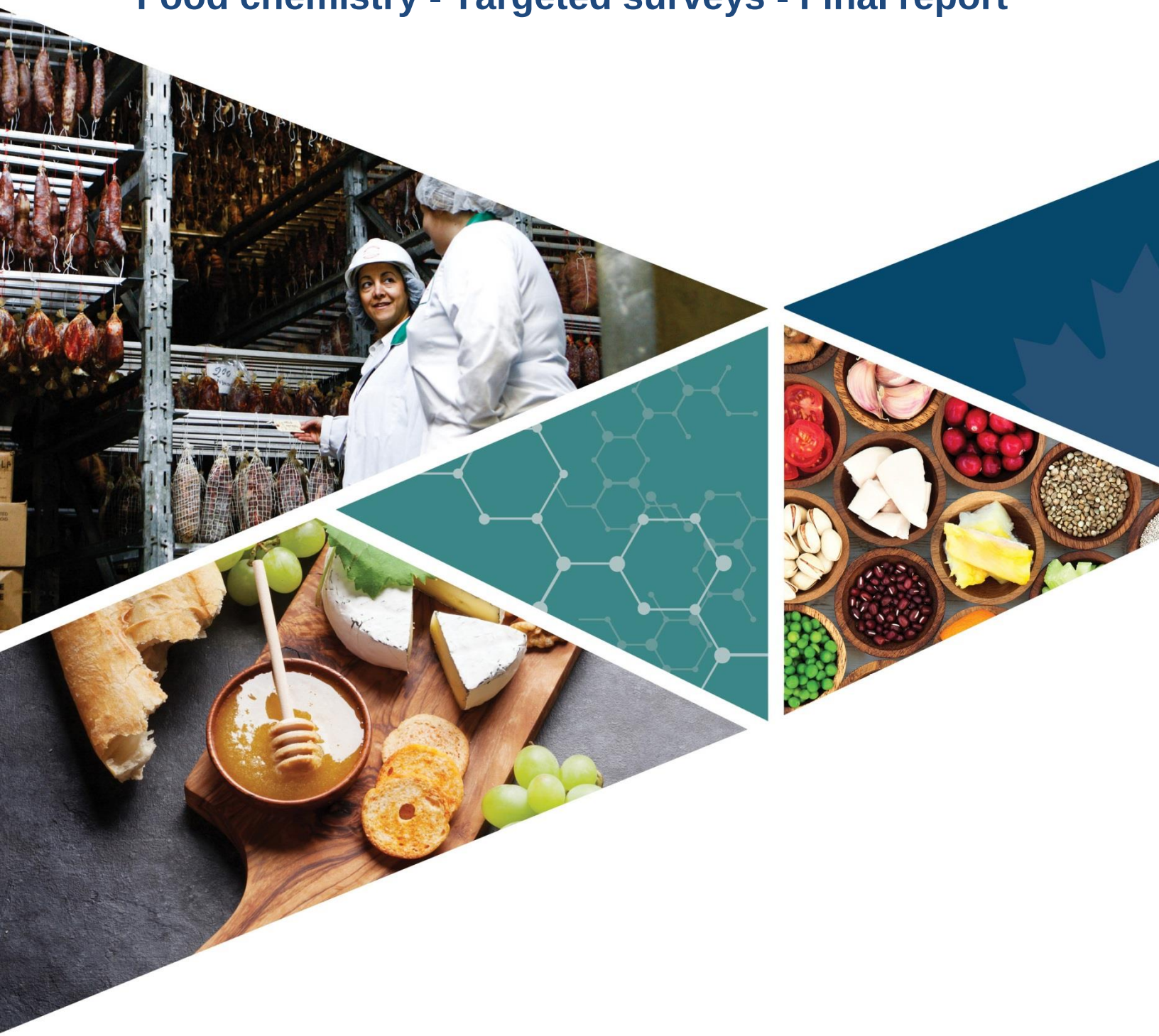
Canadian Food Inspection Agency
Agence canadienne d'inspection des aliments

Food Colours in Fish, Seafood, Meat and Meat Alternatives - April 1, 2019 to March 31, 2020

Food chemistry - Targeted surveys - Final report



Canada

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.

Food colours are routinely added to foods and beverages for a variety of reasons, including to compensate for the loss of natural colour caused by processing conditions, and to meet consumer expectations by making the food more appealing and appetizing by enhancing the colour or making it more uniform. Targeted surveys focusing on colouring agents have been initiated in part due to potential health concerns associated with uses of non-permitted colouring agents in processed foods. The presence of non-permitted colouring agents may pose a health risk to the consumer, as some are potentially damaging to DNA and carcinogenic[1,2]. Undeclared use of permitted synthetic colouring agents may also be a potential concern to a small percentage of the population which has exhibited sensitivity to synthetic colouring agents, resulting in skin rashes and triggering asthmatic reactions in individuals with asthma[3,4].

This targeted survey generated further baseline data on the occurrence of food colours in domestic and imported products on the Canadian market. A total of 398 samples of fish, seafood, meat and meat alternatives were collected and tested for up to 43 different food colour additives. Artificial food colours were not detected in 396 (99.5%) of the samples tested. In one instance a permitted food colour was found in a sample of deli meat (pork sausages), and the appropriate declaration was made in the list of ingredients. Low levels of non-permitted food colours were found in 1 sample of ready-to-eat (RTE) curry dish, therefore the overall compliance was 99.7%.

When compared to previous survey years, the detection rate was much lower indicating that the types of products tested have low likelihood of containing food colouring agents. Despite that, 1 product containing 2 non-permitted food colours was deemed to represent a health risk, appropriate follow-up actions were initiated.

What are targeted surveys

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 did we conduct this survey

Food colours, both naturally-sourced and synthetically manufactured, are widely used by the food industry. They are incorporated into processed foods for a variety of reasons including: to compensate for the natural colour(s) lost during processing; to achieve a uniform product colour; and to make the food appear more appealing and appetizing.

In Canada, food colours are considered food additives and are regulated under Marketing Authorizations issued by the Minister of Health. Health Canada conducts detailed, rigorous, safety-focused pre-market evaluations of food additives prior to allowing their use in foods and setting the maximum allowable levels of use of those colours[5,6]. It should be noted that coloured impurities other than the main colour (called subsidiary colours) are not regulated within food products, but are regulated as part of the food colour raw material source. In Canada, 10 synthetic colours have been approved for use in food, and are listed in the *Food and Drug Regulations* (FDR). The presence of 1 or more approved colours in food is not unexpected. Declaration of individual colours by the manufacturers was voluntary when the survey was carried out. However, Health Canada recently amended the food colour labelling requirements that require colouring agents to be identified on labels by their common name in order to make more information available to consumers when making food selections[7].

The presence of non-permitted food colours, particularly industrial dyes, may pose a health risk to the consumer, as some are potentially damaging to DNA and carcinogenic[1,2]. Undeclared use of permitted synthetic colouring agents may also be a potential concern to a small percentage of the population which has exhibited sensitivity to synthetic colouring agents, resulting in skin rashes and triggering asthmatic reactions in individuals with asthma[3,4]. Furthermore, several

studies have suggested a correlation between consumption of certain synthetic food colours and hyperactive behaviour in children, although this relationship has not been conclusively proven[8,9]. Despite the lack of a clear link, anecdotal information suggests that certain consumers are cautious about the use of synthetic food colour additives, primarily for health and safety reasons. With trends toward healthier lifestyles, the food industry is noting that consumers are demanding fewer artificial or synthetic ingredients in foods[10]. Targeted surveys focused on colouring agents have been carried out previously and will continue to generate further baseline data.

What did we sample

A variety of domestic and imported fish, seafood, meat and meat alternatives were sampled between April 1, 2019 and March 31, 2020. Samples of products were collected from local/regional retail locations located in 11 major cities across Canada. These cities encompassed 4 Canadian geographical areas:

- Atlantic (Halifax, Moncton)
- Quebec (Montreal, Quebec City)
- Ontario (Toronto, Ottawa)
- West (Calgary, Saskatoon, Vancouver, Victoria and Winnipeg)

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[a] origin	Total number of samples
Fish/Seafood	16	68	14	98
Meat	67	84	49	200
Meat alternatives	49	41	10	100
Grand total	**132**	**193**	**73**	**398**

[a] Unspecified refers to those samples for which the country of origin could not be assigned from the product label or available sample information

What analytical methods were used and how were samples assessed

Samples were analyzed by an ISO/IEC 17025 accredited food testing laboratory under contract with the Government of Canada. Based on the nature of the food product, samples were analyzed for water-soluble, oil-dispersible colours, or both. See Appendix A for a list of the colours analyzed. The results represent finished food products as sold and not as they would be consumed, whether the product sampled is considered an ingredient or requires preparation prior to consumption.

What were the survey results

Of the 398 food samples tested, artificial food colours were not detected in most (396) of these samples. Food colours were detected in only 2 (0.5%) samples. Allura Red, a permitted food colour, was found in a sample of deli meat (pork sausages) at 6.7 parts per million (ppm), and the declaration of use was made in the list of ingredients. This sample was compliant with Canadian regulations. Low levels of Metanil Yellow (0.078 ppm) and Orange II (0.077 ppm) were found in a sample of RTE curry dish, neither is permitted in Canada, therefore the sample was not compliant. The overall compliance rate from this study was 99.7%.

What do the survey results mean

The main objectives of this targeted survey were to expand upon baseline data regarding the levels of permitted synthetic food colours in selected foods on the Canadian retail market and to obtain information regarding the presence of non-permitted food colours in a variety of foods. Out of a total of 398 samples tested, 397 (99.7%) samples were in compliance with Canadian standards and limits.

Table 4 compares this survey results with 5 years of past survey data for food colours[11,12,13,14,15]. The detection rate in this survey (2019) was much lower compared to previous surveys and the compliance rate was higher than previous surveys. Colours can could be introduced into food products as components of some of the ingredients. The source of Orange II and Metanil Yellow detected in the 1 non-compliant product product could not be confirmed. This product containing 2 non-permitted food colours was deemed to represent a health risk, appropriate follow-up actions were initiated that reflected the magnitude of the human health concern.

Table 4. Food colours results from various survey years

Survey year	Number of samples	Detection rate (%)	Compliance rate (%)	Number of non-compliant samples (number of non-compliant results)
2019	398	0.5	99.7	1 (2)
2018	399	45	98.7	5 (5)
2014	980	15	98.9	11 (25)
2013	875	33	97.8	19 (22)
2012	1493	58	97.6	36 (38)
2011	1799	29	97.8	39 (41)

References

1. Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food on a request from the Commission to Review the toxicology of a number of dyes illegally present in food in the EU. (2005). European Food Safety Authority. EFSA Journal 263, pp. 1-71.
2. Agents Classified by the IARC Monographs, Volumes 1-123. (2019). International Agency for Research on Cancer.
3. Lockey, S.D. Sr. (1977). Hypersensitivity to tartrazine (FD&C Yellow No. 5) and other dyes and additives present in foods and pharmaceutical products. Ann Allergy. March 38 (3), pp. 206-210.
4. David, T.J. (1988). Food Additives. Archives of Disease in Childhood. 63, pp. 582-583
5. Food Additives. (2012). Canada. Health Canada.
6. Lists of Permitted Food Additives. (2017). Canada. Health Canada.
7. Notice to Industry - Regulatory amendments related to nutrition labelling, list of ingredient and food colours. (2018). Canada. Canadian Food Inspection Agency.
8. McCann, D., Barrett, A., Cooper, A., Crumpler, D., Dalen, L., Grimshaw, K., Kitchin, E., Lok, K., Porteous, L., Prince, E., Sonuga-Barke, E., Warner, J.O., Stevenson, J. (2007). Food additives and hyperactive behaviour in 3-year-old and 8/9-year-old children in the community: a randomised, double-blinded, placebo-controlled trial. The Lancet. Volume 370 (9598), pp.1560-1567.
9. FAQ on food colours. European Food Safety Authority.
10. Media – Press Releases – Smarties now made with no artificial colours. (2012). Nestlé Canada.
11. 2011-2012 Food Colours in Selected Foods. (2018). Canada. Canadian Food Inspection Agency.

12. 2012-2013 Food Colours in Selected Foods. Canada. Canadian Food Inspection Agency. [unpublished data]
13. 2013-2014 Food Colours in Selected Foods. (2019). Canada. Canadian Food Inspection Agency.
14. 2014-2015 Food Colours in Beverages, Condiments, Soups, Pickled Vegetables, Dried Spices and Mixes, and Oils. (2019). Canada. Canadian Food Inspection Agency.
15. 2018-19 Food Colours in essences/flavourings, oils, sweets and processed vegetables. (2020). Canada. Canadian Food Inspection Agency.

Appendix A

List of colours tested by the accredited laboratory in this survey (permitted colours in bold)

Water-soluble colours	**Tartrazine**
	Amaranth
	Indigo Carmine (Indigotine)
	Sunset Yellow FCF
	Allura Red
	Ponceau SX
	Fast Green FCF
	Brillant Blue FCF
	Erythrosin B
	Chlorophyllin
	Ponceau 4R (New Coccine) †
	Fast Red E†
	Bordeaux R†
	Erythrosin Yellowish (2,4,5- triiodofluorescein) †
	4,5-diiodofluorescein†
	Crocein Orange G†
	Orange II†
	2,4,7-triiodofluorescein†
	Orange GGN
	Azorubine (Carmoisine)
	Lissamine Green
	Quinoline Yellow 1
	Eosin Y
	Patent Blue VF
	Patent Blue Violet Calcium
	Chrysoidine G
	Rhodamine B
Fat-soluble colours	Sudan I
	Sudan II
	Sudan III
	Sudan IV
	Sudan Red B
	Sudan Red 7B
	Sudan Red G
	Sudan Orange G
	Sudan Blue II
	Solvent Blue 59
	Toluidine Red
	Para Red
	Methyl Yellow
	Metanil Yellow *
	Orange II *
	Rhodamine B *
	Sudan Black B
	Citrus Red 2

†May be present as a subsidiary food colour
*Water-soluble fat-soluble colours