



## **Bromodichloromethane**

**Environmental estimates (circa 2011): Supplemental data**

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## 1. Data for lifetime excess cancer risk estimates

### Overview

The summary data used to calculate lifetime excess cancer risk and the results for bromodichloromethane are provided in the tables below. For more detailed information on supporting data and sources, see below for each exposure pathway.

#### i. Environmental Concentrations

| Exposure pathway    | Units             | Average           | Maximum       | Notes |
|---------------------|-------------------|-------------------|---------------|-------|
| Indoor air          | µg/m <sup>3</sup> | 0.4               | 4.05          |       |
| Drinking water      | µg/L              | 6.2               | 32.4          |       |
| Foods and beverages |                   | See detailed data | Not estimated |       |

#### ii. Calculated Lifetime Daily Intake

| Exposure pathway    | Average intake<br>(mg/kg bodyweight per day) | Maximum intake<br>(mg/kg bodyweight per day) |
|---------------------|--|--|
| Indoor air          | 0.00013                                      | 0.0013                                       |
| Drinking water      | 0.00016                                      | 0.0008                                       |
| Foods and beverages | 0.0000011                                    | Not estimated                                |

#### iii. Cancer Potency Factors

| Exposure route | Health Canada | US EPA | CA OEHA |
|----------------|---------------|--------|---------|
| Inhalation     | --            | --     | 0.13    |
| Ingestion      | --            | 0.062  | 0.13    |

Sources for Cancer Potency Factors:

- Health Canada, 2010. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment. Version 2.0.
- Health Canada, 2010. Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors. Version 2.0.
- United States Environmental Protection Agency Integrated Risk Information System.
- California Office of Environmental Health Hazard Assessment, 2009. Air Toxics Hot Spots Risk Assessment Guidelines Part II: Technical Support Document for Cancer Potency Factors, Appendix A. (Updated 2011).

#### iv. Lifetime Excess Cancer Risk (per million people)

| Exposure pathway    | Average <sup>1</sup> |        |                       | Maximum <sup>2</sup> |
|---------------------|----------------------|--------|-----------------------|----------------------|
|                     | Health Canada        | US EPA | CA OEHHA <sup>3</sup> |                      |
| Indoor air          | --                   | --     | 16.89                 | 171.0                |
| Drinking water      | --                   | 9.98   | 20.93                 | 109.4                |
| Foods and beverages | --                   | 0.0663 | 0.1389                | Not estimated        |

<sup>1</sup>Lifetime excess cancer risk based on average intake x cancer potency factor from each agency

<sup>2</sup>Lifetime excess cancer risk based on maximum intake x highest cancer potency factor

<sup>3</sup>California Office of Environmental Health Hazard Assessment

### Supporting data by exposure pathway

#### i. Outdoor air

Bromodichloromethane is not expected to be present in outdoor air in significant amounts.

#### ii. Indoor air

**Indoor air** concentrations are based on data published in peer-reviewed literature since 2000. A ranking system was used to select data most representative of Canadian conditions circa 2011:

1. Canadian data collected in 2000 or more recently, sample duration of 24 hours or longer;
2. US studies of similar currency and sample duration;
3. Studies from northern European countries of similar currency and sample duration;
4. Canadian, US or European studies with data collected prior to 2000 and similar sample duration; and
5. Studies with sample duration of less than 24 hours regardless of country or collection date, or studies from countries not comparable to Canada.

| Rank:       | 1     | Author: | Health Canada (2012) |                          |                 |     | Location: | Halifax, NS |       |              |  |  |
|-------------|-------|---------|----------------------|--------------------------|-----------------|-----|-----------|-------------|-------|--------------|--|--|
| Samples (n) | DF*   | DL**    | Sample Date          | Units                    | Sample Duration | Min | Max       | Mean (AM)   | Med   | Geomean (GM) | Percentile   |  |
| 331         | 0.637 | 0.035   | 2009 summer          | $\mu\text{g}/\text{m}^3$ | 24h             | <DL | 1.188     | 0.114       | 0.064 | <DL          | 25 <sup>th</sup> <DL<br>75 <sup>th</sup> <DL<br>90 <sup>th</sup> <DL<br>95 <sup>th</sup> <DL |  |
| 312         | 0.641 |         | winter               |                          |                 | <DL | 0.843     | 0.093       | 0.07  | <DL          | 25 <sup>th</sup> <DL<br>75 <sup>th</sup> <DL<br>90 <sup>th</sup> <DL<br>95 <sup>th</sup> <DL |  |

\*DF = Detection frequency

\*\*DL = Detection limit

| Rank:       | 1     | Author: | Health Canada (2010) |                          |                 |       | Location: | Regina, SK |       |              |  |  |
|-------------|-------|---------|----------------------|--------------------------|-----------------|-------|-----------|------------|-------|--------------|--|--|
| Samples (n) | DF*   | DL**    | Sample Date          | Units                    | Sample Duration | Min   | Max       | Mean (AM)  | Med   | Geomean (GM) | Percentile   |  |
| 105         | 0.819 | 0.096   | 2007 Summer          | $\mu\text{g}/\text{m}^3$ | 24hr            | 0.048 | 6.910     | 0.615      | 0.330 | 0.321        | 25 <sup>th</sup> 0.177<br>75 <sup>th</sup> 0.765<br>90 <sup>th</sup> 1.270<br>95 <sup>th</sup> 2.010 |  |
| 101         | 0.931 |         |                      |                          | 5 day           | 0.048 | 3.865     | 0.735      | 0.463 | 0.440        | 25 <sup>th</sup> 0.207<br>75 <sup>th</sup> 1.015<br>90 <sup>th</sup> 1.710<br>95 <sup>th</sup> 2.340 |  |
| 105         | 0.981 |         | winter               |                          | 24hr            | 0.048 | 2.577     | 0.889      | 0.763 | 0.693        | 25 <sup>th</sup> 0.507<br>75 <sup>th</sup> 1.133<br>90 <sup>th</sup> 1.737<br>95 <sup>th</sup> 2.160 |  |
| 89          | 0.989 |         |                      |                          | 5 day           | 0.048 | 2.860     | 0.876      | 0.747 | 0.679        | 25 <sup>th</sup> 0.390<br>75 <sup>th</sup> 1.213<br>90 <sup>th</sup> 1.770<br>95 <sup>th</sup> 2.033 |  |

\*DF = Detection frequency

\*\*DL = Detection limit

| Rank:       | 1     | Author: | Health Canada (2010) |                   |                 |       | Location: | Windsor, ON |       |              |  |  |
|-------------|-------|---------|----------------------|-------------------|-----------------|-------|-----------|-------------|-------|--------------|--|--|
| Samples (n) | DF*   | DL**    | Sample Date          | Units             | Sample Duration | Min   | Max       | Mean (AM)   | Med   | Geomean (GM) | Percentile   |  |
| 217         | 0.889 | 0.154   | 2005 summer          | µg/m <sup>3</sup> | 24hr            | 0.077 | 8.350     | 0.785       | 0.640 | 0.534        | 25 <sup>th</sup> 0.337<br>75 <sup>th</sup> 1.040<br>90 <sup>th</sup> 1.543<br>95 <sup>th</sup> 1.830 |  |
| 232         | 0.897 |         | winter               |                   |                 | 0.077 | 3.144     | 0.428       | 0.360 | 0.342        | 25 <sup>th</sup> 0.237<br>75 <sup>th</sup> 0.537<br>90 <sup>th</sup> 0.707<br>95 <sup>th</sup> 0.927 |  |
| 211         | 0.015 | 0.037   | 2006 summer          |                   | 24hr            | 0.018 | 0.095     | 0.018       | 1.353 | 0.019        | 25 <sup>th</sup> 0.018<br>75 <sup>th</sup> 0.018<br>90 <sup>th</sup> 0.018<br>95 <sup>th</sup> 0.018 |  |
| 224         | 0.0   |         | winter               |                   |                 | 0.018 | 0.018     | 0.018       | 0.018 | 0.018        | 25 <sup>th</sup> 0.018<br>75 <sup>th</sup> 0.018<br>90 <sup>th</sup> 0.018<br>95 <sup>th</sup> 0.018 |  |

\*DF = Detection frequency  
 \*\*DL = Detection limit

Sources for indoor air data:

- Health Canada. 2012. Halifax Indoor Air Quality Study (2009) – Volatile Organic Compounds (VOC) Data Summary. Available online at <http://www.healthcanada.gc.ca>.
- Health Canada. 2010. Regina Indoor Air Quality Study (2007) : Data Summary for Volatile Organic Compound Sampling. Available online at <http://www.healthcanada.gc.ca>.
- Health Canada. 2010. Windsor Exposure Assessment Study (2005-2006) : Data Summary for Volatile Organic Compound Sampling. Available online at : <http://www.healthcanada.gc.ca>.

### iii. Dust

Bromodichloromethane is not expected to be present in indoor dust.

### iv. Drinking water

Drinking water data are from the Ontario Drinking Water Surveillance Program (DWSP) for 2011. A review of published reports was also conducted in order to compare how well the Ontario data represented other regions in Canada.

| Source            | Units     | DL   |     |     |                  |                  |                  |      |     |
|-------------------|-----------|------|-----|-----|------------------|------------------|------------------|------|-----|
| Ontario DWSP 2011 | (µg/L)    | 0.2  |     |     |                  |                  |                  |      |     |
| Sample Type       | Parameter | Mean | SD  | Min | 25 <sup>th</sup> | 50 <sup>th</sup> | 75 <sup>th</sup> | Max  | N   |
| Distribution      |           | 6.2  | 5.3 | 0.4 | 2.8              | 4.8              | 8.4              | 32.4 | 342 |

DL = Detection limit  
 SD = Standard Deviation

## v. Food and Beverages

**Food consumption** data are from the Statistics Canada Food Survey (2006) - Food available, adjusted for losses tables, and from the Nutrition Canada Survey (1970-1972).

**Food concentration** data are primarily from the US-FDA Total Diet Study (2003-2004), with additional data on metals and several PAHs from the Canadian Food Inspection Agency (CFIA) - National Chemical Residue Monitoring Program: 2009-2010 Annual Report and the US-FDA (TDS Statistics on Element Results - 2008).

In order to better represent actual intake, we incorporated data for cooked and/or processed foods, as in some cases, this can either add to or diminish the amount measured in raw food.

Concentration data were obtained for 11% of total fruit consumed, 8% of total vegetables consumed, 12% of total dairy and eggs consumed, 1% of total grains consumed, and 21% of total beverages consumed.

| Food or Beverage               | Concentration<br>(µg/g) | DF      |
|--------------------------------|-------------------------|---------|
| Beef                           |                         |         |
| Chicken                        |                         |         |
| Mutton and lamb                |                         |         |
| Offal                          |                         |         |
| Oils and fats                  |                         |         |
| Pork                           |                         |         |
| Salad oils                     |                         |         |
| Shortening and shortening oils |                         |         |
| Stewing hen                    |                         |         |
| Turkey                         |                         |         |
| Veal                           |                         |         |
| Fish fresh and frozen seafood  |                         |         |
| Fish freshwater                |                         |         |
| Fish processed seafood         |                         |         |
| Apple pie filling              |                         |         |
| Apple sauce                    |                         |         |
| Apples canned                  |                         |         |
| Apples dried                   |                         |         |
| Apples fresh                   |                         |         |
| Apples frozen                  |                         |         |
| Apricots canned                |                         |         |
| Apricots fresh                 |                         |         |
| Bananas fresh                  |                         |         |
| Berries other fresh            |                         |         |
| Blueberries canned             |                         |         |
| Blueberries fresh              |                         |         |
| Blueberries frozen             |                         |         |
| Cherries fresh                 |                         |         |
| Cherries frozen                |                         |         |
| Citrus other fresh             |                         |         |
| Coconut fresh                  |                         |         |
| Cranberries fresh              |                         |         |
| Dates fresh                    |                         |         |
| Figs fresh                     |                         |         |
| Fruit dried                    |                         |         |
| Grapefruit fresh               |                         |         |
| Grapes fresh                   |                         |         |
| Guava and mangoes fresh        |                         |         |
| Kiwi fresh                     |                         |         |
| Lemons fresh                   |                         |         |
| Limes fresh                    |                         |         |
| Mandarins fresh                |                         |         |
| Melons musk, cantaloupe fresh  |                         |         |
| Melons other fresh             |                         |         |
| Melons watermelons fresh       |                         |         |
| Melons, winter melons fresh    |                         |         |
| Nectarines fresh               |                         |         |
| Oranges fresh                  | 0.01400                 | 0.02273 |
| Papayas fresh                  |                         |         |
| Peaches canned                 |                         |         |

| Food or Beverage           | Concentration<br>(µg/g) | DF      |
|----------------------------|-------------------------|---------|
| Peaches fresh              |                         |         |
| Pears canned               |                         |         |
| Pears fresh                |                         |         |
| Pineapples canned          |                         |         |
| Pineapples fresh           |                         |         |
| Plums total fresh          |                         |         |
| Quinces fresh              |                         |         |
| Raspberries frozen         |                         |         |
| Strawberries canned        |                         |         |
| Strawberries fresh         | 0.00300                 | 0.02326 |
| Strawberries frozen        |                         |         |
| Sugar maple                |                         |         |
| Sugar refined              |                         |         |
| Honey                      |                         |         |
| Artichokes fresh           |                         |         |
| Asparagus canned           |                         |         |
| Asparagus fresh            |                         |         |
| Avocados fresh             |                         |         |
| Beans baked and canned     |                         |         |
| Beans dry                  |                         |         |
| Beans green and wax canned |                         |         |
| Beans green and wax fresh  |                         |         |
| Beans green and wax frozen |                         |         |
| Beets canned               |                         |         |
| Beets fresh                |                         |         |
| Broccoli fresh             |                         |         |
| Broccoli frozen            |                         |         |
| Brussels sprouts fresh     |                         |         |
| Brussels sprouts frozen    |                         |         |
| Cabbage Chinese fresh      |                         |         |
| Cabbage fresh              |                         |         |
| Carrots canned             |                         |         |
| Carrots fresh              |                         |         |
| Carrots frozen             |                         |         |
| Cauliflower fresh          |                         |         |
| Cauliflower frozen         |                         |         |
| Celery fresh               |                         |         |
| Corn canned                |                         |         |
| Corn flour and meal        |                         |         |
| Corn fresh                 |                         |         |
| Corn frozen                |                         |         |
| Cucumbers fresh            |                         |         |
| Eggplant fresh             |                         |         |
| Garlic fresh               |                         |         |
| Kohlrabi fresh             |                         |         |
| Leeks fresh                |                         |         |
| Lettuce fresh              |                         |         |
| Lima beans frozen          |                         |         |
| Manioc fresh               |                         |         |
| Mushrooms canned           |                         |         |



| Food or Beverage                   | Concentration (µg/g) | DF      |
|------------------------------------|----------------------|---------|
| Mushrooms fresh                    |                      |         |
| Okra fresh                         |                      |         |
| Olives fresh                       |                      |         |
| Onions and shallots fresh          |                      |         |
| Parsley fresh                      |                      |         |
| Parsnips fresh                     |                      |         |
| Peas canned                        |                      |         |
| Peas dry                           |                      |         |
| Peas fresh                         |                      |         |
| Peas frozen                        |                      |         |
| Peppers fresh                      | 0.01400              | 0.02273 |
| Potatoes chips                     |                      |         |
| Potatoes frozen                    |                      |         |
| Potatoes other processed           |                      |         |
| Potatoes sweet fresh               |                      |         |
| Potatoes white fresh               |                      |         |
| Potatoes white fresh and processed |                      |         |
| Pumpkins and squash fresh          |                      |         |
| Radishes fresh                     |                      |         |
| Rappini fresh                      |                      |         |
| Rutabagas and turnip fresh         |                      |         |
| Spinach fresh                      |                      |         |
| Spinach frozen                     |                      |         |
| Tomatoes canned                    |                      |         |
| Tomatoes fresh                     | 0.01100              | 0.02273 |
| Tomatoes pulp, paste and puree     |                      |         |
| Vegetables other edible root fresh |                      |         |
| Vegetables other leguminous fresh  |                      |         |
| Vegetables unspecified canned      |                      |         |
| Vegetables unspecified fresh       |                      |         |
| Vegetables unspecified frozen      |                      |         |
| Butter                             | 0.00600              | 0.02273 |
| Cheese cheddar                     |                      |         |
| Cheese cottage                     |                      |         |
| Cheese processed                   | 0.00300              | 0.02273 |
| Cheese variety                     | 0.00036              | 0.06818 |
| Cream cereal 10%                   |                      |         |
| Cream sour                         | 0.00030              | 0.09091 |
| Cream table 18%                    |                      |         |
| Cream whipping 32% or 35%          |                      |         |
| Eggs                               |                      |         |
| Ice cream                          | 0.00034              | 0.11364 |
| Ice milk                           |                      |         |
| Margarine                          | 0.00030              | 0.06818 |

| Food or Beverage                 | Concentration (µg/g) | DF      |
|----------------------------------|----------------------|---------|
| Milk buttermilk                  |                      |         |
| Milk chocolate drink             |                      |         |
| Milk concentrated skim           |                      |         |
| Milk concentrated whole          |                      |         |
| Milk other whole milk products   |                      |         |
| Milk partly skimmed 2%           |                      |         |
| Milk skim                        |                      |         |
| Milk standard                    |                      |         |
| Milk sweetened concentrated skim |                      |         |
| Milkshake                        |                      |         |
| Powder buttermilk                |                      |         |
| Powder skim milk                 |                      |         |
| Powder whey                      |                      |         |
| Sherbet                          |                      |         |
| Yogurt                           |                      |         |
| Cereal products                  |                      |         |
| Oatmeal and rolled oats          |                      |         |
| Peanuts                          | 0.01000              | 0.02273 |
| Pot and pearl barley             |                      |         |
| Pulses and nuts                  |                      |         |
| Rice                             |                      |         |
| Rye flour                        |                      |         |
| Tree nuts                        |                      |         |
| Wheat flour                      |                      |         |
| Ale, beer, stout and porter      |                      |         |
| Beverages alcoholic              |                      |         |
| Coffee                           |                      |         |
| Distilled spirits                |                      |         |
| Juice apple                      | 0.03300              | 0.02273 |
| Juice grape                      |                      |         |
| Juice tomato                     |                      |         |
| Juice fruit                      |                      |         |
| Juice grapefruit                 |                      |         |
| Juice lemon                      |                      |         |
| Juice orange                     | 0.00300              | 0.25000 |
| Juice pineapple                  |                      |         |
| Juice vegetable                  |                      |         |
| Soft drinks                      | 0.00043              | 0.09091 |
| Tea                              |                      |         |
| Water bottled                    |                      |         |
| Wines                            |                      |         |
| Cocoa                            |                      |         |

## 2. Data quality for lifetime excess cancer risk estimates

Only publicly available data were used to calculate these indicators. Data that are not publicly available may produce different results.

No systematic method for measuring data quality was possible, so we provide the following assessments of how well the data used may represent the actual Canadian average levels. Quality is rated higher when there are data from a number of Canadian monitors, or from Canadian studies that show results similar to other comparable studies. Quality is rated lower when data from few monitors or studies were available, and lowest when estimates are based on non-Canadian data. Others may rate data quality differently.

| Exposure Pathway    | Data Quality | Notes  |
|---------------------|--------------|--|
| Indoor Air          | Moderate     | <ul style="list-style-type: none"> <li>Reasonable agreement in mean concentrations measured in three recent Canadian studies (Halifax NS, Regina SK, and Windsor ON).</li> </ul>   |
| Drinking water      | Moderate     | <ul style="list-style-type: none"> <li>Bromodichloromethane was detected in all samples (n = 342) of water in distribution systems, based on data from the Ontario Drinking Water Surveillance Program in 2011.</li> </ul> |
| Foods and beverages | Very Low     | <ul style="list-style-type: none"> <li>No Canadian data on concentrations of bromodichloromethane in foods and beverages were identified. Data from the US-FDA (TDS-2003-2004) were used for this estimate.</li> </ul>     |