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Health Canada's Updated Assessment of Bisphenol A (BPA) Exposure from Food Sources

September 2012

Bureau of Chemical Safety
Food Directorate
Health Products and Food Branch



Canada

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Background

Health Canada last updated its [risk assessment associated with Bisphenol A \(BPA\) used in food packaging applications in August 2008](#). At the time of that assessment, the Department determined Probable Daily Intakes (PDI) for BPA of 0.18 µg/kg bw/day for the general population and 1.35 µg/kg bw/day for infants. Since that time, Health Canada has conducted a number of additional surveys to measure the [concentrations of BPA in canned drink products](#) (Health Canada 2009 A; Cao et al, 2009), [bottled water products](#) (Health Canada 2009 B), [canned food products](#) (Health Canada 2010 A), [soft drink and beer products](#) (Health Canada 2010 B) and Total Diet samples (Cao et al., 2011).

Updated Exposure Assessment

In an effort to generate a more refined and detailed assessment of dietary exposure to BPA among Canadians, Health Canada has conducted a probabilistic assessment based on the collective results of these surveys. The BPA concentrations measured in the assayed foods, comprising 132 food commodities in 33 food categories, and food intakes and body weights from [The Canadian Community Health Survey \(CCHS\) – Cycle 2.2 on Nutrition](#) (Statistics Canada, 2004) were used to develop a probabilistic exposure assessment using an iterative process.

A probabilistic exposure assessment uses all of the individual chemical concentrations determined in food along with the range in consumption patterns of the foods of interest. This type of assessment provides more information about the likely range of exposure in the population and the proportions of the population with low, average, and high BPA intakes. A deterministic exposure assessment is one in which single numbers or point estimates for each factor used in the exposure assessment are combined to generate a single number characterizing some aspect of the exposure, (e.g.: the combining of the 95th percentiles of chemical levels and food intakes with mean body weights to generate a measure of high intake).

A probabilistic exposure assessment was conducted by randomly applying the BPA concentrations measured through the surveys of canned and bottled foods, as well as all food composites from the Total Diet Study, to the relevant food consumption rates reported by each individual. For each survey respondent, BPA exposure from all foods was summed to give an estimate of the distribution for total dietary BPA exposure within a population. Five-hundred different exposure scenarios were generated for each individual, from which mean exposure estimates were calculated for each age-sex group. The [probabilistic dietary exposure estimates of BPA for the general population are shown in Table 1](#). Based on the results of the probabilistic assessment, a mean exposure to BPA of 0.055 µg/kg bw/day was calculated for the general population, which is approximately 3 times lower than the intake calculated using migration studies conducted on epoxy-lined cans from the US market in 1995, and presented in the Department's previous health risk assessment published in August of 2008. This updated dietary exposure figure

generally aligns with exposure estimates that are based on the results of population-based biomonitoring studies. When total BPA concentrations in urine collected as part of the 2007-09 Canadian Health Measures Survey were used to derive exposure estimations, the mean all population intake was 0.043 ug/kg bw/day (Lakind et al., 2012).

Table 1. Probabilistic dietary exposure to BPA for the general population

Age-sex group		Mean, µg/kg bw/day
9 to 13 years	male	0.050
	female	0.067
14 to 18 years	male	0.038
	female	0.039
19 to 30 years	male	0.046
	female	0.042
31 to 50 years	male	0.056
	female	0.046
51 to 70 years	male	0.049
	female	0.040
71 or more	male	0.052
	female	0.061
All Ages	male	0.055
	female	0.054
	both	0.055

µg/kg bw/day - microgram per kilogram of body weight per day

Based on Health Canada's surveys of [Bisphenol A in canned liquid infant formula products from the Canadian market](#) (Health Canada, 2008; Cao et al, 2008), [canned powdered infant formula products](#) (Health Canada, 2009 C), [canned liquid infant formula and baby food products pre-packaged glass jars with metal lids](#) (Health Canada, 2009 D), and additional data for 85 samples of infant formula from Health Canada's Total Diet Study (Cao et al, 2011), a probabilistic exposure assessment was performed using food intakes from *The Canadian Community Health Survey (CCHS) – Cycle 2.2 on Nutrition* (Statistics Canada, 2004). For the purpose of determining per kilogram body weight

intakes, infant body weights were set to the mean body weights as derived from the Continuing Survey of Food Intakes by Individuals (CSFII) surveys (1998) from the United States Food and Drug Administration (USDA). The [probabilistic dietary exposure estimates of BPA for infants of different age groups are shown in Table 2.](#)

Table 2: Probabilistic dietary exposure to BPA for infants of different age groups

Age group*	Mean µg/kg bw/day
0 to 1 month	0.083
2 to 3 months	0.143
4 to 7 months	0.164
8 to 12 months	0.092
13 to 18 months	0.110

*Males and females are both included in each age group of infants
µg/kg bw/day - microgram per kilogram of body weight per day

The results of the probabilistic assessment demonstrate that infants, as an age group, are exposed to the greatest amount of BPA, as infants generally consume more food per unit of body weight relative to older age groups. The BPA PDI's varied from as low as 0.083 µg/kg b.w. for infants 0 to 1 month of age to as high as 0.164 µg/kg b.w. for 4 to 7 month old infants. Similar to the general population results, collectively, the BPA intake estimates for these age categories are, on average, approximately 3-fold lower than those previously derived as part of the 2008 assessment. As with the BPA intake estimations for the general population, biomonitoring-based BPA exposure estimates for infants (0.02-0.12 ug/kg bw/day) are comparable to these dietary intakes (WHO, 2011).

Conclusion and Recommendations

Dietary intake estimations of BPA for both the general population and infants were updated using more recent food occurrence data sets, including results from the Total Diet Study. The updated dietary exposure assessments are lower than those estimated in the assessment of August 2008. Therefore, based on the overall weight of evidence, the findings of the previous assessment remain unchanged and Health Canada's Food Directorate continues to conclude that current dietary exposure to BPA through food packaging uses is not expected to pose a health risk to the general population, including newborns and young children. This conclusion is consistent with those of other food regulatory agencies in other countries, including notably the United States, the European Union and Japan.

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