
Notes from the Field: Outbreak of Listeriosis Associated with Consumption of Packaged Salad – United States and Canada, 2015–2016

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In September 2015, PulseNet, the national molecular subtyping network for foodborne disease surveillance, identified a cluster of *Listeria monocytogenes* (*Listeria*) clinical isolates indistinguishable by two-enzyme pulsed-field gel electrophoresis (PFGE) pattern combination and highly related by whole-genome multilocus sequence typing (wgMLST). A case was defined as isolation of *Listeria* with the outbreak PFGE pattern and highly related by wgMLST with an isolation date on or after July 5, 2015, the isolate date of the earliest case in this cluster.

A standardized *Listeria* Initiative questionnaire (1) was used to gather information about foods consumed in the 4 weeks before illness from seven persons identified by November 30, 2015, with isolation dates occurring July 5, 2015–October 30, 2015. This tool did not include leafy green vegetables and failed to identify a common source for the infections. During December 2015 and January 2016, eight new or previously interviewed patients or their surrogates participated in open-ended interviews or provided shopper card records, and all reported consuming leafy greens in the month before illness onset. Among these, seven (88%) reported romaine and six (75%) reported spinach, higher than national food consumption estimates of 47% ($p = 0.022$) and 24% ($p = 0.003$), respectively (2). Six patients (75%) recalled consuming packaged salad, and three patients (38%) who recalled brands reported packaged salad brands processed by Company A.

The Ohio Department of Agriculture obtained packaged salad processed at Company A's Ohio facility from a store during routine sampling. On January 14, 2016, PulseNet analyzed sequence data from *Listeria* isolated from the packaged salad, and the isolate was highly related to the clinical isolates by wgMLST (median allele differences < 10). This molecular finding, combined with the epidemiologic information, led the Food and Drug Administration to initiate an inspection of Company A's Ohio facility on January 16, 2016. Two food samples collected during the inspection yielded *Listeria*, and wgMLST analysis indicated that they were highly related (median allele differences < 10) to clinical and retail product isolates ([Figure](#)).

On January 21, 2016, Company A voluntarily halted production at its Ohio facility and conducted a market withdrawal of all packaged salad products from that facility because of possible *Listeria* contamination.* The market withdrawal included 22 varieties of packaged salads sold under various brand names. Company A issued a voluntary recall of these products on January 27, 2016, which further identified the list of affected products and brand names.†

After the market withdrawal and recall, CDC fielded >450 inquiries about listeriosis from concerned consumers and clinicians, and the CDC outbreak website received >787,000 page views, more views than after any other foodborne illness outbreak to date.⁵

As of March 28, 2016, there were 19 persons meeting the case definition from nine states (Connecticut, Indiana, Massachusetts, Michigan, Missouri, New Jersey, New York, Ohio, and Pennsylvania) with isolation dates through January 31, 2016. All were hospitalized; one died. One illness in a pregnant woman resulted in a preterm live birth. One otherwise healthy child developed meningitis.

The Public Health Agency of Canada investigated 14 cases of listeriosis associated with this outbreak, with onset dates from May 7, 2015 to February 23, 2016 ([3](#)). Six Canadian clinical isolates were compared with U.S. clinical isolates and were highly related by wgMLST. Three cases reported consuming packaged salad processed at the Ohio facility. In January 2016, the Canadian Food Inspection Agency (CFIA) collected 55 packaged salads from stores in Canada representing 12 different products processed at the Ohio facility. CFIA isolated the outbreak strain and issued a food recall warning on January 22, 2016, for all products processed at the Ohio facility and distributed in Canada.¶

The wgMLST analysis identified this listeriosis cluster and provided evidence of the link between contaminated food products and human illness. This allowed timely recall of potentially contaminated food, which might have prevented additional cases of serious illness.

This is the first reported outbreak of listeriosis associated with leafy greens and the eighth reported outbreak of listeriosis associated with fresh produce in the United States; all occurred since 2008 ([4](#)).** It is unclear whether the appearance of these outbreaks might be attributed to improved outbreak detection, changes in consumer behavior, or changes in production and

distribution. Fresh produce processors are advised to review food safety plans and consider incorporating measures to avoid the growth and persistence of *Listeria*.^{††} The *Listeria* Initiative questionnaire has been revised to include additional questions about fresh produce to better identify produce vehicles of *Listeria*.

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* Food and Drug Administration. Recall—firm press release: Dole Fresh Vegetables announces voluntary withdrawal for salads. <http://www.fda.gov/Safety/Recalls/ucm482822.htm> (<http://www.fda.gov/Safety/Recalls/ucm482822.htm>) .

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† Food and Drug Administration. What you need to know about our voluntary recall of salads processed at the Springfield, Ohio facility. <http://www.fda.gov/Safety/Recalls/ucm483588.htm> (<http://www.fda.gov/Safety/Recalls/ucm483588.htm>) .

[§] CDC. Multistate outbreak of listeriosis linked to packaged salads produced at Springfield, Ohio Dole processing facility. <http://www.cdc.gov/listeria/outbreaks/bagged-salads-01-16/> (<http://www.cdc.gov/listeria/outbreaks/bagged-salads-01-16/>).

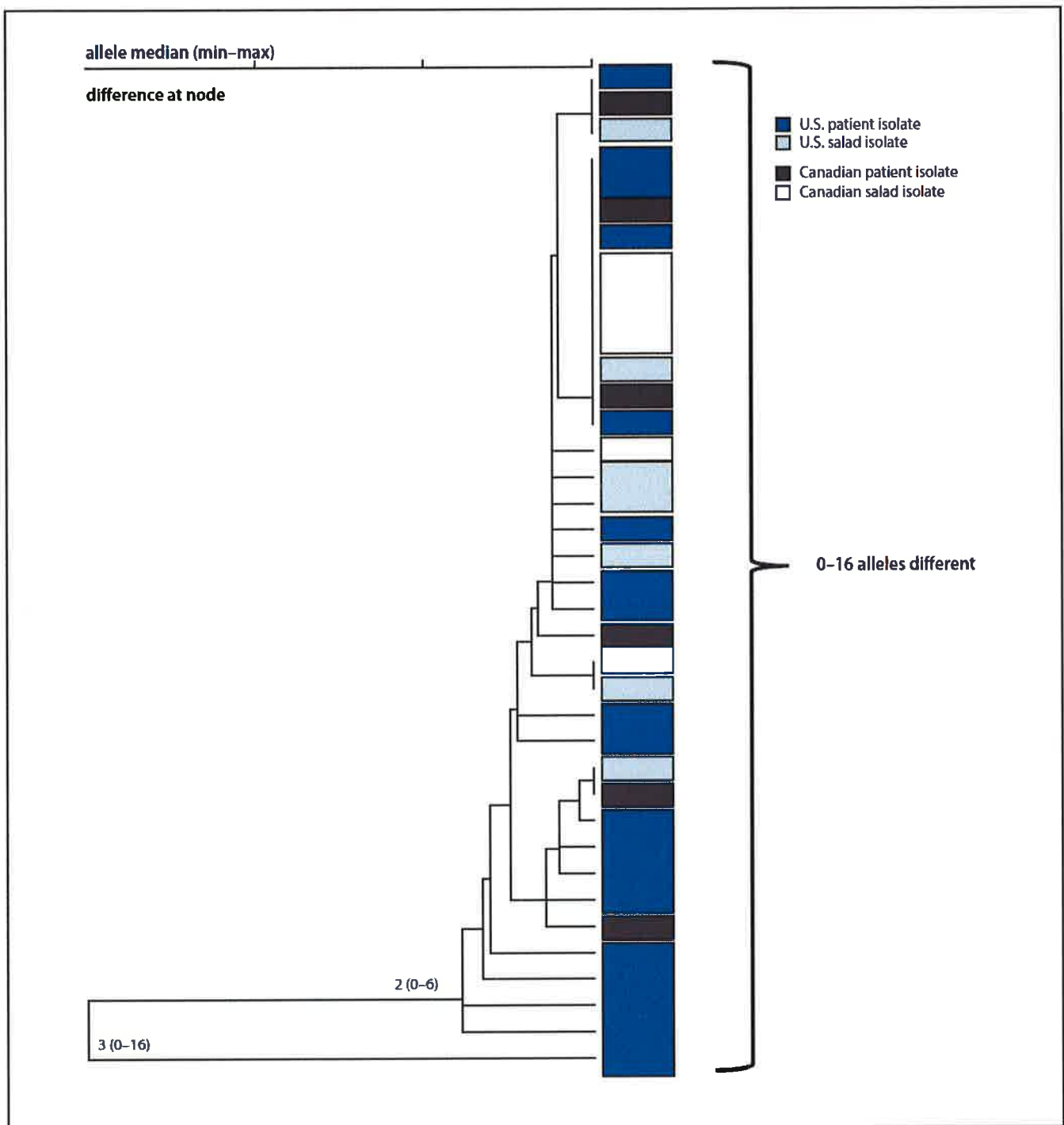
[¶] CFIA. Food recall warning—certain Dole brand pre-packaged chopped salads, salad blends and kits and leafy greens and certain PC Organics brand leafy greens recalled due to *Listeria monocytogenes*. <http://www.inspection.gc.ca/about-the-cfia/newsroom/food-recall-warnings/complete-listing/2016-01-22c/eng/1453522915084/1453522920123> (<http://www.inspection.gc.ca/about-the-cfia/newsroom/food-recall-warnings/complete-listing/2016-01-22c/eng/1453522915084/1453522920123>) .

^{**} CDC. Foodborne Outbreak Online Database (FOOD Tool). <http://wwwn.cdc.gov/foodborneoutbreaks/> (<http://wwwn.cdc.gov/foodborneoutbreaks/>).

^{††} Food and Drug Administration. FSMA Final Rule for Preventive Controls for Human Food. <http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm334115.htm> (<http://www.fda.gov/Food/GuidanceRegulation/FSMA/ucm334115.htm>) .

FIGURE. Phylogenetic tree by whole-genome multilocus sequence typing (wgMLST) of *Listeria monocytogenes* isolates* from patients and salad products with indistinguishable pulsed-field gel electrophoresis patterns — United States and Canada,[†] July 5, 2015–January 31, 2016

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* By wgMLST, clinical and food isolates from the United States and Canada were closely related because they differed by a median of three alleles, with a range of 0–16 alleles.

† 19 patients from nine U.S. states and six patients from Canada.

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