	3.5E-11
b+10	4.9E-09	9.2E-10	2.8E-11	3.5E-10	3.5E-11
b+20	4.7E-09	7.4E-10	2.3E-11	3.3E-10	3.3E-11
<b>Chronic</b>					
Pregnancy	1.4E-10	1.9E-10	1.0E-11	1.0E-11	1.0E-12
Lactation	4.8E-09	8.4E-10	2.6E-11	3.4E-10	3.4E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

Table A.31.6. Dose coefficients (Sv Bq<sup>-1</sup> intake by the mother; worker) for infants consuming breast-milk containing U-238 (T<sub>1/2</sub> = 4.47E+09 y) after maternal inhalation or ingestion

Intake time, weeks*	Inhalation			Ingestion	
	Type F, $f_1 = 0.02$	Type M, $f_1 = 0.02$	Type S, $f_1 = 0.002$	$f_1 = 0.02$	$f_1 = 0.002$
<b>Acute</b>					
c-26	1.0E-11	2.7E-11	7.1E-12	7.1E-13	7.1E-14
c+5	2.6E-11	9.1E-11	8.8E-12	1.9E-12	1.9E-13
c+15	5.1E-11	1.4E-10	9.5E-12	3.6E-12	3.6E-13
c+35	4.0E-10	3.7E-10	1.3E-11	2.9E-11	2.9E-12
b+1	4.8E-09	9.9E-10	3.2E-11	3.4E-10	3.4E-11
b+10	4.8E-09	9.0E-10	2.8E-11	3.4E-10	3.4E-11
b+20	4.6E-09	7.2E-10	2.2E-11	3.2E-10	3.2E-11
<b>Chronic</b>					
Pregnancy	1.4E-10	1.9E-10	1.0E-11	9.7E-12	9.7E-13
Lactation	4.6E-09	8.3E-10	2.6E-11	3.3E-10	3.3E-11

\* Intake at the indicated time (weeks); c denotes conception, b denotes birth, negative times are prior to pregnancy.

## Reference

ICRP, 2004. Doses to infants from ingestion of radionuclides in mothers' milk. ICRP Publication 95, Ann. ICRP 34 (3/4).