12. Intake of Grain Products

12.1 Introduction

Grain products may become contaminated with toxic chemicals by several different pathways. Ambient air pollutants may be deposited on or absorbed by the plants, or dissolved in rainfall or irrigation waters that contact the plants. Pollutants may also be absorbed through plant roots from contaminated soil and ground water. The addition of pesticides, soil additives, and fertilizers may also result in contamination of grain products. To assess exposure through this pathway, information on ingestion rates of grain products is needed. Chapter 12 of the *Exposure Factors Handbook* provides information and recommendations on ingestion rates of grain products for the general population. Highlights of these data are provided here.

12.2 Recommended Exposure Factors

Table 12-1 presents a summary of the recommended values for per capita and consumer-only intake of total grain products. The U.S. EPA analysis of NHANES 2003-2006 data was used in selecting recommended intake rates. NHANES collects 24-hour dietary intake data via interviews conducted on 2 non-consecutive days. U.S. EPA converted intake data on the foods people reported eating to the quantities of agricultural commodities eaten (e.g., an apple pie may contain the commodities apples, flour, fat, sugar, and spices), and estimated intake rates for total grain products. Consumer-only intake is defined as the quantity of grain products consumed by individuals during the survey period. These data are generated by averaging intake across only the individuals in the survey who consumed these food items. Per capita intake rates are generated by averaging consumer-only intakes over the entire population (including those individuals who reported no intake). The U.S. EPA analysis was conducted using childhood age groups that differed slightly from U.S. EPA's *Guidance on Selecting Age Groups for Monitoring and Assessing Childhood Exposures to Environmental Contaminants* (U.S. EPA, 2005). However, for the purposes of the recommendations presented here, childhood data were placed in the standardized age categories closest to those used in the analysis. Overall confidence in the recommended values is medium-high for the averages and low for the long-term upper percentiles.

For more information about the key studies used to derive the recommended grain intake rates, refer to **Chapter 12 of the *Exposure Factors Handbook*** at http://www.epa.gov/ncea/efh/pdfs/efh-chapter12.pdf. Detailed information on the grain intake studies are presented in Section 12.3, and information on the conversion between dry (after the moisture content has been removed from food weight) and wet intake rate is provided in Section 12.4. For more information on consumption of specific grain products refer to Chapter 12 of the *Exposure Factors Handbook*.

Table 12-1. Recommended Values for Intake of Grains, Edible Portion, Edible Portion, Uncooked[a]				
Age Group	Per Capita		Consumers Only	
	Mean	95th Percentile	Mean	95th Percentile
	g/kg-day	g/kg-day	g/kg-day	g/kg-day
Total Grains[b]				
Birth to 1 year	3.1	9.5[c]	4.1	10.3[c]
1 to <2 years	6.4	12.4[c]	6.4	12.4[c]
2 to <3 years	6.4	12.4[c]	6.4	12.4[c]
3 to <6 years	6.2	11.1	6.2	11.1
6 to <11 years	4.4	8.2	4.4	8.2
11 to <16 years	2.4	5.0	2.4	5.0
16 to <21 years	2.4	5.0	2.4	5.0
20 to <50 years	2.2	4.6	2.2	4.6
≥50 years	1.7	3.5	1.7	3.5
Individual Grain Products—See Tables 12-5 and 12-6 in the *Exposure Factors Handbook*				

[a] Analysis was conducted using slightly different childhood age groups than those recommended in *Guidance on Selecting Age Groups for Monitoring and Assessing Childhood Exposures to Environmental Contaminants* (U.S. EPA, 2005). Data were placed in the standardized age categories closest to those used in the analysis.

[b] For multiple percentiles, see Tables 12-3 and 12-4 in the *Exposure Factors Handbook*.

[c] Estimates are less statistically reliable based on guidance published in the *Joint Policy on Variance Estimation and Statistical Reporting Standards on NHANES III and CSFII Reports: NHIS/NCHS Analytical Working Group Recommendations* (NCHS, 1993).

Source: U.S. EPA analysis of NHANES 2003-2006 data.