

15. Human Milk Intake

15.1 Introduction

Human lactation is known to impart a wide range of benefits to nursing infants, including protection against infection, increases in cognitive development, and avoidance of allergies due to intolerance to cow's milk (AAP, 2005). Ingestion of human milk has also been associated with a reduction in risk of postneonatal death in the United States (Chen and Rogan, 2004). The American Academy of Pediatrics recommends exclusive breast-feeding for approximately the first six months and supports the continuation of breast-feeding for the first year and beyond if desired by the mother and child (AAP, 2005). However, contaminants may find their way into human milk of lactating mothers because mothers are themselves exposed, thus making human milk a potential source of exposure to toxic substances for nursing infants. Estimating the magnitude of the potential dose to infants from human milk requires information on the milk intake rate (quantity of human milk consumed per day) and the duration (months) over which breast-feeding occurs. Information on the fat content of human milk is also needed for estimating dose from human milk residue concentrations that have been indexed to lipid content. Chapter 15 of the *Exposure Factors Handbook* provides recommendations for human milk intake rates and lipid intake rates. These data are highlighted here.

15.2 Recommended Exposure Factors

A summary of recommended values for human milk and lipid intake rates is presented in Table 15-1. These values are based on data from Pao et al. (1980), Dewey and Lönnerdal (1983), Butte et al. (1984), Neville et al. (1988), Dewey et al. (1991a, b), Butte et al. (2000), and Arcus-Arth et al. (2005). These studies presented data by month, and these month-by-month intakes were composited to yield intake rates for the standardized age groups by calculating weighted averages. Recommendations were converted to mL/day using a density of human milk of 1.03 g/mL rounded to two significant figures. The overall confidence in the recommended values for human milk and lipid intake rates is medium.



For more information about the key studies used to derive the recommended human milk intake values, refer to **Chapter 15 of the *Exposure Factors Handbook*** at <http://www.epa.gov/ncea/efh/pdfs/efh-chapter15.pdf>. Detailed information on human milk intake studies is included in Section 15.3. Key studies on lipid content and lipid intake from milk are discussed in Section 15.4, and a relevant study on lipid intake is included in Section 15.5. Section 15.6 discusses other factors that influence the initiation, continuation, and amount of human milk intake.

Table 15-1. Recommended Values for Human Milk and Lipid Intake Rates for Exclusively Breast-Fed Infants

Age Group	Mean		Upper Percentile ^a	
	mL/day	mL/kg-day	mL/day	mL/kg-day
Human Milk Intake				
Birth to <1 month ^{b, c}	510	150	950	220
1 to <3 months ^{b, c, d, e, f}	690	140	980	190
3 to <6 months ^{b, c, d, e, f, g, h}	770	110	1,000	150
6 to <12 months ^{b, c, d, f, g, h}	620	83	1,000	130
Lipid Intakeⁱ				
Birth to <1 month ^{b, c}	20	6.0	38	8.7
1 to <3 months ^{b, c, d, e, f}	27	5.5	40	8.0
3 to <6 months ^{b, c, d, e, f, g, h}	30	4.2	42	6.1
6 to <12 months ^{b, c, d, f, g, h}	25	3.3	42	5.2

^a Upper percentile is reported as mean plus two standard deviations.

^b Neville et al., 1988.

^c Arcus- Arth et al., 2005.

^d Pao et al., 1980.

^e Butte et al., 1984.

^f Dewey and Lönnerdal, 1983.

^g Butte et al., 2000.

^h Dewey et al., 1991b.

ⁱ The recommended value for the lipid content of human milk is 4.0 percent. See Section 15.4 of the *Exposure Factors Handbook*.