Pentachlorophenol

Environmental estimates (circa 2011): Supplemental data

Table of Contents

1. Data for lifetime excess cancer risk estimates

Overview

The summary data used to calculate lifetime excess cancer risk and the results for pentachlorophenol 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
Outdoor air	µg/m³	0.0005825	0.0521	
Indoor air	µg/m³	0.00153	0.0733	
Dust	µg/g	0.2059	34	
Drinking water	µg/L	--	0.01	Maximum is the detection limit.
Food and beverages		See detailed data.	Not Estimated.	

ii. Calculated Lifetime Daily Intake

Exposure pathway	Average intake (mg/kg bodyweight per day)	Maximum intake (mg/kg bodyweight per day)
Outdoor air	0.0000000135	0.0000012
Indoor air	0.00000050	0.000024
Dust	0.00000014	0.000022
Drinking water	--	0.00000026
Food and beverages	0.000000035	Not estimated

iii. Cancer Potency Factors

Exposure route	Health Canada	US EPA	CA OEHHA
Inhalation	--	--	0.018
Ingestion	--	0.4	0.018

Sources for Cancer Potency Factors:

- Health Canada, 2007 (draft). Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment. Version 2.0.*
- Health Canada, 2007 (draft). Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs). Version 2.0. *
  *Cited by Persistent Organic Pollutants Toolkit website.
- 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.

iv. Lifetime Excess Cancer Risk (per million people)

Exposure pathway	Average[1]			Maximum[2]
	Health Canada	US EPA	CA OEHHA[3]	
Outdoor air	--	--	0.00024	0.0217
Indoor air	--	--	0.009	0.429
Dust	--	0.0541	0.002	0.1039
Drinking water	--	--	--	8.932
Food and beverages	--	0.0138	0.00062	Not estimated

[1]Lifetime excess cancer risk based on average intake x cancer potency factor from each agency
[2]Lifetime excess cancer risk based on maximum intake x highest cancer potency factor
[3]California Office of Environmental Health Hazard Assessment

Supporting data by exposure pathway

i. Outdoor air

Outdoor 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: 2 Author: Wilson (2007) Location: USA, North Carolina and Ohio

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
			2000-2001	µg/m³	48-hr						95th
126	94						0.0521		0.00091		0.0033
13	100					0.00035	0.0023		0.00077		0.0023
106	60						0.0116		0.00043		0.0041
13	54						0.0054		0.00022		0.0054

Notes: Values listed in the following order: NC Home. NC Daycare, OH Home, OH Daycare
*DF = Detection frequency
**DL = Detection limit

Sources for outdoor air data:

- Wilson NK, Chuang JC, Morgan MK, Lordo RA, Sheldon LS. 2007. An observational study of the potential exposures of preschool children to pentachlorophenol, bisphenol-A, and nonylphenol at home and daycare. Environmental Research 103: 9-20

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: 2 Author: Kumar (2001) Location: Canada, AB

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
68	65-82%	0.00005	1999-2001	µg/m³	24-hr		0.00282				

*DF = Detection frequency
**DL = Detection limit

Rank: 2 Author: Rudel (2003) Location: USA, Cape Cod, MA

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
120	58	0.001	1999-2001	µg/m³	24-hr		0.034	0.0016			

*DF = Detection frequency
**DL = Detection limit

Rank: 2 Author: Wilson (2007) Location: USA, North Carolina and Ohio

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
			2000-2001	µg/m³	48-hr						95th
128	97						0.0275		0.00150		0.0120
20	100					0.0005	0.0633		0.00116		0.0363
123	92						0.0733		0.00214		0.0183
22	68						0.0168		0.00132		0.0106

Notes: Values listed in the following order: NC Home. NC Daycare, OH Home, OH Daycare
*DF = Detection frequency
**DL = Detection limit

Sources for indoor air data:

- Kumar Y. 2001. Pesticides in ambient air in Alberta. ISBN 0-7785-1889-4. Report prepared for the Air Research Users Group, Alberta Environment, Edmonton, Alberta.
- Rudel RA, Camann DE, Spenger JD, Korn LR, Brody JG. 2003. Phthalates, alkyphenols, pesticides, polybrominated diphenyl ethers, and other endocrine-disrupting compounds in indoor air and dust. Environmental Science and Technology 37(20): 4543-4553.
- Wilson NK, Chuang JC, Morgan MK, Lordo RA, Sheldon LS. 2007. An observational study of the potential exposures of preschool children to pentachlorophenol, bisphenol-A, and nonylphenol at home and daycare. Environmental Research 103: 9-20.

iii. Dust

Indoor dust 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: 2 Author: Rudel (2003) Location: USA, Cape Cod, MA

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
118	0.86	0.3	1999-2001	µg/g		7.96	34		0.793		

*DF = Detection frequency
**DL = Detection limit

Rank: 2 Author: Wilson (2007) Location: USA, North Carolina and Ohio

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
			2000-2001	µg/g	48-hr						95th
121	0.92						4.220		0.0598		0.492
20	1.0					0.00338	0.632		0.0813		0.407
119	0.94						2.250		0.0598		0.345
23	0.91						0.712		0.0356		0.165

Notes: Values listed in the following order: NC Home. NC Daycare, OH Home, OH Daycare
*DF = Detection frequency
**DL = Detection limit

Sources for dust:

- Rudel RA, Camann DE, Spenger JD, Korn LR, Brody JG. 2003. Phthalates, alkyphenols, pesticides, polybrominated diphenyl ethers, and other endocrine-disrupting compounds in indoor air and dust. Environmental Science and Technology 37(20): 4543-4553.
- Wilson NK, Chuang JC, Morgan MK, Lordo RA, Sheldon LS. 2007. An observational study of the potential exposures of preschool children to pentachlorophenol, bisphenol-A, and nonylphenol at home and daycare. Environmental Research 103: 9-20.

iv. Drinking water

Drinking water data are from the Ontario Drinking Water Surveillance Program (DWSP) for 2006. 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 2006	(µg/L)	0.01							
Sample Type	Parameter	Mean	SD	Min	25th	50th	75th	Max	N
Treated Water		0.01	0.0	0.01	0.01	0.01	0.01	0.01	54

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 6% of total meat consumed.

Food or Beverage	Concentration (µg/g)	DF
Beef		
Chicken	0.01000	0.02273
Mutton and lamb		
Offal		
Oils and fats		
Pork		
Salad oils		
Shortening and shortening oils		
Stewing hen		
Turkey		
Veal		
Fish fresh and frozen seafish		
Fish freshwater		
Fish processed seafish		
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		
Papayas fresh		
Peaches canned		

Food or Beverage	Concentration (µg/g)	DF
Peaches fresh		
Pears canned		
Pears fresh		
Pineapples canned		
Pineapples fresh		
Plums total fresh		
Quinces fresh		
Raspberries frozen		
Strawberries canned		
Strawberries fresh		
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	Food or Beverage	Concentration (µg/g)	DF
Mushrooms fresh			Milk buttermilk		
Okra fresh			Milk chocolate drink		
Olives fresh			Milk concentrated skim		
Onions and shallots fresh			Milk concentrated whole		
Parsley fresh			Milk other whole milk products		
Parsnips fresh			Milk partly skimmed 2%		
Peas canned			Milk skim		
Peas dry			Milk standard		
Peas fresh			Milk sweetened concentrated skim		
Peas frozen			Milkshake		
Peppers fresh			Powder buttermilk		
Potatoes chips			Powder skim milk		
Potatoes frozen			Powder whey		
Potatoes other processed			Sherbet		
Potatoes sweet fresh			Yogurt		
Potatoes white fresh			Cereal products		
Potatoes white fresh and processed			Oatmeal and rolled oats		
Pumpkins and squash fresh			Peanuts		
Radishes fresh			Pot and pearl barley		
Rappini fresh			Pulses and nuts		
Rutabagas and turnip fresh			Rice		
Spinach fresh			Rye flour		
Spinach frozen			Tree nuts		
Tomatoes canned			Wheat flour		
Tomatoes fresh			Ale, beer, stout and porter		
Tomatoes pulp, paste and puree			Beverages alcoholic		
Vegetables other edible root fresh			Coffee		
Vegetables other leguminous fresh			Distilled spirits		
Vegetables unspecified canned			Juice apple		
Vegetables unspecified fresh			Juice grape		
Vegetables unspecified frozen			Juice tomato		
Butter			Juice fruit		
Cheese cheddar			Juice grapefruit		
Cheese cottage			Juice lemon		
Cheese processed			Juice orange		
Cheese variety			Juice pineapple		
Cream cereal 10%			Juice vegetable		
Cream sour			Soft drinks		
Cream table 18%			Tea		
Cream whipping 32% or 35%			Water bottled		
Eggs			Wines		
Ice cream			Cocoa		
Ice milk					
Margarine					

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
Outdoor air	Very Low	• No recent Canadian data or studies identified using appropriately accurate analytical methods. A study measuring pentachlorophenol levels outside of homes and daycares in the US (NC and OH) in 2000-2001 are used for estimates.
Indoor air	Very Low	• One Canadian study identified (2001) which detected maximum concentrations a magnitude lower than two US studies in NC and OH (2007) and MA (2003).
Indoor dust	Very Low	• No recent Canadian data or studies identified using appropriately accurate analytical methods. Two US studies were identified. Concentrations in MA (2003) were a magnitude higher than in NC and OH (2007). Data from these studies are used for estimates, but very low data quality is noted.
Drinking water	Very Low	• Only one sample was noted as being tested for pentachlorophenol in the Ontario Drinking Water Surveillance Program in 2010. It was not detected in any samples (n=54) of treated drinking water, based on data from the Ontario Drinking Water Surveillance Program in 2006. The detection limit was 0.01 µg/L. No other data were identified.
Food and beverages	Very Low	• No Canadian data on concentrations of pentachlorophenol in foods and beverages were identified. Data from the US-FDA (TDS-2003-2004) were used for this estimate.