2014/15 Annual Report

National Microbiological Monitoring Program

Canada

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Summary

The Canadian Food Inspection Agency (CFIA) develops and delivers programs and services designed to protect Canadians from preventable food safety hazards. The CFIA works to ensure that food safety emergencies are effectively managed, that the public is aware of and contributes to food safety, and that consumers and the marketplace are protected from unfair practices. Canada's food safety requirements apply equally to the domestic and imported food sectors.

The National Microbiological Monitoring Program (NMMP) is a food surveillance program managed by the CFIA to verify industry compliance with microbial standards, facilitate access of Canadian food products to international markets, provide information on the effectiveness of food safety control measures and interventions, and maintain consumer confidence in the safety of the food supply. Under the NMMP, a broad range of imported and domestic food products are sampled by CFIA inspectors. These foods are frequently sampled at federally registered establishments (i.e., those that produce food products that are exported or traded inter-provincially), which are inspected by CFIA inspectors. Samples may also be collected at other establishment types, such as warehouses, distribution centres, and wholesalers.

Food products of the following commodities were tested under the NMMP in the 2014/15 fiscal year (April 1, 2014 to March 31, 2015): red meat and poultry products, shell eggs and egg products, dairy products, fresh fruits and vegetables and processed fruit and vegetable products. Food products within these commodities were selected for testing on the basis of known food-hazard combinations. The NMMP also performed environmental sampling at Canadian federally registered establishments to verify the producer's ability to control the presence of pathogens within the processing environment and confirm that food products are produced under sanitary conditions.

Product and environmental samples collected were sent to CFIA laboratories and tested to verify industry compliance with food microbiological safety and quality standards. All samples were subject to appropriate follow-up actions by both industry and the CFIA. Such follow-up actions could include follow-up inspections, additional sampling, product disposal, corrective action requests, food safety investigations, product recalls, etc.

In the 2014/15 fiscal year, 13910 tests were performed on 5589 domestic and imported products under the NMMP. Specifically, 9179 tests were performed on 4038 domestic products and 4731 tests were performed on 1551 imported products to verify their compliance with food safety standards. Results indicated that domestic products were 99.8% compliant whereas imported products were 98.6% compliant. Overall, a 99.5% compliance rate for combined domestic and imported products was observed. In addition, there were 2266 tests performed on 1826 environmental samples, of which 98.0% were assessed as compliant.

The results of the 2014/15 NMMP sampling activities indicated that the vast majority of food products available in Canada between April 1, 2014 and March 31, 2015 were compliant with food standards. The few noncompliant samples that were detected resulted in appropriate follow-up actions by the CFIA and industry. These actions allowed the CFIA to continue to safeguard Canada's food system and the health and well-being of Canadians.

What is the National Microbiological Monitoring Program?

The National Microbiological Monitoring Program (NMMP) is a food surveillance program managed by the CFIA to verify industry compliance with microbial standards, facilitate access of Canadian food products to international markets, provide information on the effectiveness of food safety control measures and interventions, and maintain consumer confidence in the safety of the food supply. Under the NMMP, a broad range of imported and domestic food products are sampled by CFIA inspectors. These products are frequently sampled at federally registered establishments (i.e., those that produce food products that are exported or traded inter-provincially), which are inspected by CFIA inspectors. Samples may also be collected at other establishment types, such as warehouses, distribution centres, and wholesalers. Both food products and their manufacturing environments are sampled by CFIA inspectors during inspection of establishments.

The samples collected are sent for testing at CFIA laboratories. The samples are tested to verify industry compliance with food microbiological safety and quality standards. All samples are subject to appropriate follow-up actions by both industry and the CFIA, e.g., follow-up inspection, additional sampling, product disposal, corrective action requests, food safety investigations, product recalls, etc.

In addition to the NMMP, the CFIA also manages the Targeted Survey Program which is another food microbial surveillance program which operates at the retail level. The purpose of Targeted Surveys is to generate baseline information on the occurrence of specific hazards in foods. Should a food-hazard combination be identified under these Targeted Surveys, the food product may be subsequently monitored under the NMMP.

What Was Sampled?

In the 2014/15 fiscal year, domestic and imported food products of the following commodities were tested: red meat and poultry products; shell eggs and egg products; dairy products; fresh fruits and vegetables; and processed fruit and vegetable products. Food products within these commodities were selected for testing on the basis of known food-hazard combinations. The number of samples that were taken for each product depended on various factors, including the number of establishments producing the food product, whether the food product would be consumed directly or would undergo further preparation, historical compliance levels, market access requirements, etc.

Sampling of imported food was performed at ports of entry and distribution facilities, therefore test results of imported foods reflected the conditions the foods were exposed to during both processing,

handling and storage. Sampling of imported foods was representative of products found at these locations. Imported foods are required to meet the same safety standards as domestic products.

In addition to sampling domestic and imported food products, the CFIA also tested environmental samples taken within food processing establishments. An environmental sample typically consists of a swab (absorbent material) that has been wiped on a specific surface within an establishment to detect the presence of microorganisms on that surface. For example, the blade of a meat slicer used in the preparation of a deli-meat might be tested for the presence of microorganisms. An environmental sample could also be a sample of water used in the preparation of a food, such as water used to wash shell eggs. Environmental sampling is done to verify the producer's ability to control the presence of pathogens within the processing environments and confirm that food products are produced under sanitary conditions.

The CFIA's role is to provide oversight and ensure that the industry is producing safe food and complying with standards in place. Industry is responsible for implementing controls and practices, which may include sampling and testing programs, to ensure that all food they produce or import into Canada is safe. Therefore, the CFIA does not test all imported or domestically produced lots of food. In the 2014/15 fiscal year, a randomized strategy was employed under the NMMP to test representative samples of these foods..

What Tests Were Performed?

Food and environmental samples collected under the NMMP were tested for microorganisms associated with known food-hazard combinations or manufacturing processes. Certain food samples were also tested for physicochemical properties or non-microbial indicators (see below). The majority of methods used for testing are found in Health Canada's Compendium of Analytical Methods (HC, 2008a). Non-compendium or modified versions of compendium methods were also used when appropriate. These methods included both rapid screening and confirmatory methods.

Pathogens are microorganisms that can cause illness when consumed. Samples collected under the NMMP were tested for the following pathogens in the 2014/15 fiscal year: *Escherichia coli* O157:H7 and other verotoxin producing *E. coli* (VTEC), *Staphylococcus aureus* and its enterotoxins, *Listeria monocytogenes, Salmonella* spp.*, Shigella* spp.*, Trichinella spiralis and Cyclospora* spp.

Indicator organisms are microorganisms that do not cause illness but may be associated with pathogens or unsanitary practices. The presence of high levels of indicator organisms do not always imply the existence of a food-related health hazard but can expose unsanitary practices and conditions under which pathogens could contaminate food products. The following indicator organisms were tested by the NMMP in the 2014/15 fiscal year: generic *E. coli*, *Listeria* spp., Coliforms and Aerobic Colony Counts (ACC).

Physiochemical characteristics of foods are evaluated to assess the ability of such foods to support microbial growth. The physiochemical indicators tested for under the NMMP in the 2014/15 fiscal year were salt, pH and water activity.

Lastly, non-microbial indicators are not designed to determine the presence or absence of microorganisms. These criteria are used to obtain information pertaining to other aspects of food safety. Such tests may be performed to identify manufacturing processes that could support the introduction of potential food safety hazards. The following non-microbial indicators were tested for under the NMMP in the 2014/15 fiscal year: presence of central nervous system tissue, meat species verification and phosphatase testing.

How Were Samples Assessed?

Microbial test results are assessed using assessment criteria specific to a food type and test of interest. These assessment criteria set clear limits in determining if food products are safe for consumption and/or produced under conditions compliant with food standards. In Canada, Health Canada's Standards and Guidelines for Microbiological Safety of Food – An Interpretive Summary (HC, 2008b) contains microbiological assessment criteria based on current regulatory standards and guidelines. Additional information on assessment criteria is also found in Health Canada's Policies on *Listeria monocytogenes* in Ready-to-Eat (RTE) Foods (HC, 2011) and *E. coli* O157:H7 and *E. coli* O157:NM in Raw Beef (HC, 2014). International standards, such as those outlined by the International Commission on Microbiological Specifications for Foods (ICMSF), may also provide information on microbiological assessment criteria when appropriate (ICMSF, 2011).

Microbial assessment criteria for *L. monocytogenes* in RTE food products in Canada are based upon Health Canada's Policy on *Listeria monocytogenes* in Ready-to-Eat Foods (HC, 2011). This policy considers the levels of *L. monocytogenes* in a food and the potential for growth of *L. monocytogenes* in a particular food when assessing the risk. As such, the assessment criteria specific to *L. monocytogenes* in RTE foods differ depending on if the product can support the growth of *L. monocytogenes* (Category 1 product) or if limited (<100 CFU/g) or no growth can occur throughout the stated shelf-life (Category 2 product).

Samples collected and tested under the NMMP were assessed using assessment criteria (see Appendix) based on information from these sources. On the basis of these assessment criteria, samples tested under the NMMP were considered Satisfactory, Unsatisfactory or Investigative. A Satisfactory result indicated that there were no concerns identified with the food as all test results were considered acceptable by the assessment criteria. An Unsatisfactory result indicated that one or more test results were considered unacceptable by the assessment criteria and the sample therefore did not meet regulatory standards and guidelines. An Investigative result indicated that the sample was considered acceptable based on the assessment criteria, but that there was an indication that manufacturing practices should be investigated

further to ensure good manufacturing practices are in place. Thus, appropriate follow-up actions were taken in response to both Unsatisfactory and Investigative samples.

Percent compliance levels were reported for each food type and analyte tested. Both Satisfactory and Investigative samples are considered acceptable based on the assessment criteria as their test results indicate they are compliant with standards. Therefore percent compliance values were calculated as the number of Satisfactory and Investigative samples divided by the total number of samples tested. The significance of compliance percentage's derived from small numbers of samples/tests should be interpreted with caution. For this report, we considered that this included percent compliance values derived from fewer than 50 samples.

What Were The 2014/15 NMMP Results for Red Meat and Poultry Products?

i) Ready-To-Eat Meat Products

Ready-to-eat meats are defined as meat products that have been subjected to a process sufficient to control and/or inactivate microorganisms so that they do not require further preparation before consumption except washing, thawing or exposing to sufficient heat to warm the products without cooking them. Ready-to-eat meats have been associated with foodborne illness due to recontamination from raw or undercooked products or exposure to environmental contaminants while being handled in processing establishments, catering establishments and in the home kitchen.

Under the NMMP in 2014/15, RTE meat products were sampled and tested for the following pathogens of concern: *Salmonella* spp., *L. monocytogenes,* and *E. coli* O157:H7 (on fermented RTE products containing beef only). Additional RTE meat products were tested for *L. monocytogenes* only. A total of 1460 tests were performed on 1028 domestic samples, which were determined to be 99.9% compliant (Table 1). One sample of cacciatore sausage was assessed as Unsatisfactory due to the detection of *Salmonella spp.* Two Category 2 products, a chipotle chicken sandwich and cooked chicken strips were assessed as Investigative due to the detection of low levels ($\leq$100 CFU/g) of *L. monocytogenes.* An additional 210 tests were performed on 103 imported RTE meat products (Table 1), the majority of which originated from the United States (Figure 1). The imported products tested were 98.1% compliant; two samples of salami from Italy were assessed as unsatisfactory as they were found to contain *Salmonella* spp. and *L. monocytogenes* respectively.

Table 1: Assessment of Domestic and Imported Ready-To-Eat Meat Product Samples

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Domestic					
L. monocytogenes [b]	1028	1026	2	0	100
Salmonella spp.	429	428	n/a	1	99.8
E. coli O157:H7	3	3	n/a	0	100[c]
Total Domestic Samples	**1028**	**1025**	**2**	**1**	**99.9**
Imported					
L. monocytogenes [b]	103	102	0	1	99.0
Salmonella spp.	103	102	n/a	1	99.0
E. coli O157:H7	4	4	n/a	0	100[c]
Total Imported Samples	**103**	**101**	**0**	**2**	**98.1**
Total Samples	**1131**	**1126**	**2**	**3**	**99.7**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in a Category 2 product; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.
[c]Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

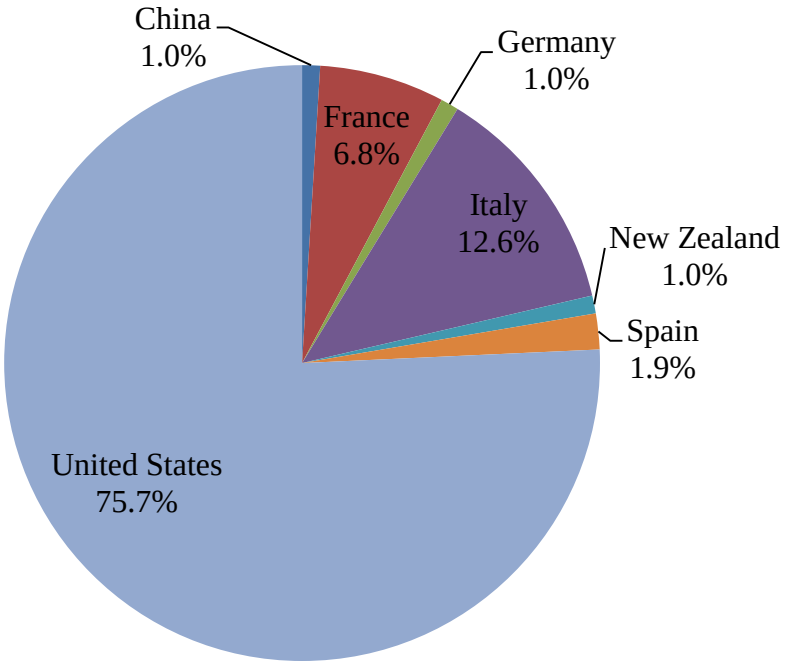

Figure 1. Percent Distribution of Imported Ready-To-eat Meat Products Analyzed by Country of Origin (n=103)

ii) Precursor Materials and Raw Ground Beef/Veal

Precursor materials include any raw beef or veal products intended to be used for production of finished raw ground beef/veal products (i.e., raw ground beef/veal). This includes, but is not limited to, trims, bench trims, boneless beef, course ground beef, hearts, head meat, cheek meat, tongue roots and weasand meat. It also includes primal cuts, such as chucks, if they are intended to be used for production of finished raw ground beef/veal products. Pathogens, such as *E. coli* O157:H7 can contaminate the outer surfaces of whole intact pieces of precursor materials during slaughter and this contamination may be introduced into raw ground beef/veal during grinding. Illness due to *E. coli* O157:H7 have occurred in ground beef/veal products that were not fully cooked.

Under the NMMP in 2014/15, precursor materials and raw ground beef/veal were sampled and tested for *E. coli* O157:H7 and generic *E. coli*. A total of 3061 tests were performed on 831 domestic precursor material and 700 domestic raw ground beef/veal samples, which were determined to be 99.9% compliant (Table 2). Of the domestic samples, 11 precursor material and 27 raw ground product samples were assessed as Investigative due to the detection of elevated levels of generic *E. coli* (>100 CFU/g). A domestic sample of precursor material was assessed as Unsatisfactory due to the detection of *E. coli* O157:H7. An additional 72 tests were performed on 29 imported precursor material and 7 imported raw ground beef/veal samples from the United States, Australia, New Zealand and Uruguay (Figure 2). Three imported precursor material samples (1 from the United states and 2 from Uruguay) were assessed as Investigative due to the detection of elevated levels of generic *E.coli* (>100CFU/g). No *E. coli* O157:H7 was detected in any of the imported products. All samples were determined to be compliant (Table 2).

Table 2: Assessment of Domestic and Imported Precursor Material and Raw Ground Beef/Veal Samples

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory[a]	% Compliance
Domestic Precursor Material					
E.coli O157:H7	830	829	n/a	1	99.9
Generic *E.coli*[b]	831	820	11	n/a	100
Domestic Raw Ground Beef/ Veal					
E.coli O157:H7	700	700	n/a	0	100
Generic *E.coli*[b]	700	673	27	n/a	100
Total Domestic Samples	**1531**	**1492**	**38**	**1**	**99.9**
Imported Precursor Material					
E.coli O157:H7	29	29	n/a	0	100[c]
Generic *E.coli*[b]	29	26	3	n/a	100[c]
Imported Raw Ground Beef/ Veal					
E.coli O157:H7	7	7	n/a	0	100[c]
Generic *E.coli*[b]	7	7	0	n/a	100[c]
Total Imported Samples	**36**	**33**	**3**	**0**	**100[c]**
Total Samples	**1567**	**1525**	**41**	**1**	**99.9**

[a] n/a = not applicable. The assessment does not apply.
[b] Generic *E. coli* >100 CFU/g detected = Investigative.
[c] Due to small sample/test numbers the significance of the compliance percentage should be interpreted with caution.

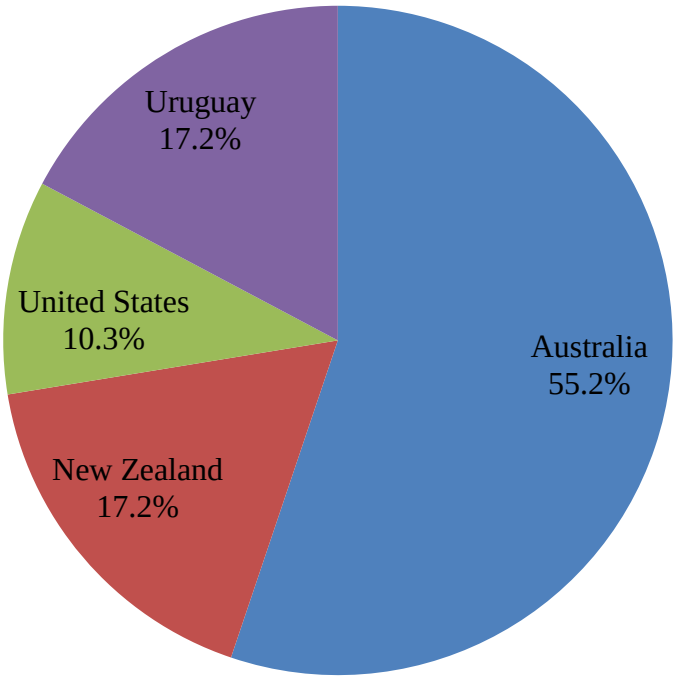

Figure 2. Percent Distribution of Imported Precursor Material and Raw Ground Beef/Veal Analyzed by Country of Origin (n=36)

iii) Raw Mechanically Separated Beef and Finely Textured Beef

Mechanically separated beef and finely textured beef are edible beef products obtained by mechanically separating most of the bone and cartilage from portions of beef from which the bone and cartilage have not been previously removed. Bovine Spongiform Encephalopathy (BSE), more commonly known as Mad Cow Disease, is a progressive, degenerative neurological disease. The BSE prion is also able to infect humans, causing variant Creutzfeld-Jakob Disease (vCJD; FDA, 2012), through human consumption of contaminated meat products from BSE-infected cattle. Since BSE may be present in central nervous system (CNS) tissue of BSE-infected cattle, the spinal cord is removed from beef carcasses and portions of beef prior to their use as material for mechanical separation (CFIA, 2016). Although detection of CNS tissue in a meat product does not necessarily mean the BSE prion is present, the CFIA tests domestic mechanically separated and finely textured beef products to verify the absence of CNS tissue, and consider meat products contaminated with CNS tissue to be adulterated. Thus detection of CNS tissue can be considered a trigger to ensure that the establishment in question is producing this type of product in a manner that meets Canadian standards.

In 2014/15, domestic mechanically separated beef and finely textured beef samples were tested under the NMMP for the presence of CNS tissue. A total of 40 samples were tested, of which one sample was found to contain CNS tissue.

iv) Raw Pork and Wild Boar

Human infection by the parasitic roundworm *Trichinella spiralis* is traditionally associated with ingestion of infected raw and undercooked pork. Because of modern production methods of raising pigs in confinement and high quality feed, *T. spiralis* is rare in Canadian domestic swine populations. However, precautions must remain in effect due to the presence of *T. spiralis* in wildlife and the potential for its sporadic transfer to domestic herds. Government testing for *T. spiralis* in commercial pork and wild boar establishments also supports the Canadian pork industry's continued access to international markets.

Under the NMMP in 2014/15, market hogs, breeder hogs and wild boar were tested for *T. spiralis.* The analytical methodology for testing *T. spiralis* in pork allows for tissues from up to 100 animals to be pooled and submitted for analysis. A total of 308 samples representing 30,181 individual animals were tested under the NMMP. *T. spiralis* was not detected in any of these samples.

v) Meat Species Verification

Meat species verification is conducted to detect adulteration of meat products claiming to be derived from one species with that from another species. In some cases, an operator may fraudulently substitute less expensive types of meat for some or all of the more expensive meat declared on the label. In other cases, adulteration may occur due to improper cleaning of equipment and contamination during processing thus from a food safety perspective, species verification is performed to assess the effectiveness of sanitation procedures within the establishment.

The CFIA performs meat species verification on imported meat products. Products with label claims indicating they are composed of a single or a combination of specific species are tested to verify these label claims. Selected products are those that have been ground to the point where it is impossible to determine through visual examination what species has been used. This includes raw ground meat products, RTE products and other products which have received heat treatment.

In 2014/15, 18 imported meat products, the majority originating from the United States (Figure 3), were tested to verify the meat species claimed. Of these, all were found to be compliant.

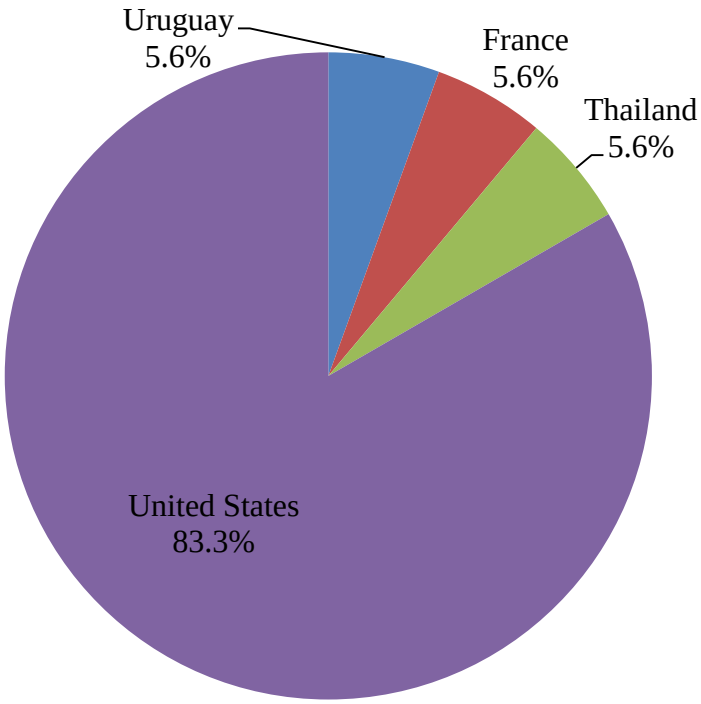

Figure 3. Percent Distribution of Imported Meat Products Tested to Verify the Meat Species Claimed; Analyzed by Country of Origin (n=18)

vi) Environmental Testing in RTE Meat Establishments

Environmental testing is also carried out at domestic federally registered RTE meat product establishments to verify the establishment's ability to control the presence of *Listeria* spp. within the processing environment. Surfaces within the RTE meat product establishments are swabbed during production, and the swabs are combined and tested for *Listeria* spp. If *Listeria* spp. are detected in an environmental sample, the sample is further tested to determine if *L. monocytogenes* is present.

In 2014/15, 980 environmental samples representing approximately 9,800 food contact surfaces from 207 domestic federally registered establishments producing RTE meat products were tested for *Listeria* spp. and *L. monocytogenes* under the NMMP. Thirteen of the samples (1.3 %) were assessed as Investigative due to the detection of *Listeria* spp. *L. monocytogenes*, however, was not detected in any of these samples, thus 100% of these samples were determined to be compliant.

vii) Compliance History

The historical compliance levels of domestic and imported red meat and poultry products tested under the NMMP between April 1, 2011 and March 31, 2015 are summarized in Table 3. Compliance levels

observed in RTE meat products, precursor materials and raw ground beef/veal, raw pork and wild boar, and in environmental samples were consistent over the years.

Table 3: Historical percent compliance and number of samples (n) of Red Meat and Poultry Products tested under the NMMP

	2014/15	2013/14	2012/13	2011/12
RTE Meat Products	99.7 % (1131)	99.7 % (1189)	99.7 % (1236)	99.5% (1289)
Precursor Materials and Raw Ground Beef/Veal	99.9 % (1567)	100 % (1501)	99.7 % (1816)	99.4 % (892)
Raw Mechanically Separated and Finely Textured Beef	97.5 %[a] (40)	92.1 %[a] (38)	97.5 %[a] (40)	97.4 %[a] (38)
Raw Pork and Wild Boar	100 % (308)	100 % (332)	100 % (338)	100 % (318)
Meat Species verification	100 %[a] (18)	89.5%[a] (19)	100 %[a] (20)	98.1 % (156)
Environmental Testing	100 % (980)	98.7 % (1010)	99.1 % (1004)	99 % (1062)

[a] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

What Were The 2014/15 NMMP Results for Shell Eggs and Egg Products?

i) Shell Eggs

Shell eggs are a potential source of *Salmonella* spp. The risk of illness from consuming *Salmonella* spp. in shell eggs could be increased by the fact that eggs are often consumed raw or undercooked. In Canada, eggs that are exported or traded inter-provincially are graded, sized and packed at egg grading stations registered by the CFIA. *Salmonella* spp. contamination in Canadian shell eggs is rare so instead of testing shell eggs, environmental sampling and testing of egg grading stations for *Salmonella* spp. is performed to determine compliance with Canadian standards (see section iii). Under the NMMP, only imported shell eggs are sampled and tested for *Salmonella* spp.

In 2014/15, a total of 326 imported shell egg samples, all from the United States, were tested under the NMMP. Each sample consisted of 12 eggs thus a total of 3912 eggs were tested. No *Salmonella* spp. was detected, and samples were 100 % compliant.

ii) Egg Products

Egg products include all frozen, liquid, or dried egg products which are subjected to the process of pasteurization. In addition to *Salmonella* spp. associated with shell eggs, other microorganisms may be introduced during the production of egg products.

Under the NMMP in 2014/15, domestic and imported egg products were tested for ACC, coliforms, *L. monocytogenes* and *Salmonella* spp. A total of 1160 tests were performed on 315 domestic egg products, of which 99.7% were compliant (Table 4). One sample of liquid whole egg was assessed as Unsatisfactory as it was found to contain *L. monocytogenes*. In addition, 112 tests were performed on 28 imported egg products, all from the United States. All imported egg product samples were compliant (Table 4).

Table 4: **Assessment of Domestic and Imported Processed Egg Product Samples**

Analysis	# Tests	# Satisfactory	# Investigative[c]	# Unsatisfactory	% Compliance
Domestic[a]					
ACC	265	265	n/a	0	100
Coliforms	265	265	n/a	0	100
L. monocytogenes[b]	315	314	0	1	99.7
Salmonella spp.	315	315	n/a	0	100
Total Domestic Samples	**315**	**314**	**0**	**1**	**99.7**
Imported					
ACC	28	28	n/a	0	100[d]
Coliforms	28	28	n/a	0	100[d]
L. monocytogenes[b]	28	28	0	0	100[d]
Salmonella spp.	28	28	n/a	0	100[d]
Total Imported Samples	**28**	**28**	**0**	**0**	**100[d]**
Total Samples	**343**	**342**	**0**	**1**	**99.7**

[a] The number of domestic samples tested for *L. monocytogenes* and *Salmonella* spp. exceeds the number of samples tested for ACC and coliforms because only these two analyses were performed on product samples taken simultaneously with environmental samples.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.
[c] n/a = not applicable. The assessment (Investigative) does not apply.
[d] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

iii) Environmental Testing in Domestic Shell Egg Grading Stations and Egg Product Processing Establishments

Environmental testing of surfaces and wash water is carried out at domestic federally registered shell egg grading stations and egg product processing establishments to verify the operator systems' ability to control contaminants within the processing environment.

At shell egg grading stations in Canada, eggs are washed, checked for cracks, weighed, sorted and packaged. Within these domestic shell egg grading stations, surfaces from both graded and ungraded product areas within the establishments were swabbed under the NMMP in 2014, and the swabs from each area are combined and tested for *Salmonella* spp. A total of 679 tests for *Salmonella* spp. were performed on 342 combined environmental samples (Table 5), representing approximately 3400 surfaces within the shell egg grading establishments. Of these, eight samples tested positive for *Salmonella* spp. for an overall compliance rate of 97.7%.

Processed egg products are produced at egg product processing establishments in Canada. Within these domestic egg product processing establishments, surfaces in the raw product areas are swabbed and tested for *Salmonella spp*. In addition, finished product areas are swabbed and tested for both *Salmonella* spp. and *Listeria* spp. If *Listeria* spp. are detected, the sample is further tested to determine if *L. monocytogenes* is present. Under the NMMP in 2014/15, 156 tests were performed on 53 environmental samples (Table 5), representing approximately 530 surfaces within the processing establishments. Two of these samples tested positive for *Salmonella* spp. for an overall compliance rate of 96.1%. *Listeria* spp. was detected in one sample, however, the species was not *L. monocytogenes*, therefore, the sample was assessed as Investigative.

Within both domestic shell egg grading stations and domestic egg product processing establishments, wash water environmental samples are also collected and tested for ACC. Although high levels of ACC are not a health concern, their presence may indicate inadequate practices at the establishment to ensure that the microbial quality of the wash water is controlled. Under the NMMP in 2014/15, 321 environmental wash water samples were tested, and 27 of these samples were found to contain high levels of ACC for a 91.6% compliance rate (Table 5).

In total, in 2014/15, 1156 tests were performed on 716 environmental samples with an overall compliance rate of 94.7%.

Table 5: Assessment of Environmental Samples from Domestic Shell Egg Grading Stations and Egg Product Processing Establishments

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Shell Egg Grading Station Environmental Swabs					
Salmonella spp.	679	671	n/a	8	98.8
Total Egg Grading Station Samples	**342**	**334**	**n/a**	**8**	**97.7**
Egg Processing Establishment Environmental Swabs					
L. monocytogenes[b]	51	50	1	0	100
Salmonella spp.	105	103	n/a	2	98.1
Total Egg Processing Samples	**53**	**50**	**1**	**2**	**96.1**
Wash Water Environmental Samples					
ACC	321	294	n/a	27	91.6
Total Environmental Samples	**716**	**678**	**1**	**37**	**94.7**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = *Listeria* spp. detected.

iv) Compliance History

The historical compliance levels and number of samples of domestic and imported shell eggs and egg products tested under the NMMP between April 1, 2011 and March 31, 2015 are summarized in Table 6. Compliance levels for both product and environmental samples were consistent over the years. Compliance levels of samples of shell eggs and egg products were higher than those of environmental samples.

Table 6: Historical percent compliance and number of samples (n) of Shell Eggs and Egg Products tested under the NMMP

	2014/15	2013/14	2012/13	2011/12
Shell Eggs	100 % (326)	100 % (302)	100 % (248)	100 % (315)
Egg Products	99.7 % (343)	99.1 % (329)	100 % (318)	99.1 % (344)
Environmental Testing	94.7 % (716)	95.9 % (760)	95.5 % (758)	95.3 % (764)

What Were The 2014/15 NMMP Results for Dairy Products?

i) Fluid Milk Products

Fluid milk products include all grades of milk, chocolate milk, coffee creams and specialty products. Imported fluid milk represents only about 1% of what is consumed by Canadians (Catford *et al*, 2014); therefore only domestic fluid milk products are tested under the NMMP.

Under the NMMP in 2014/15, fluid milk products at domestic dairy producers were tested for generic *E. coli* and *L. monocytogenes*. A total of 180 tests were performed on 90 domestic fluid milk products (Figure 4), which were 100% compliant (Table 7).

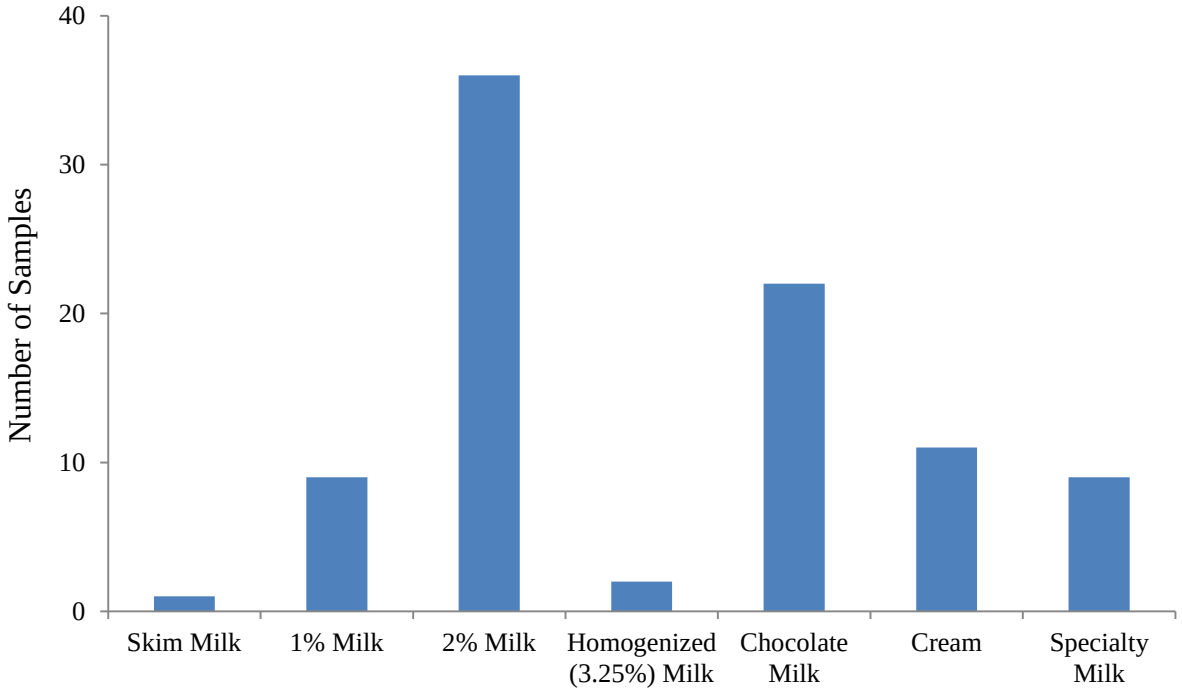

Figure 4. Number and Types of Domestic Fluid Milk Products Sampled

Table 7: Assessment of Domestic Fluid Milk Products

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Generic *E.coli*	90	90	n/a	0	100
L. monocytogenes	90	90	n/a	0	100
Total Samples	**90**	**90**	**n/a**	**0**	**100**

[a] n/a = not applicable. The assessment (Investigative) does not apply.

ii) Cheese Products

Cheese is a manufactured product for which microbial contamination may be introduced during handling and fermentation. A broad range of types of cheeses made from various milk sources, of various moisture contents and using various manufacturing techniques are tested. Because the microbial contaminants in cheese products made from pasteurized milk and those made from raw milk may differ, the sampling results for these two categories of cheese products will be presented separately.

Under the NMMP in 2014/15, domestic and imported cheeses were sampled and tested for generic *E. coli*, *Salmonella* spp., *L. monocytogenes,* and *S. aureus*. In addition, *E. coli* O157:H7 testing was performed on cheeses claimed to be made from raw milk, and phosphatase testing was performed, when deemed appropriate, to verify claims of pasteurization.

A total of 358 domestic pasteurized milk cheeses were subjected to 1517 tests and were determined to be 99.4% compliant (Table 8). The two Unsatisfactory samples were of cheeses made with goat's milk which were positive for *S. aureus* enterotoxins. In addition, 159 samples of imported pasteurized milk cheeses were subjected to 636 tests and found to be 95.6% compliant (Table 8). The largest proportion of these samples was of French and Italian cheeses but numerous other countries were also represented (Figure 5). Of these imported cheeses, a cheese sample from Portugal was Unsatisfactory due to the detection of *L. monocytogenes*, and a cheddar cheese sample from Macedonia was Unsatisfactory due to detection of a high level of generic *E. coli*. Two samples of fresh cheeses from Italy were Unsatisfactory due to high levels of generic *E. coli*. One sample of fresh cheese from Italy was Unsatisfactory for both high levels of generic *E. coli* and *S. aureus*. An additional 2 samples of fresh cheese from Italy were Unsatisfactory for both high levels of generic *E. coli* and *L. monocytogenes*.

Table 8: Assessment of Domestic and Imported Pasteurized Milk Cheeses

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Domestic Pasteurized Milk Cheese					
Generic *E. coli*	358	358	n/a	0	100
Salmonella spp.	358	358	n/a	0	100
L. monocytogenes[b]	358	358	0	0	100
S. aureus	358	358	n/a	0	100
S. aureus enterotoxins	84	82	n/a	2	97.6
Phosphatase	1	1	n/a	0	100[c]
Total Domestic Samples	**358**	**356**	**0**	**2**	**99.4**
Imported Pasteurized Milk Cheese					
Generic *E. coli*	159	153	n/a	6	96.2
Salmonella spp.	159	159	n/a	0	100
L. monocytogenes[b]	159	156	0	3	98.1
S. aureus	159	158	n/a	1	99.4
Phosphatase	0	0	n/a	0	n/a
Total Imported Samples	**159**	**152**	**0**	**7**	**95.6**
Total Samples	**517**	**508**	**0**	**9**	**98.3**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product..

[c] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

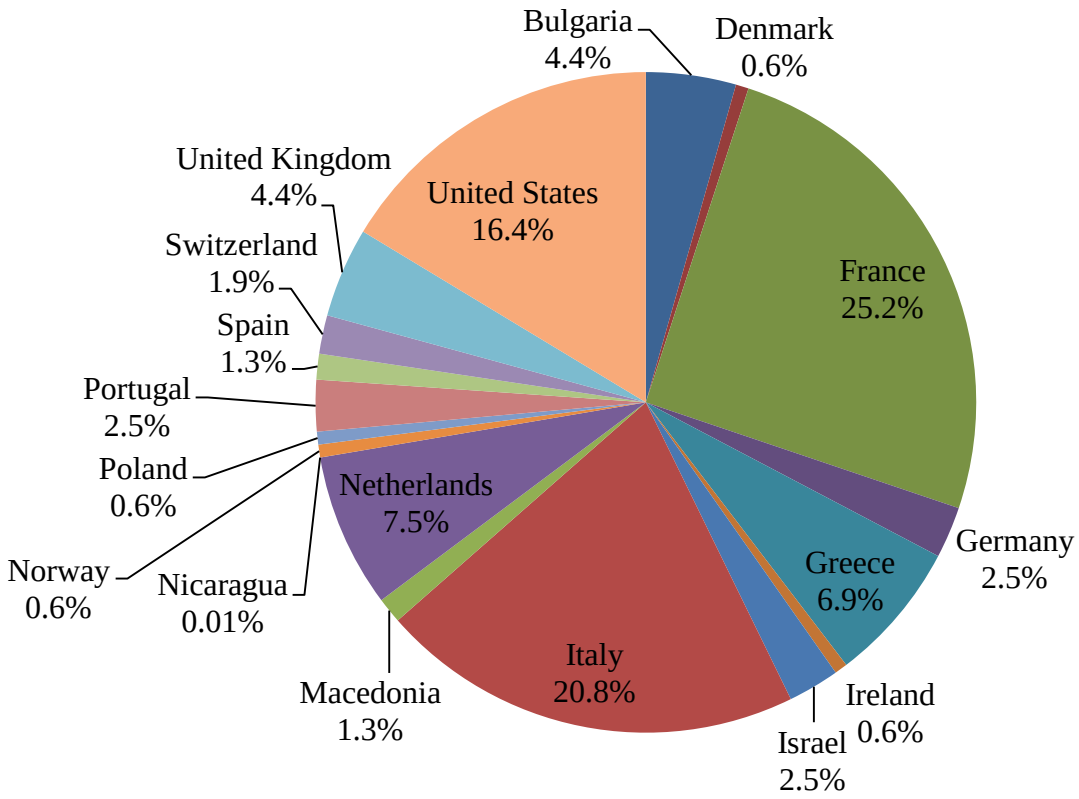

Figure 5. Percent Distribution of Imported Pasteurized Milk Cheeses Analyzed by Country of Origin (n=159)

Under the NMMP in 2014/15, 251 tests were performed on 48 domestic cheeses made with raw milk, which were 100% compliant (Table 9). In addition, 121 imported raw milk cheese samples were subjected to 605 tests and assessed to be 95.9% compliant. The largest proportion of the imported cheeses sampled was from France but cheeses from numerous other countries were also tested (Figure 6). Three samples of cheeses from France were Unsatisfactory due to high levels of *S. aureus*. One sample of cheese from France was Unsatisfactory due to a high level of generic *E. coli*, a high level of *S. aureus*, and the detection of *Salmonella* spp. One sample of cheese from Italy was Unsatisfactory due to a high level of generic *E. coli* and the detection of *L. monocytogenes*

Table 9: Assessment of Domestic and Imported Raw Milk Cheeses

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Domestic Raw Milk Cheese					
Generic *E. coli*	48	48	n/a	0	100[c]
E. coli O157:H7	45	45	n/a	0	100[c]
Salmonella spp.	48	48	n/a	0	100[c]
L. monocytogenes[b]	48	48	0	0	100[c]
S. aureus	48	48	n/a	0	100[c]
S. aureus enterotoxins	14	14	n/a	0	100[c]
Total Domestic Samples	**48**	**48**	**0**	**0**	**100[c]**
Imported Raw Milk Cheese					
Generic *E. coli*	121	119	n/a	2	98.3
E. coli O157:H7	121	121	n/a	0	100
Salmonella spp.	121	120	n/a	1	99.2
L. monocytogenes[b]	121	120	0	1	99.2
S. aureus	121	117	n/a	4	96.7
Total Imported Samples	**121**	**116**	**0**	**5**	**95.9**
Total Samples	**169**	**164**	**0**	**5**	**97.0**

[a] n/a = not applicable. The assessment (Investigative) does not apply.

[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.

[c] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

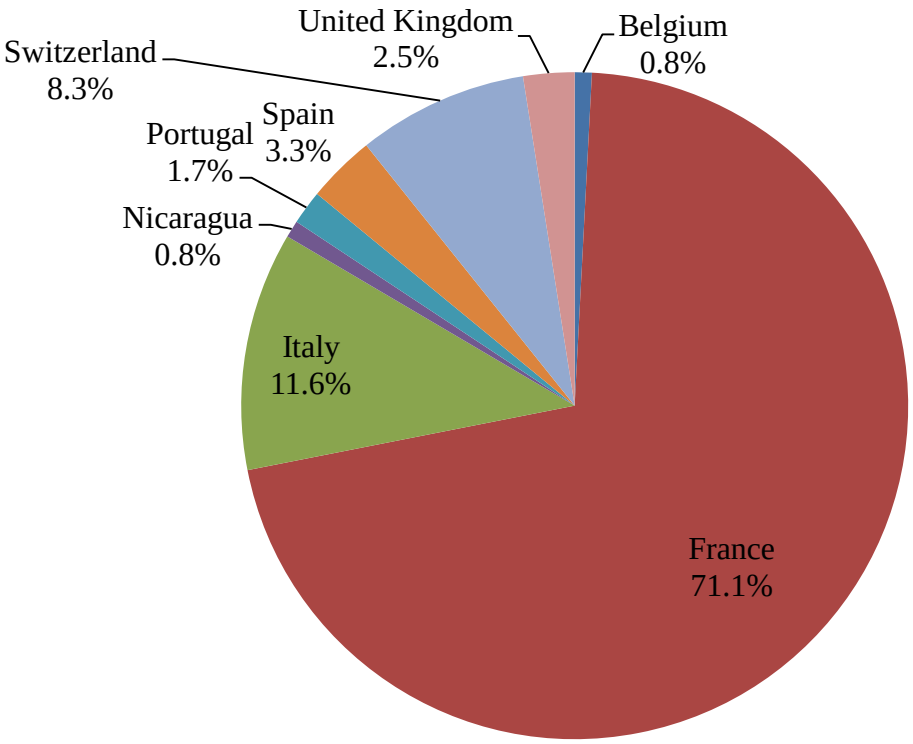

Figure 6. Percent Distribution of Imported Raw Milk Cheeses Analyzed by Country of Origin (n=121)

iii) Environmental Testing in Cheese Manufacturing Establishments

Environmental testing is carried out at domestic federally registered cheese establishments to verify the operator systems' ability to control the presence of *Listeria* spp. within the processing environment. Under the NMMP in 2014/15, surfaces within these establishments are swabbed and the swabs from each area are combined and tested for *Listeria* spp. If *Listeria* spp. are detected in an environmental sample, the sample is further tested to determine if *L. monocytogenes* is present.

A total of 130 environmental samples, representing approximately 1,300 food contact surfaces from 126 domestic federally registered establishments producing cheese products were tested for *Listeria* spp. and were 100% compliant.

v) Compliance History

The historical compliance levels and number of samples of domestic and imported dairy products tested under the NMMP between April 1, 2011 and March 31, 2015 are shown in Table 10. Compliance levels were consistent for all products over the years, with those for raw milk cheeses being lower than those for cheeses made with pasteurized milk.

Table 10: Historical percent compliance and number of samples (n) of Dairy Products tested under the NMMP

	2014/15	2013/14	2012/13	2011/12
Fluid Milk	100 % (90)	100 % (78)	100 % (89)	100 % (95)
Pasteurized Milk Cheese	98.3 % (517)	97.9 % (472)	99 % (505)	98.3 % (463)
Raw Milk Cheese	97.0 % (169)	93.1 % (174)	95.4 % (151)	91.2 % (147)
Environmental Testing	100 % (130)	99.2 % (125)	99.2 % (130)	100 % (52)

What Were The 2014/15 NMMP Results for Fresh and RTE Fresh-Cut Fruits and Vegetables?

i) Fresh Fruits and Ready-To-Eat Fresh-Cut Fruits

Fresh fruits may be contaminated with pathogens. Ready-to-eat fresh-cut fruits may also be exposed to environmental contaminants during processing. These products are often consumed without further processing that might kill or remove pathogens thus if pathogens are present, they are a food safety concern. The types of fresh and fresh-cut fruits tested under the NMMP and the types of microorganisms tested for are based upon known food-hazard combinations. Because the microbial contaminants in fresh and RTE fresh-cut fruits may differ, the sampling results for these two categories of products will be presented separately.

Domestic and imported fresh fruits targeted for sampling under the NMMP in 2014/15 included cantaloupe, papaya, mango and berries (Figure 7). All fresh fruits were tested for generic *E. coli*, *E. coli* O157:H7, *Salmonella* spp. and *Shigella* spp., except for whole cantaloupe which could not be tested for generic *E. coli* due to difficulty extracting this particular microorganism from its netted rind.

In addition, samples of blackberries imported from Guatemala were tested for the parasite *Cyclospora* because in the 1990s, multiple outbreaks of infection due to this parasite were linked to the consumption of berries from Guatemala (Bern *et al*., 1999). Since that time, restrictions on importation of farmed blackberries from Guatemala have been lifted, however, monitoring of this product by the CFIA was put in place to verify the implementation of effective practices on blackberry farms in Guatemala.

A total of 95 tests were performed on 26 whole domestic fresh fruit samples, and 626 tests were performed on 184 imported fresh fruit samples. All samples were compliant (Table 11).

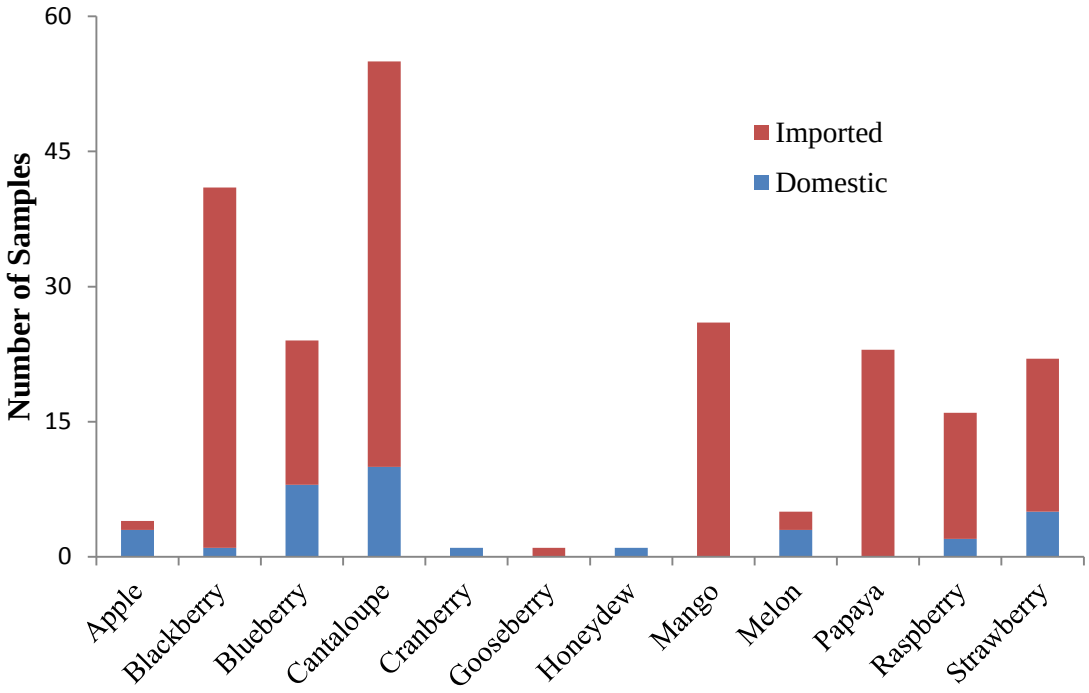

Figure 7. Number and Types of Domestic and Imported Fresh Fruits and Ready-To-Eat Fresh-Cut Fruits Sampled

Table 11: Assessment of Domestic and Imported Fresh Fruit

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory[a]	% Compliance
Domestic					
Generic *E. coli*	17	17	n/a	0	100[b]
E. coli O157:H7	26	26	n/a	0	100[b]
Salmonella spp.	26	26	n/a	0	100[b]
Shigella spp.	26	26	n/a	0	100[b]
Total Domestic Samples	**26**	**26**	**n/a**	**0**	**100[b]**
Imported					
Generic *E. coli*	116	116	n/a	0	100
E. coli O157:H7	163	163	n/a	0	100
Salmonella spp.	163	163	n/a	0	100
Shigella spp.	163	163	n/a	0	100
Cyclospora spp.	21	21	0	n/a	100[b]
Total Imported Samples	**184**	**184**	**n/a**	**0**	**100**
Total Samples	**210**	**210**	**n/a**	**0**	**100**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

Domestic and imported RTE fresh-cut fruits, such as sliced apples and melons, were also sampled under the NMMP in 2014/15 (Figure 7). All RTE fresh-cut fruits were tested for generic *E. coli*, *E. coli* O157:H7, *L. monocytogenes*, *Salmonella* spp. and *Shigella* spp., except for whole cantaloupe which could not be tested for generic *E. coli* due to difficulty extracting this particular microorganism from its netted rind.

A total of 45 tests were performed on 9 domestic RTE fresh-cut fruit samples and one imported RTE fresh-cut fruit sample (Table 12). The domestic and imported RTE fresh-cut fruit samples were 100% compliant.

Table 12: Assessment of Domestic and Imported RTE Fresh-Cut Fruit

Analysis	# Tests	# Satisfactory	# Investigative [a]	# Unsatisfactory	% Compliance
Domestic					
Generic *E. coli*	8	8	n/a	0	100[c]
E. coli O157:H7	8	8	n/a	0	100[c]
L. monocytogenes[b]	8	8	0	0	100[c]
Salmonella spp.	8	8	n/a	0	100[c]
Shigella spp.	8	8	n/a	0	100[c]
Total Domestic Samples	**8**	**8**	**0**	**0**	**100[c]**
Imported					
Generic *E. coli*	1	1	n/a	0	100[c]
E. coli O157:H7	1	1	n/a	0	100[c]
L. monocytogenes[b]	1	1	0	0	100[c]
Salmonella spp.	1	1	n/a	0	100[c]
Shigella spp.	1	1	n/a	0	100[c]
Total Imported Samples	**1**	**1**	**0**	**0**	**100[c]**
Total Samples	**9**	**9**	**0**	**0**	**100[c]**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.
[c] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

The majority of the 185 imported fresh fruit and RTE fresh-cut fruit samples tested in 2014/15 were from the United States and Mexico (Figure 8). These samples were 100% compliant.

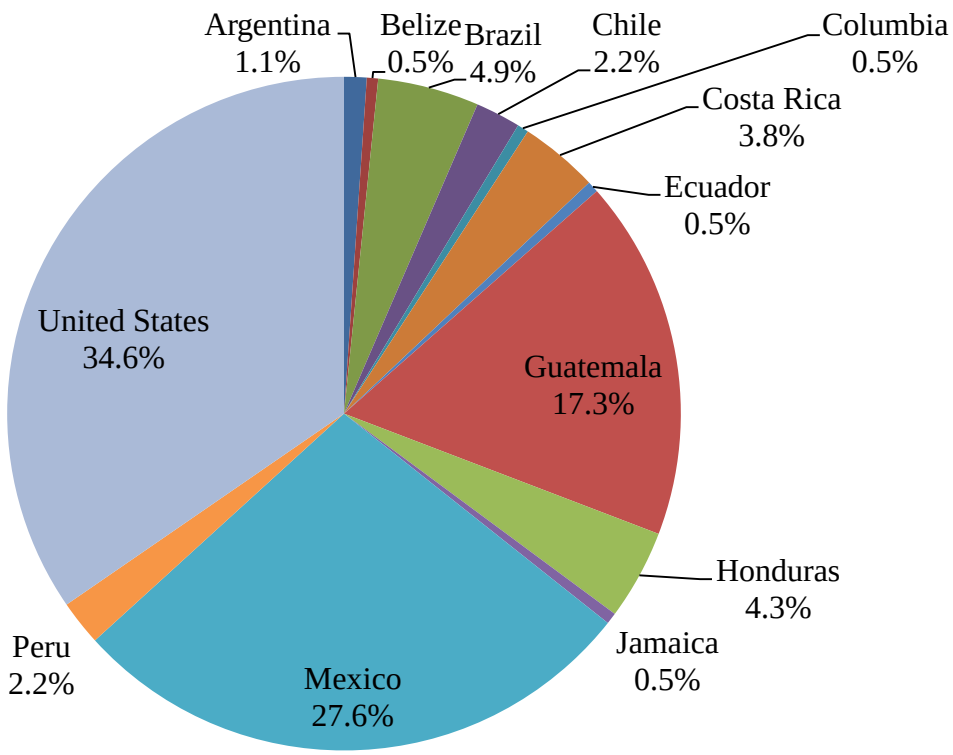

Figure 8. Percent Distribution of Imported Fresh Fruit and RTE Fresh-Cut Fruit Samples Analyzed by Country of Origin (n=185)

ii) Fresh Vegetables and Ready-To-Eat Fresh-Cut Vegetables

Fresh vegetables may be contaminated with pathogens. Ready-to-eat fresh-cut vegetables may also be exposed to environmental contaminants during processing. These products are often consumed without further processing that might kill or remove pathogens thus if pathogens are present, they are a food safety concern. The types of fresh and fresh-cut vegetables tested under the NMMP and the types of microorganisms tested for are based upon known food-hazard combinations. Because the microbial contaminants in fresh and RTE fresh-cut vegetables may differ, the sampling results for these two categories of products will be presented separately.

Domestic and imported fresh vegetables targeted for sampling under the NMMP in 2014/15 included fresh herbs, sprouted seeds and beans, green onions, leafy vegetables, tomatoes and peppers (Figure 9). Fresh vegetables were tested for generic *E. coli*, *E. coli* serotype O157:H7, *Salmonella* spp. and *Shigella* spp., and some types of vegetables were also tested for other serotypes of VTEC (O26, O103, O111 and

O145). In total, 902 tests were performed on 237 domestic fresh vegetable samples, which had an overall compliance rate of 99.6% (Table 13). One sample of bean sprouts was assessed as Unsatisfactory due to high levels of generic *E. coli.* In addition, 1724 tests were performed on 460 imported fresh vegetable samples which had an overall compliance rate of 99.6%. One imported herb sample from Morocco was determined to be Unsatisfactory due to high levels of generic *E. coli*, and one imported spinach sample from the United States was Unsatisfactory due to the detection of *Salmonella* spp.

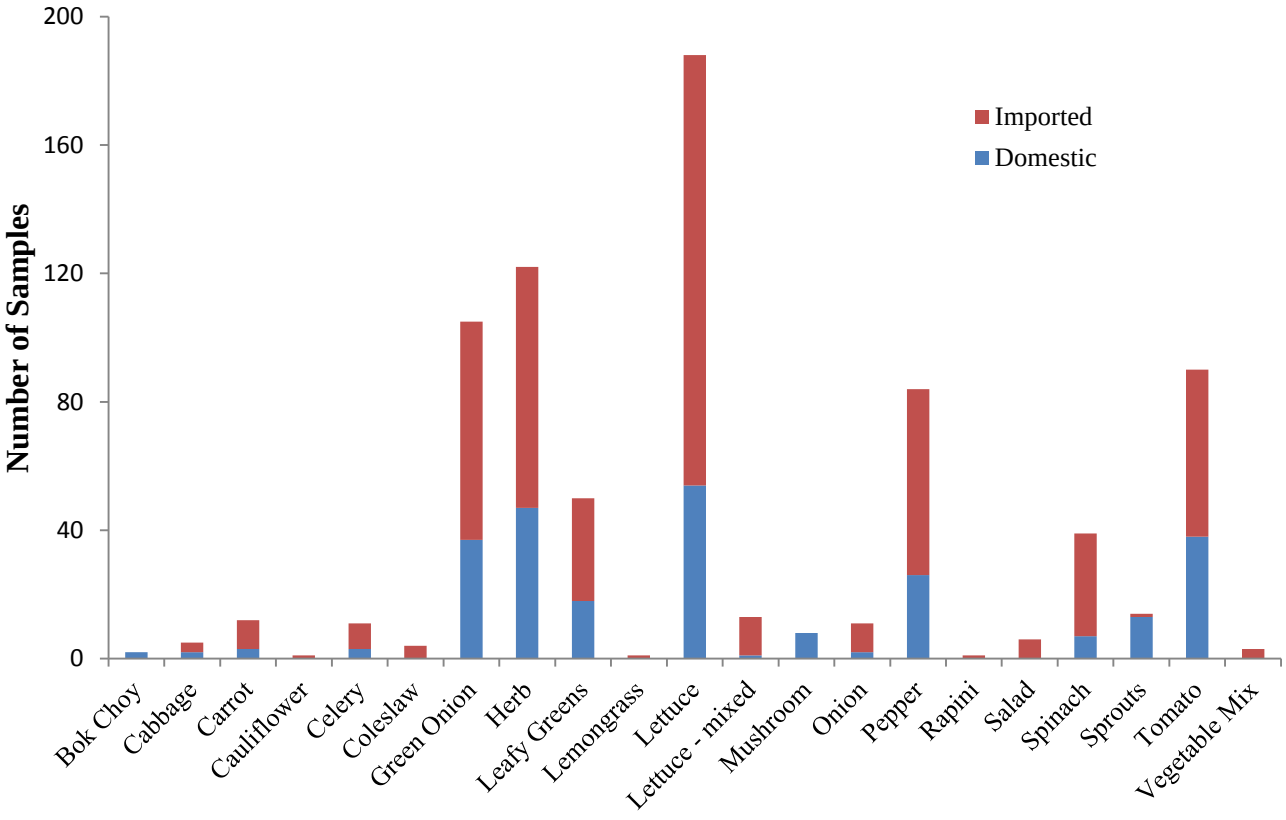

Figure 9. Number and Types of Domestic and Imported Fresh Vegetables and RTE Fresh-Cut Vegetables Sampled

Table 13: Assessment of Domestic and Imported Fresh Vegetables

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory[a]	% Compliance
Domestic					
Generic *E. coli*	237	236	n/a	1	99.6
E. coli O157:H7	214	214	n/a	0	100
Salmonella spp.	214	214	n/a	0	100
Shigella spp.	213	213	n/a	0	100
VTEC	24	24	n/a	0	100[b]
Total Domestic Samples	**237**	**236**	**n/a**	**1**	**99.6**
Imported					
Generic *E. coli*	460	459	n/a	1	99.8
E. coli O157:H7	403	403	n/a	0	100
Salmonella spp.	403	402	n/a	1	99.8
Shigella spp.	401	401	n/a	0	100
VTEC	57	57	0	n/a	100
Total Imported Samples	**460**	**458**	**n/a**	**2**	**99.6**
Total Samples	**697**	**694**	**n/a**	**3**	**99.6**

[a] n/a = not applicable. The assessment does not apply.
[b]Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

A variety of RTE fresh-cut vegetables were also sampled under the NMMP in 2014/15 (Figure 9). Ready-to-eat fresh-cut vegetables were tested for generic *E. coli*, *E. coli* O157:H7, *L. monocytogenes*, *Salmonella* spp. and *Shigella* spp. In total, 112 tests were performed on 23 domestic RTE fresh-cut vegetable samples with an overall compliance rate of 95.7% (Table 14). One sample of mushrooms was determined to be Unsatisfactory due to the detection of *L. monocytogenes*. In addition, 237 tests were performed on 49 imported RTE fresh-cut vegetable samples, which were 100% compliant.

Table 14: Assessment of Domestic and Imported RTE Fresh-Cut Vegetables

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Domestic					
Generic *E. coli*	23	23	n/a	0	100[c]
E. coli O157:H7	23	23	n/a	0	100[c]
L. monocytogenes[b]	20	19	0	1	95.0[c]
Salmonella spp.	23	23	n/a	0	100[c]
Shigella spp.	23	23	n/a	0	100[c]
Total Domestic Samples	**23**	**22**	**0**	**1**	**95.7[c]**
Imported					
Generic *E. coli*	49	49	n/a	0	100[c]
E. coli O157:H7	49	49	n/a	0	100[c]
L. monocytogenes[b]	41	41	0	0	100[c]
Salmonella spp.	49	49	n/a	0	100[c]
Shigella spp.	49	49	n/a	0	100[c]
Total Imported Samples	**49**	**49**	**0**	**0**	**100[c]**
Total Samples	**72**	**71**	**0**	**1**	**98.6**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.
[c] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

The 509 imported fresh vegetables and RTE fresh-cut vegetable samples tested in 2014/15 had an overall compliance of 99.6%. The majority of these originated from the United States and Mexico (Figure 10).

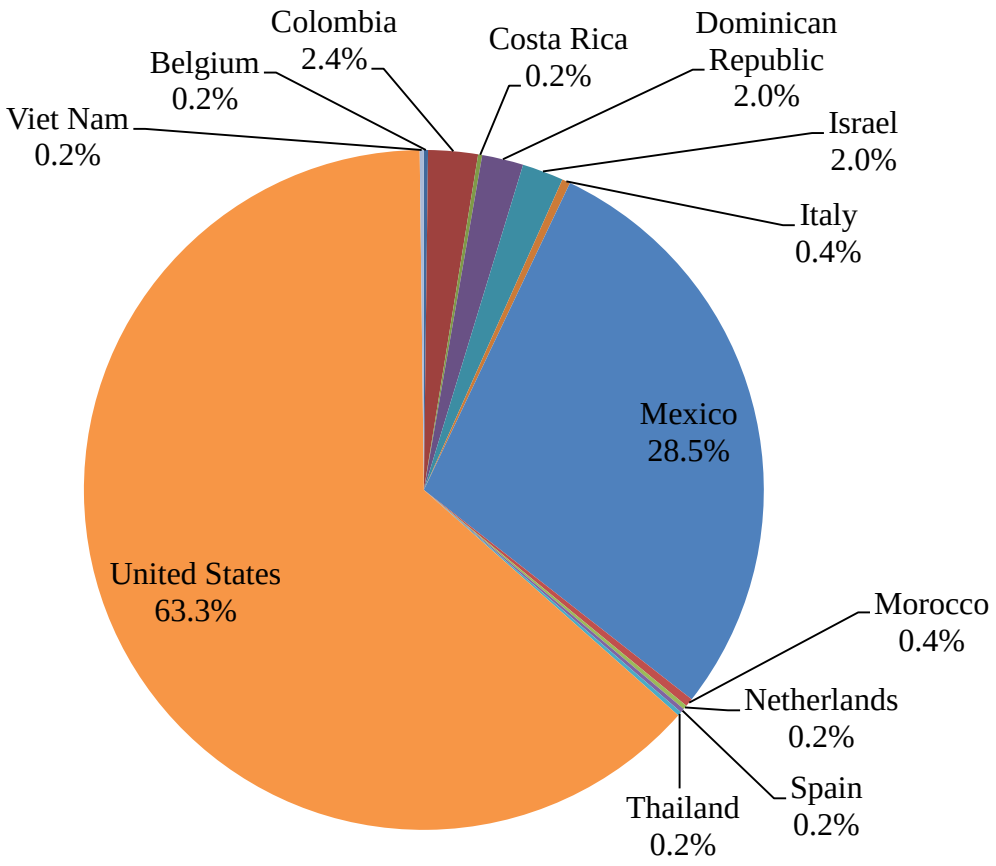

Figure 10. Percent Distribution of Imported Fresh Vegetable and RTE Fresh-Cut Vegetable Samples Analyzed by Country of Origin (n=509)

iii) Compliance History

The historical compliance levels and number of samples of domestic and imported fresh fruit and vegetables and RTE fresh-cut fruit and vegetables tested under the NMMP between April 1, 2011 and March 31, 2015 is shown in Table 15. Compliance levels of samples of these products were consistent over the years, with the exception of the compliance level for fresh-cut fruit in 2013/14, which was 85.7 %. This lower compliance level, however, was the result of one noncompliant sample out of only 7 samples tested.

Table 15: Historical percent compliance and number of samples (n) of Fresh Fruit and Vegetables tested under the NMMP

	2014/15	2013/14	2012/13	2011/12
Fresh Vegetables	99.6 % (697)	99.6 % (693)	99 % (710)	99.1 % (692)
Fresh-Cut Vegetables	98.6 % (72)	98.8 % (85)	98.9 % (90)	100 % (100)
Fresh Fruit	100 % (210)	100 % (197)	100 % (183)	99.5 % (193)
Fresh-Cut Fruit	100 % [a](9)	85.7 % [a](7)	100 %[a] (12)	100 % [a](9)

[a] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

What Were The 2014/15 NMMP Results for Processed Fruit and Vegetable Products?

i) Refrigerated and Shelf-Stable Pickled Products

Pickled products are acidified low-acid foods to which acid(s) are added to decrease their pH to at least 4.6. These foods include, but are not limited to green olives, pickles, pickled eggplant, pickled peppers, pickled artichoke hearts, pickled asparagus. Some pickled products require refrigeration to maintain their shelf-life, while others can be stored at room temperature. In Canada, establishments producing shelf-stable pickled products are inspected by the CFIA to confirm that these products are produced under good manufacturing conditions. Under the NMMP, only imported shelf-stable pickled products are sampled and tested for pH, water activity and salt content to verify that these products are produced in such a way that they do not support the growth of microbial pathogens. According to the Health Canada's Policy on Listeria monocytogenes in Ready-to-Eat Foods (HC, 2011), Category 2B products are not considered to support the growth of *L. monocytogenes*. Refrigerated pickles are considered Category 2B products and are therefore given a lower priority for regulatory oversight and *L. monocytogenes* testing (CFIA, 2013). Therefore, only a small number of domestic and imported refrigerated pickled products are tested under the NMMP, and testing is restricted to *L. monocytogenes*.

In 2014/15, 71 tests were performed on 24 samples of imported shelf-stable pickled products, which were 100% compliant (Table 16). Two refrigerated pickled products, one domestic and one imported, were also tested for *L. monocytogenes* (Table 16). No *L. monocytogenes* was detected. The products originated from a variety of countries (Figure 11).

Table 16: Assessment of Domestic and Imported Pickled Products

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Imported Shelf-Stable Pickled Products					
pH[c]	24	24	0	0	100[b]
Salt content	23	23	n/a	0	100[b]
Water activity[c]	24	24	0	0	100[b]
Total Imported Acidified Samples	**24**	**24**	**0**	**0**	**100**[b]
Domestic Refrigerated Pickled Products					
L. monocytogenes[c]	1	1	0	0	100[b]
Imported Refrigerated Pickled Products					
L. monocytogenes[c]	1	1	0	0	100[b]
Total Samples	**26**	**26**	**0**	**0**	**100**[b]

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.
[c] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.

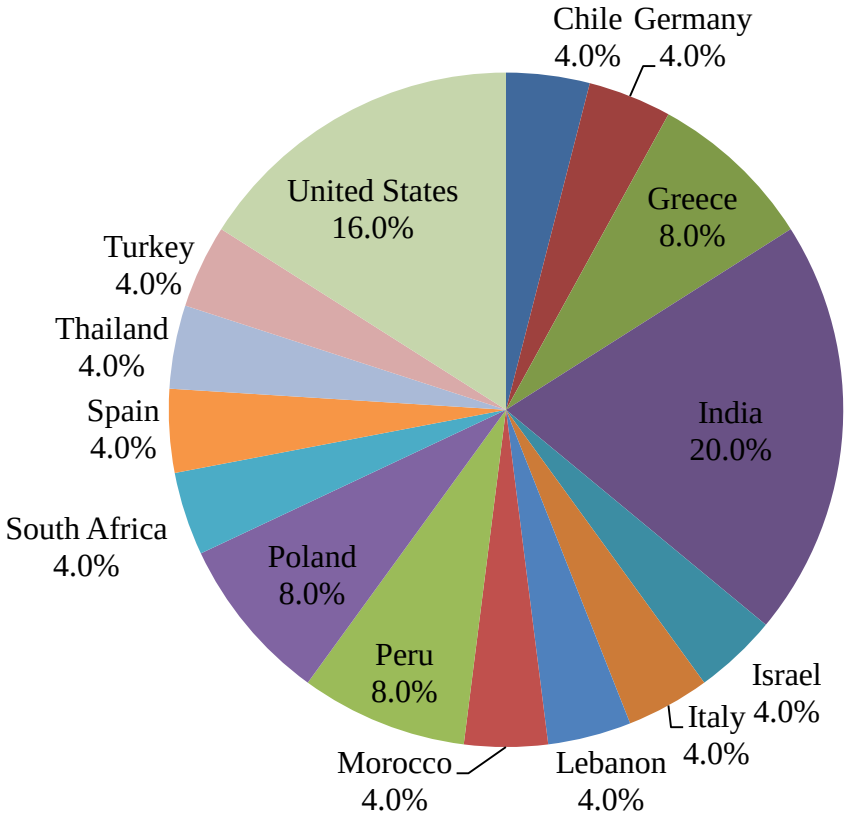

Figure 11. Percent Distribution of Imported Shelf-Stable and Refrigerated Pickled Products Analyzed by Country of Origin (n=25)

ii) Frozen Fruits and Vegetables

Frozen fruits may be contaminated with pathogens. These products are often consumed without further processing that might kill or remove pathogens thus if pathogens are present, they are a food safety concern.

Under the NMMP in 2014/15, all frozen fruit samples were tested for *L. monocytogenes* and *Salmonella* spp. In total, 8 tests were performed on 4 domestic frozen fruit samples and 13 tests were performed on 7 imported frozen fruit samples from a variety of countries (Figure 12). All samples were compliant (Table 17).

Table 17: Assessment of Domestic and Imported Frozen Fruit

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Domestic					
L. monocytogenes[b]	4	4	0	0	100[c]
Salmonella spp.	4	4	n/a	0	100[c]
Total Domestic Samples	**4**	**4**	**n/a**	**0**	**100[c]**
Imported					
L. monocytogenes[b]	7	7	0	0	100[c]
Salmonella spp.	6	6	n/a	0	100[c]
Total Imported Samples	**7**	**7**	**n/a**	**0**	**100[c]**
Total Samples	**11**	**11**	**n/a**	**0**	**100[c]**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* in Category 2 products; Unsatisfactory = *L. monocytogenes* detected in Category 1 products or >100 CFU/g of *L. monocytogenes* in a Category 2 product.
[c] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

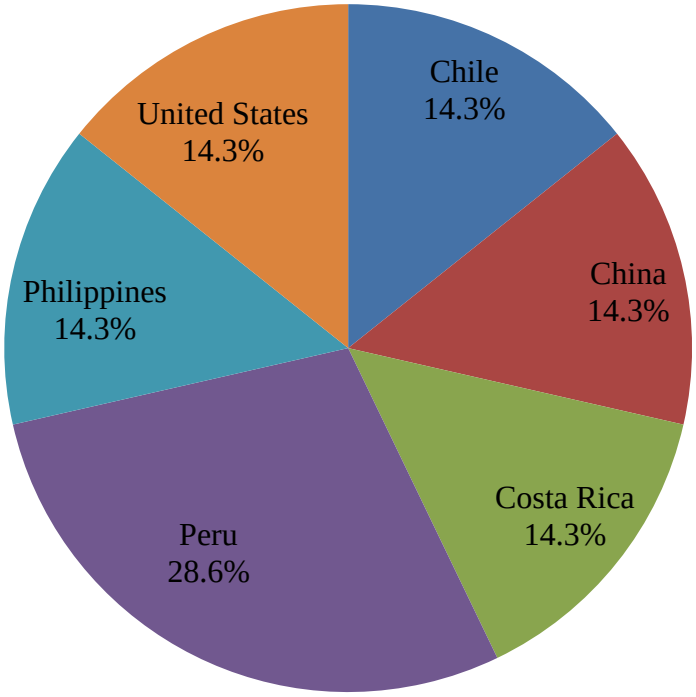

Figure 12. Percent Distribution of Imported Frozen Fruit Analyzed by Country of Origin (n=7)

Typically, frozen vegetables are heated or cooked prior to serving, and are clearly labelled with cooking instructions that, if followed, will kill any pathogens that may be present. Under the NMMP in 2014/15, therefore, frozen vegetables with cooking instructions were tested for the indicator organisms ACC and generic *E. coli* to confirm that these products are produced under good manufacturing conditions but they are not tested for pathogens. Some types of frozen vegetables, however, are not clearly labelled with cooking instructions, for example, frozen spinach. These types of products are not always subjected to cooking prior to consumption and thus may be considered RTE. These products were tested for *L. monocytogenes*.

In total, 38 tests were performed on 19 domestic frozen vegetable samples with cooking instructions and 76 tests were performed on 38 imported frozen vegetable samples with cooking instructions from a variety of countries (Figure 13). All of domestic frozen vegetable samples with cooking instructions were compliant (Table 18). Of the imported frozen vegetables with cooking instructions, 6 were assessed as Unsatisfactory due to high levels of ACC (Table 18), resulting in a compliance rate of 84.6%. These noncompliant samples were cow peas from Fiji, baby okra, fenugreek, and baby pumpkin from India and 2 samples of spinach from Spain.

Five samples of frozen vegetables without cooking instructions (1 domestic and 4 imported) were also tested for *L. monocytogenes.* All samples were compliant (Table 18).

Table 18: Assessment of Domestic and Imported Frozen Vegetables

Analysis	# Tests	# Satisfactory	# Investigative[a]	# Unsatisfactory	% Compliance
Domestic Frozen Vegetables w/ cooking instructions					
ACC	19	19	n/a	0	100[c]
Generic *E. coli*	19	19	n/a	0	100[c]
Total Domestic w/ cooking Samples	**19**	**19**	**n/a**	**0**	**100[c]**
Imported Frozen Vegetables w/ cooking instructions					
ACC	38	32	n/a	6	84.2[c]
Generic *E. coli*	38	38	n/a	0	100[c]
Total Imported w/cooking Samples	**38**	**32**	**n/a**	**6**	**84.2[c]**
Domestic Frozen Vegetables w/out cooking instructions					
L. monocytogenes[b]	1	1	0	0	100[c]
Imported Frozen Vegetables w/out cooking instructions					
L. monocytogenes[b]	4	4	0	0	100[c]
Total Samples	**62**	**56**	**0**	**6**	**90.3**

[a] n/a = not applicable. The assessment (Investigative) does not apply.
[b] Investigative = ≤ 100 CFU/g of *L. monocytogenes* were detected in Category 2 products. Unsatisfactory = >100 CFU/g of *L. monocytogenes* in a Category 2 product.
[c] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

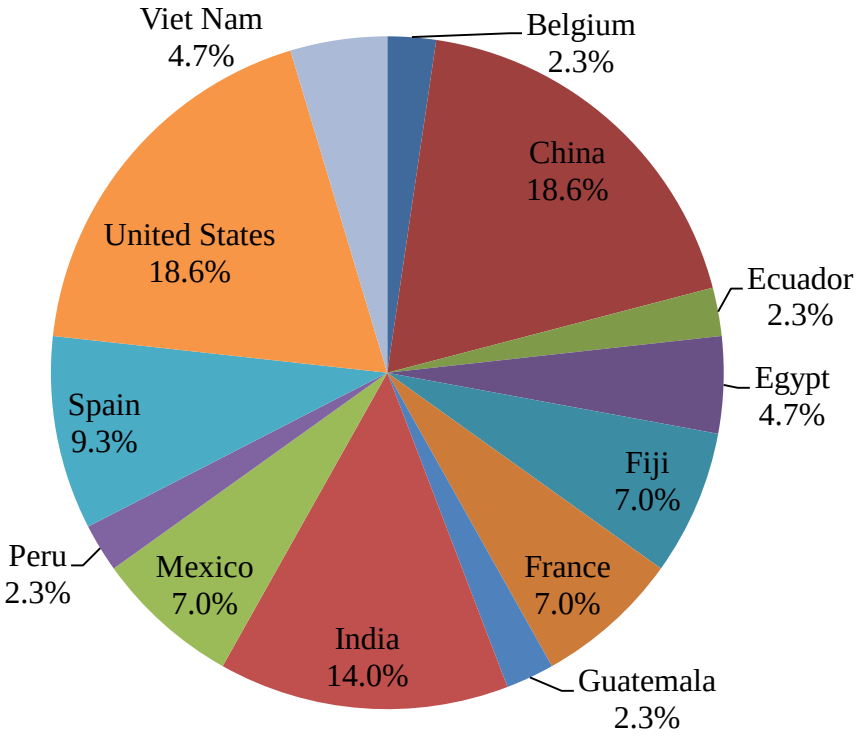

Figure 13. Percent Distribution of Imported Frozen Vegetables (With and Without Cooking Instructions) Analyzed by Country of Origin (n=43)

iii) Compliance History

The historical compliance levels and number of samples of domestic and imported processed fruit and vegetables tested under the NMMP between April 1, 2011 and March 31, 2015 is shown in Table 19. Compliance levels of samples of these products were consistent over the years. Lower compliance levels were observed in frozen vegetables, largely due to elevated levels of ACC in imported frozen vegetables with cooking instructions. Although any pathogens present in these products should be killed by the cooking process, the presence of elevated ACC levels indicates that these products may not have been manufactured under good manufacturing conditions.

Table 19: Historical percent compliance and number of samples (n) of Processed Fruit and Vegetable Products tested under the NMMP

	2014/15	2013/14	2012/13	2011/12
Shelf-Stable Pickled	100 %[a] (24)	100 %[a] (16)	100 %[a] (17)	100 %[a] (22)
Refrigerated Pickled	100 %[a] (2)	100 %[a] (6)	100 %[a] (4)	100 %[a] (8)
Frozen Fruit	100 %[a] (11)	100 %[a] (13)	100 %[a] (13)	100 %[a] (15)
Frozen Vegetables	90.3 % (62)	94.9 % (59)	93.5 % (62)	90.5 % (95)

[a] Due to small sample/test number, the significance of the compliance percentage should be interpreted with caution.

What Do The NMMP Results Mean?

In the 2014/15 fiscal year under the NMMP, 13910 tests were performed on 5589 domestic and imported products. Specifically, 9179 tests were performed on 4038 domestic products and 4731 tests were performed on 1551 imported products. Domestic products were 99.8% compliant whereas imported products were 98.6% compliant. Overall, a 99.5% compliance rate was observed for combined domestic and imported products. In addition to testing food products, the NMMP performed environmental sampling at Canadian federally registered establishments. In 2014/15, there were 2266 tests performed on 1826 environmental samples, which were assessed as 98.0% compliant.

These results indicate that Canada maintains a very high overall level of quality and safety, for both domestic and imported food products and for the environments under which domestic products were produced. In addition, the levels of compliance observed in the 2014/15 fiscal year were relatively consistent with previous years, indicating that this high level of quality and safety is being maintained over time.

A total of 29 product samples and 37 environmental samples were assessed as noncompliant in 2014/15. Of the 29 noncompliant food product samples, 14 were assessed as noncompliant due to the presence of one or more pathogens, while the remaining 15 were assessed as noncompliant due to the presence of high levels of indicator organisms. Of the 37 noncompliant environmental samples, 10 were assessed as noncompliant due to the presence of one or more pathogens, while the remaining 27 were assessed as noncompliant due to the presence of high levels of indicator organisms. The presence of a pathogen in a

food sample represents a direct food hazard. The presence of a pathogen in an environmental sample indicates that pathogens are present in the production environment and that the food product is at a higher risk of being contaminated. The presence of high levels of indicator organisms does not always imply the existence of a food-related health hazard but can expose unsanitary practices and conditions under which pathogens could contaminate food products.

A total of 44 product samples and 14 environmental samples were considered to be compliant but were assessed as Investigative in 2014/15. Of these Investigative samples, only 2 were assessed as such due to the presence of pathogens. These 2 samples were Category 2 products in which *L. monocytogenes* was detected at low levels (<100 CFU/g).

Food safety is a collective responsibility of government, industry and consumers. All food producers/importers are responsible under Canadian law for the safety of the food they produce and distribute. In 2014/15, under the NMMP, the CFIA tested food and environmental samples to verify that they met their obligations. Follow-up actions taken by both industry and the CFIA acted to improve Canadian manufacturing processes and identify imported products that did not meet Canadian standards.

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Appendix: Assessment Criteria for NMMP samples (Fiscal Year 2014-2015)

Assessment criteria (n, c, m and M) are used to assess test results to determine if a sample is Satisfactory, Unsatisfactory or Investigative. For all sample plans, "n" represents the number of sample units (i.e., subsamples) from a single lot of product to be analyzed. Collectively, these samples units represent one sample. "c" represents the maximum allowable number of unacceptable sample units in a 2-class plan (i.e, only two possible results) or marginally acceptable sample units in a 3-class plan. "m" represents a microbiological limit which, in a 2-class plan, separates sample units of acceptable from unacceptable quality or, in a 3-class plan, "m" separates sample units of acceptable quality from those of marginally acceptable quality. "M" represents a microbiological limit which, in a 3-class plan, separates sample units of marginally acceptable quality from those of unacceptable quality.

A Satisfactory result indicates that the sample was considered acceptable by the assessment criteria for all tests. An Unsatisfactory result indicates that the sample was considered unacceptable by the assessment criteria for one or more tests. An Investigative result indicates that, based on the assessment criteria, the sample was acceptable but that manufacturing practices should be investigated further to ensure good manufacturing practices are in place.

Commodity	Analyte	n	c	m	M	Satisfactory	Investigative	Unsatisfactory
Red Meat & Poultry Products and Environmental								
Category 1 RTE Meat Products	*L. monocytogenes*	5	0	0	-	Not Detected	n/a	Detected
Category 2 RTE Meat Products	*L. monocytogenes*	5	0	100	-	Not Detected	≤m/g in all sub sample units tested	>m/g in any sub sample unit tested
RTE Meat Products	*Salmonella* spp.	5	0	0	-	Not Detected	n/a	Detected
RTE Dry & Semi-dry Fermented Meat Products	*E. coli* O157:H7	5	0	0	-	Not Detected	n/a	Detected
Raw Ground Beef/Veal	generic *E. coli*	5	0	10^2	-	≤10^2/g	>10^2/g	n/a
Raw Ground Beef/Veal	*E. coli* O157:H7	5	0	0	-	Not Detected	n/a	Detected
Beef/Veal Trims	generic *E. coli*	60	0	10^2	-	≤10^2/g	>10^2/g	n/a

Commodity	Analyte	n	c	m	M	Satisfactory	Investigative	Unsatisfactory
Beef/Veal Trims	*E. coli* O157:H7	60	0	0	-	Not Detected	n/a	Detected
Mechanically Separated & Finely Textured Beef	CNS	3	n/a			Not Detected	Detected	n/a
Pork Carcasses	*Trichinella spiralis*	100	n/a			Not Detected	n/a	Detected
Raw Meat & RTE Meat Products	Species Verification	1	n/a			Detected as declared or not detected and not declared	n/a	Not detected but declared or detected but not declared
Environmental - RTE Meat Establishments	*Listeria* spp.	10	n/a			Not Detected	*Listeria* spp. other than *L. monocytogenes* detected	*L. monocytogenes* detected
Shell Egg & Processed Egg Products and Environmental								
Shell Eggs	*Salmonella* spp.	12	0	0	-	Not Detected	n/a	Detected
Processed Egg	ACC	5	0	5×10^4	-	≤m/g	n/a	>m/g in one or more sample units
Processed Egg	Coliforms	5	0	10	-	≤m/g	n/a	>m/g in one or more sample units
Processed & Cooked Egg Products	*Salmonella* spp.	10	0	0	-	Not Detected	n/a	Detected
Category 1 RTE Processed Egg Products	*L. monocytogenes*	5	0	0	-	Not Detected	n/a	Detected
Category 2 RTE Processed Egg Products	*L. monocytogenes*	5	0	100	-	Not Detected	≤m/g in all sub sample units tested	>m/g in any sub sample unit tested
Egg Wash Water - Basket Washer	ACC	1	n/d	n/d	10^5	≤10^5/mL	n/a	>10^5 /mL

Commodity	Analyte	n	c	m	M	Satisfactory	Investigative	Unsatisfactory
Egg Wash Water - Recirculating Washer	ACC	3	n/d	n/d	10^5	≤10^5/mL	n/a	>10^5/mL
Environmental - Shell Egg Grading Station (FCS, NFCS)	*Salmonella* spp.	5	0	0	-	Not Detected	n/a	Detected
Environmental - Processed Egg (FCS, NFCS)	*Listeria* spp.	5	0	0	-	Not Detected	*Listeria* spp. other than *L. monocytogenes* detected	*L. monocytogenes* detected
Environmental - Processed Egg (FCS, NFCS)	*Salmonella* spp.	5	0	0	-	Not Detected	n/a	Detected
Dairy Products and Environmental								
Fluid Milk Products	generic *E. coli*	5	0	0	-	Not Detected	n/a	Detected
Category 1 RTE Fluid Milk Products	*L. monocytogenes*	5	0	0	-	Not Detected	n/a	Detected
Cheese (pasteurized milk)	generic *E. coli*	5	2	10^2	$2x10^3$	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if c is exceeded
Cheese (raw milk)	generic *E. coli*	5	2	$5x10^2$	$2x10^3$	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if c is exceeded
Cheese (raw milk)	*E. coli* O157:H7	5	0	0	-	Not Detected	n/a	Detected
Cheese (pasteurized and raw milk)	*Salmonella* spp.	5	0	0	-	Not Detected	n/a	Detected
Category 1 RTE Cheese Products (pasteurized and raw milk)	*L. monocytogenes*	5	0	0	-	Not Detected	n/a	Detected

Commodity	Analyte	n	c	m	M	Satisfactory	Investigative	Unsatisfactory
Category 2 RTE Cheese Products (pasteurized and raw milk)	*L. monocytogenes*	5	0	100	-	Not Detected	≤m/g in all sub sample units tested	>m/g in any sub sample unit tested
Cheese (pasteurized milk)	*S. aureus*	5	2	10^2	10^4	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if c is exceeded
Cheese (raw milk)	*S. aureus*	5	2	10^3	10^4	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if c is exceeded
Cheese (pasteurized and raw milk)	*S. aureus* enterotoxins	5	0	0	-	Not Detected	n/a	Detected
Cheese (pasteurized milk)	Phosphatase	3	2	5ug	10ug	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if C is exceeded
Environmental - Cheese (FCS) & Dairy (FCS, NFCS) Processors	*Listeria* spp.	10	0	0	-	Not Detected	*Listeria* spp. other than *L. monocytogenes* detected	*L. monocytogenes* detected
Fresh Fruits & Vegetables and Environmental								
Fresh and RTE Fresh-Cut Fruits & Vegetables	generic *E. coli*	5	2	10^2	10^3	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if c is exceeded
Fresh and RTE Fresh-Cut Fruits & Vegetables	*E. coli* O157:H7	5	0	0	-	Not Detected	n/a	Detected
Leafy Vegetables, Herbs, Green Onions, Sprouted Seeds & Beans	VTEC	5	0	0	-	Not Detected	Detected	n/a

Commodity	Analyte	n	c	m	M	Satisfactory	Investigative	Unsatisfactory
Fresh and RTE Fresh-Cut Fruits & Vegetables	*Salmonella* spp.	5	0	0	-	Not Detected	n/a	Detected
Fresh and RTE Fresh-Cut Fruits & Vegetables	*Shigella* spp.	5	0	0	-	Not Detected	n/a	Detected
Category 1 RTE Fresh-Cut Fruit & Vegetable Products	*L. monocytogenes*	5	0	0	-	Not Detected	n/a	Detected
Category 2 RTE Fresh-Cut Fruit & Vegetable Products	*L. monocytogenes*	5	0	100	-	Not Detected	≤m/g in all sub sample units tested	>m/g in any sub sample unit tested
Sprouted Seeds & Beans	generic *E. coli*	5	2	10^2	10^3	≤m/g or if c is not exceeded	n/a	>M/g in any one unit or if c is exceeded
Blackberries & Raspberries	*Cyclospora*	5	0	0	-	Not Detected	Detected	n/a
Environmental - Fresh Produce Producers (FCS)	*Listeria* spp.	10	0	0	-	Not Detected	*Listeria* spp. other than *L. mono*	*L. monocytogenes* detected
Processed Products								
Shelf-Stable Pickled Products	a_w	5	1	0.85	0.87	≤m/g or if c is not exceeded	>0.85 but ≤0.87 in more than 1 unit when pH >4.8 in any unit	>0.87 in any unit when pH >4.8 in any unit
Shelf-Stable Pickled Products	pH	5	1	4.6	4.8	≤m/g or if c is not exceeded	>4.6 but ≤4.8 in more than 1 unit when a_w >0.87 in any unit	>4.8 in any unit when a_w >0.87 in any unit
Category 1 Refrigerated Pickled Products	*L. monocytogenes*	5	0	0	-	Not Detected	n/a	Detected

Commodity	Analyte	n	c	m	M	Satisfactory	Investigative	Unsatisfactory
Category 2 Refrigerated Pickled Products	*L. monocytogenes*	5	0	100	-	Not Detected	≤m/g in all sub sample units tested	>m/g in any sub sample unit tested
Frozen Vegetables	ACC	5	0	$2.5x10^5$	-	≤m/g	n/a	>m/g
Frozen Vegetables	generic *E. coli*	5	2	10^2	10^3	≤m/g or if c is not exceeded	n/a	>M/g in one or more sample units or if c is exceeded
Frozen Berries	*Salmonella* spp.	5	0	0	-	Not Detected	n/a	Detected
Frozen Fruit & Vegetable Products (Category 2)	*L. monocytogenes*	5	0	100	-	Not Detected	≤m/g in all sub sample units tested	>m/g in any sub sample unit tested

n/a = not applicable; n/d = not determined