



Canadian Food  
Inspection Agency

Agence canadienne  
d'inspection des aliments

# Phthalates in ready-to-eat meals, vegetable fats and oils – April 1, 2020, to March 31, 2021

## Food chemistry – Targeted surveys – Final report



# Summary

Targeted surveys provide information on potential food hazards and enhance the Canadian Food Inspection Agency's (CFIA's) routine monitoring programs. These surveys provide evidence regarding the safety of the food supply, identify potential emerging hazards, and contribute new information and data to food categories where it may be limited or non-existent. They are often used by the agency to focus surveillance on potential areas of higher risk. Surveys can also help to identify trends and provide information about how industry complies with Canadian regulations.

Phthalates (also called plasticizers) are chemicals used to make plastics more flexible and harder to break. The major source of phthalate exposure is eating and drinking foods that have been in contact with plastic containers and/or foods containing phthalates. Exposure to phthalates is of concern, as studies have linked these substances to reduced reproductive health and development in animal studies. In people, increased levels of phthalates are associated with adverse health effects, for example obesity and reduced masculinization in newborn boys. For certain phthalates (di(2-ethylhexyl)phthalate (DEHP), di-butylphthalate (DBP) and di isobutyl phthalate (DIBP)), food is thought to be the main exposure source. Increased phthalate levels in people were found to be associated with the consumption of fatty foods<sup>1,2,3</sup>.

This targeted survey generated baseline surveillance data regarding phthalate levels in selected foods on the Canadian retail market. A total of 500 domestic and imported samples of ready-to-eat (RTE) meals and vegetable fats and oils were collected and tested for the presence of 6 phthalates. Of these samples, 464 (93%) did not contain detectable levels of phthalates. The phthalate levels ranged from 0.2 parts per million (ppm) to a maximum of 4.2 ppm. Overall, the levels detected and the detection rates were lower than those observed in previous survey years<sup>4</sup>.

There are no regulations in Canada for phthalate levels in food. All levels of phthalate found in the products tested in this survey were evaluated by Health Canada and deemed safe for consumption by Canadians; no product recalls were required.

## What targeted surveys are

Targeted surveys are used by the CFIA to focus its surveillance activities on areas of highest health risk. The information gained from these surveys provides support for the allocation and prioritization of the agency's activities to areas of greater concern. Originally started as a project under the Food Safety Action Plan (FSAP), targeted surveys have been embedded in our regular surveillance activities since 2013. Targeted surveys are a valuable tool for generating information on certain hazards in foods, identifying and characterizing new and emerging hazards, informing trend analysis, prompting and refining health risk assessments, highlighting potential contamination issues, as well as assessing and promoting compliance with Canadian regulations.

Food safety is a shared responsibility. We work with federal, provincial, territorial and municipal governments and provide regulatory oversight of the food industry to promote safe handling of foods throughout the food production chain. The food industry and retail sectors in Canada are responsible for the food they produce and sell, while individual consumers are responsible for the safe handling of the food they have in their possession.

## Why the survey was conducted

Phthalates (also called plasticizers) are chemicals used to make plastics more flexible and harder to break. They are commonly used in PVC (polyvinyl chloride plastics). They have a wide variety of industrial uses that include the manufacture of household and consumer goods such as lubricating oils, solvents, personal care products and food packaging. Phthalates can migrate from plastic food packaging and from the gaskets of lids for glass containers into foods, particularly those foods that are oily or that have a high fat content. Phthalates can also migrate into food before it is packaged, while in contact with food contact materials during processing. RTE meals and vegetable fats and oils were identified as commodities with elevated levels of phthalates. The aim of this survey is to collect further data on these commodity types. Exposure to phthalates is of concern, because these substances are linked to reduced reproductive health and development in animal studies. In people, increased levels of phthalates are associated with adverse health effects, for example obesity and reduced masculinization in newborn boys. Phthalates encompass a broad range of compounds. For certain phthalates, food is believed to be the main source of exposure. Increased phthalate levels in human blood and urine have been associated with the consumption of specific foods, especially fatty foods<sup>1,2,3</sup>. DEHP is the most commonly used and best-studied of the phthalates<sup>2</sup>. Recently, a dietary exposure assessment to DBP, butyl-benzyl-phthalate (BBP), DEHP and DINP was carried out by the European Food Safety Authority (EFSA) where the concentration is expressed as DEHP equivalents<sup>3</sup>. In this survey, 6 phthalates were examined. They included BBP, DBP, di-n-octyl phthalate (DNOP), DEHP, Di-isononyl phthalate (DINP) and di-

isodecylphthalate (DIDP). The phthalate concentration is reported as the sum of the concentrations of all phthalate forms observed.

The main objectives of this targeted survey were to generate additional baseline surveillance data on the level of phthalates in foods available on the Canadian retail market, and to compare the phthalate levels in foods in this survey with that of previous targeted surveys.

## What we sampled

A total of 500 domestic and imported RTE meals (infant/children/adult meals and pizza products), as well as, vegetable fats and oils (oils, salad dressings and vegetable shortenings/mayonnaise/vegan mayonnaise) were sampled between April 1, 2020 and March 31, 2021. Samples of products were collected from local/regional retail locations located in 6 major cities across Canada. These cities encompassed 4 Canadian geographical areas:

- Atlantic (Halifax)
- Quebec (Montreal)
- Ontario (Toronto, Ottawa)
- West (Vancouver and Calgary)

The number of samples collected from these cities was in proportion to the relative population of the respective areas.

**Table 1. Distribution of samples based on product type and origin**

Product type	Number of domestic samples	Number of imported samples	Number of samples of unspecified <sup>a</sup> origin	Total number of samples
RTE meals	56	165	29	250
Vegetable fats and oils	27	161	62	250
<b>Total</b>	<b>83</b>	<b>326</b>	<b>91</b>	<b>500</b>

### Table notes

<sup>a</sup> Unspecified refers to those samples for which the country of origin could not be assigned from the product label or available sample information.

## How samples were analyzed and assessed

Samples were analyzed by an ISO/IEC 17025 accredited food testing laboratory under contract with the Government of Canada. The method quantified 6 phthalates; the phthalate concentration is reported as the sum of the concentrations of all phthalate forms observed. The results are based on the food products as sold and not necessarily as they would be consumed.

Currently, no maximum level, tolerance, or standard has been established by Health Canada for phthalate levels in food; therefore, compliance with numeric Canadian regulations was not evaluated in this survey. The European Union has set migration limits for phthalates from food contact materials: 0.3 mg per kg of food for BBP, 1.5 mg per kg of food for DEHP, 9 mg per kg of food DINP and DIDP, and 30 mg per kg of food for DBP<sup>3</sup>. The United States has set a limit of 0.006 milligram per liter (0.6 parts per billion (ppb)) in bottled water<sup>5</sup>.

in the absence of a specific maximum level, the levels of phthalates detected were assessed by Health Canada on a case-by-case basis using the most current scientific data available.

## Results of the survey

A total of 500 domestic and imported RTE meals (infant/children/adult meals and pizza products) and vegetable fats and oils products were tested in this survey. Of these samples, 464 (93%) did not contain detectable levels of phthalates. The concentration, reported as the sum of the concentrations of all phthalate forms observed, ranged from 0.2 ppm to 4.2 ppm. The highest phthalates level was detected in a sample of a RTE hot dog meal for children. Vegetable fats and oils had a higher detection rate at 12% compared to 2% in RTE meals but a slightly lower average level of phthalates.

The most prominent phthalate detected was DEHP, found in 4.6% (23) of samples. Other phthalate forms were detected in 1 to 9 samples. Only 7 samples had detected levels of more than one phthalate form.

**Table 2. Summary of phthalates testing**

Product type	Number of samples	Number of samples with detected levels (%)	Minimum (ppm)	Maximum (ppm)	Average (ppm)
RTE meals	250	5 (2)	0.3	4.2	1.56
Vegetable fats and oils	250	31 (12)	0.2	3.4	0.86
<b>Total</b>	<b>500</b>	<b>36 (7)</b>	<b>0.2</b>	<b>4.2</b>	<b>0.96</b>

## What the survey results mean

The main objective of this targeted survey was to expand upon baseline data regarding the levels of phthalates in selected foods on the Canadian retail market. Of the 500 samples tested, 36 (7%) tested positive for phthalates. The levels of phthalates found in this targeted survey were compared to those previously found in similar product types<sup>4</sup>. The results of previous survey years are summarized in Table 3 below.

Both the average and maximum levels of phthalates in RTE meals are comparable between survey years for most products types, although the detection rates decreased from 57.1% in the 2012 to 2015 survey years to 2% in this survey.

Phthalates were not observed in mayonnaise and vegetable shortening samples in this survey. Similarly, no samples of vegetable shortening tested in 2012 to 2015 had detectable levels of phthalates, however 12% of mayonnaise samples tested in 2012-2015 survey years contained detectable levels of phthalates, with an average concentration of 2.77 ppm. The percentage of salad dressing samples that were positive for phthalates also decreased to 4% in this survey from 36% in 2012 to 2015 surveys years. The greatest decrease was observed for oils, the levels of phthalates as well as the detection rates were significantly higher in the 2012 to 2015 survey years. Although some differences may be due to the specific type of product tested or to the sample size; in some instances, the same brands of products tested were observed to have significantly lower phthalate levels. This suggests phthalate levels reduction through mitigation strategies during the manufacturing process.

**Table 3. Minimum, maximum and average concentration of phthalates from various survey years**

Product type	Survey year	Number of samples	Minimum (ppm)	Maximum (ppm)	Average <sup>b</sup> (ppm)
RTE meals	2020	250	0.3	4.2	1.56
RTE meals	2012 to 2015	224	0.27	15.4	1.46
Vegetable fats and oils	2020	250	0.2	3.4	0.86
Oil	2020	150	0.2	3.4	0.89
Salad dressing	2020	50	0.3	0.6	0.45
Vegetable fats and oils	2012 to 2015	327	0.26	2608	84.3
Oil	2012 to 2015	180	0.26	2608	107
Salad dressing	2012 to 2015	22	0.71	3.75	2.25

**Table notes**

<sup>b</sup> Only positive results were used to calculate the average phthalate levels.

Currently, no maximum level, tolerance, or standard has been established by Health Canada for phthalate levels in food and therefore, compliance with a numerical standard was not evaluated in this survey. All levels of phthalate found in the products tested in this survey were evaluated by Health Canada and deemed safe for consumption by Canadians; no product recalls were required.

# References

1. Muncke, J. (2012). [Phthalates](#). Food Packaging Forum.
2. [Opinion of the Scientific Panel on food additives, flavourings, processing aids and materials in contact with food \(AFC\) on a request from the Commission related to Bis\(2-ethylhexyl\)phthalate \(DEHP\) for use in food contact materials](#). (2005). EFSA Journal 243, pp. 1-20.
3. [Public Consultation on EFSA's draft assessment of five phthalates used in plastic food contact materials](#). (2019). European Food Safety Authority.
4. 2012 to 2015 Phthalates in Selected Foods. Canada. Canadian Food Inspection Agency. [unpublished data]
5. [Guidance for Industry: Bottled Water Quality Standard: Establishing an Allowable Level for di\(2-ethylhexyl\)phthalate; Small Entity Compliance Guide](#). (2015). United States. Food and Drug Administration.