

**Conference for Food Protection  
2008 Issue Form**

**Internal Number: 022  
Issue: 2008 III-022**

<b>Council Recommendation:</b>	Accepted as Submitted _____	Accepted as Amended _____	No Action _____
<b>Delegate Action:</b>	Accepted _____	Rejected _____	

*All information above the line is for conference use only.*

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**Title:**

Time/Temperature Control for Safety for Cut Leafy Greens

**Issue you would like the Conference to consider:**

Research shows that cut lettuces and other cut leafy greens support the growth of pathogens commonly associated with foodborne illness outbreaks when stored outside of temperature control. Requiring that these foods be stored under refrigeration in retail and foodservice establishments should significantly limit the growth of pathogens that may be present on the product and therefore represents an important step in preventing foodborne illness in the U.S.

**Public Health Significance:**

Note: Where reference numbers are noted in parentheses, see Attachment A

Since 1996, at least 21 confirmed foodborne illness outbreaks have been attributed to consumption of various types of leafy greens (11) that were contaminated prior to the point of service, most likely on the farm. Additional outbreaks are likely to have occurred due to contamination at the point of service. These illnesses can produce severe gastrointestinal distress long-term chronic sequelae, and death. (Attachment B).

Cut leafy greens with a pH of 5.8 or more (1, 4) and  $a_w$  of 0.99 or more (3) have been shown to support pathogenic growth (1, 2, 3, 7, 8, 9, 12) once the product is cut and internal liquid and nutrients are made available to pathogens that may be present.

Laboratory studies have shown that storage of cut leafy greens at 41°F or less effectively limits the growth of pathogens such as *E. coli* O157:H7, *Salmonella spp.* and *Listeria monocytogenes*. Refrigeration of cut leafy greens at 5°C/41°F or less has been shown to limit the growth of *E. coli* O157:H7 as well as promote a general die-off of the pathogens over time (1, 2, 3, 8, 9).

It is common industry practice to refrigerate cut produce to preserve the crispness and to prevent browning, decomposition and sliminess from spoilage organisms. Changing state and local retail food codes and ordinances to mandate that cut leafy greens be stored and displayed at a temperature of 41°F or less in retail and foodservice establishments will help to ensure that these products are not held for extended periods within the lower temperature limit of growth for *E. coli* O157:H7 (8°C/46.4°F), *Salmonella* spp. (7°C/44.6°F) and other pathogens identified in illness outbreaks associated with lettuce and other leafy greens. Storage at temperatures above 41°F can negate pathogen reductions achieved from prior washing in cold or warm chlorinated water and allow surviving pathogens to multiply.

In the FDA *Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables*, subparagraph VII (C)(3) and paragraph VIII (D), FDA recommends that finished, fresh-cut produce be held, stored, transported, and displayed at 40°F or lower. (5)

Once the pathogens have been in contact with the leaves, they are able to attach to the leaves, especially at cut surfaces and openings such as stomatal pores. Under adverse conditions, *E. coli* O157:H7, *Salmonella* and *Listeria monocytogenes* can also form biofilms for additional protection. Contamination, which may occur anywhere from the field to the kitchen (6), cannot be effectively removed from the leaves once the pathogen has attached or internalized through cut surfaces. For example, studies have shown that once *E. coli* O157:H7 becomes internalized in cuts in the plant tissue, it becomes inaccessible to chlorinated or other chemical washes and can survive the disinfection or sanitizing process (13). Other controls such as different atmospheres (anaerobic or other gases) or competing microflora (Standard Plate Count (SPC) of 5-8 million are normal) have not been proven effective at preventing pathogenic growth on cut leafy greens (7).

### **Recommended Solution: The Conference recommends...:**

1. The FDA Food Code and state and local regulations applicable to retail and foodservice establishments be amended to include cut leafy greens among the foods that require time/temperature control for safety, including cold holding at 41°F or less; and

2. The intended meaning of the term "cut leafy greens" should be made clear by including appropriate definitions in Chapter 1 of the FDA Food Code. For the purposes of this recommendation, the term "cut leafy greens" refers to 1) leafy greens that are considered "fresh-cut produce" as defined in FDA *Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables* (5), and 2) fresh leafy greens whose leaves have been cut, shredded, sliced, chopped or torn at the point of sale or service. For the purposes of this recommendation the term "leafy greens" refers only to iceberg lettuce, romaine lettuce, leaf lettuce, butter lettuce, baby leaf lettuce (i.e., immature lettuce or leafy greens), escarole, endive, spring mix, spinach, cabbage, kale, arugula and chard. The term "leafy greens" does not include herbs such as cilantro or parsley.

### **Submitter Information:**

Name: Glenda R. Lewis, Team Leader  
Organization: FDA/CFSAN/Retail Food Protection Team  
Address: 5100 Paint Branch Parkway, HFS-320  
City/State/Zip: College Park, Maryland 20740  
Telephone: 301-436-2150 Fax: 301-436-2672  
E-mail: Glenda.Lewis@fda.hhs.gov

**Attachments:**

- "Attachment A - References"
- "Attachment B - Outbreaks and Illnesses Associated with Leafy Greens"

*It is the policy of the Conference for Food Protection to not accept Issues that would endorse a brand name or a commercial proprietary process.*

## Time/Temperature Control for Safety for Cut Lettuce and Leafy Greens Issue

### Attachment A - References

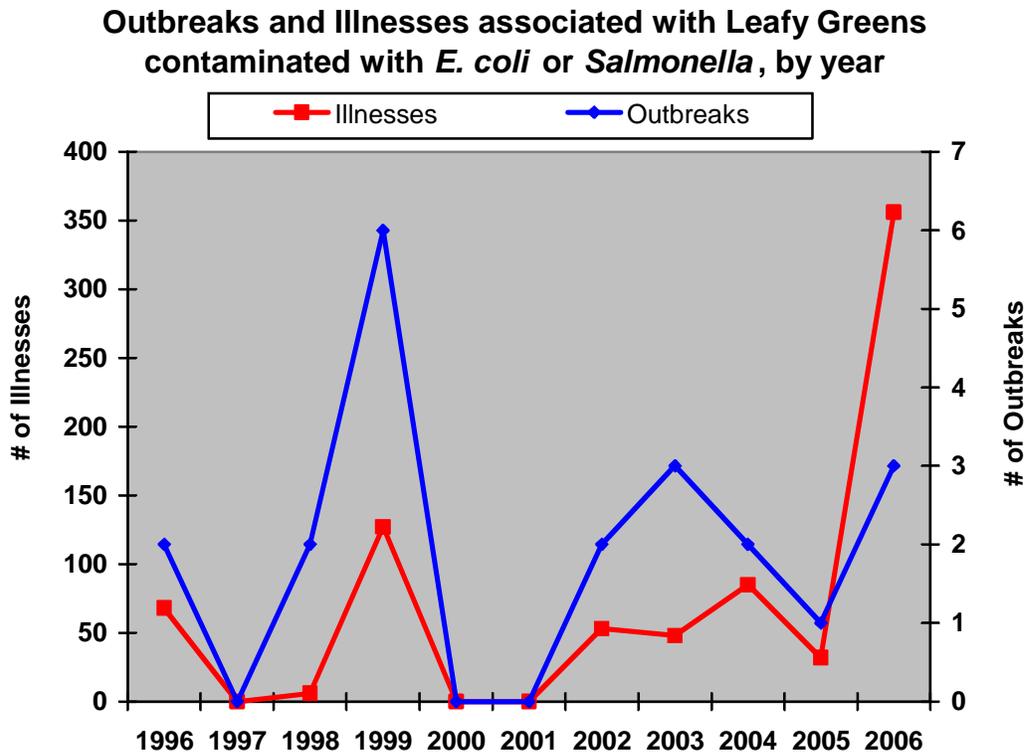
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4. FDA Foodborne Pathogenic Microorganisms and Natural Toxins Handbook, *Escherichia coli* O157:H7, available at <http://www.cfsan.fda.gov/~mow/chap15.html>.
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11. State of California, Department of Food and Agriculture, Marketing Branch. California Leafy Green Products Handler Marketing Agreement, Article II Definition of "Leafy Green Products. With Amendments Effective Through July 16, 2007. Available at <http://www.caleafygreens.ca.gov/applications/DocumentLibraryManager/upload/LGMA%20MARKETING%20AGREEMENT.pdf>.
12. USDA/AMS Microbiological Data Program Progress Update and 2005 Data Summary, available at <http://www.ams.usda.gov/science/mpo/MDPSumm05.pdf>
13. Wachtel, M.R. and A.O. Charkowski. 2002. Cross-Contamination of Lettuce with *Escherichia coli* O157:H7, *J. Food Protect.* (65)3: 463-470.

## Time/Temperature Control for Safety for Cut Lettuce and Leafy Greens

### Attachment B- Outbreaks & Illnesses Associated with Leafy Greens Contaminated with *E. coli* or *Salmonella*, 1996-2006\*

\* Source: CFSAN Outbreak Surveillance Database

- Types of leafy greens associated with these outbreaks/illnesses:
  - Mesclun lettuce
  - Lettuce
  - Romaine lettuce
  - Spinach
  - Cabbage (coleslaw outbreak associated with contaminated cabbage – 22 ill)
- # of outbreaks associated with Leafy Greens, 1996-2006: 21
- # of illnesses associated with Leafy Greens, 1996-2006: 775
- # of deaths associated with Leafy Greens, 1996-2006: 5
- *E. coli* O157:H7 was associated with all of the outbreaks and illnesses of leafy greens except for one lettuce outbreak (79 ill) due to *Salmonella* Newport in 2004.



## 2006 Leafy Green Outbreaks:

### 1. Spinach and *E. coli* O157:H7

Outcome	N (%)
Total ill	205
Hospitalized	104 (51)
HUS	31 (15)
Death	3 (1)

State	Number of Confirmed Cases
AZ	8
CA	2
CO	1
CT	3
ID	8
IL	2
IN	10
KY	8
MD	5
ME	3
MI	4
MN	2
NE	11
NM	5
NV	2
NY	11
OH	26
OR	6
PA	10
TN	1
UT	19
VA	2
WA	3
WI	50
WV	1
WY	1
<b>Total</b>	<b>204</b>

### 2. Lettuce and *E. coli* O157:H7 (Facility A)

Outcome	N (%)
Total ill	71
Hospitalized	53 (75)
HUS	8 (11)
Death	3 (1)

State	Number of Confirmed Cases
DE	2
NJ	33
NY	22
PA	13
SC	1
<b>Total</b>	<b>71</b>

3. Lettuce and *E. coli* O157:H7 (Facility B)

Outcome	N (%)
Total ill	81
Hospitalized	26 (32)
HUS	1 (1)

#### Data Limitations:

The CFSAN Outbreak Surveillance Database was developed by the Epidemiology Team and the Emergency Coordination and Response Team to capture and retrieve data on foodborne and cosmetic illnesses associated with FDA-regulated products. **The following caveats are to be cited when providing data from the CFSAN Outbreak Surveillance database:**

1. The data only represent those outbreaks and illnesses associated with FDA-regulated foods and cosmetics.
2. The data do not contain information on outbreaks/illnesses where the point of contamination is the retail food setting or home.
3. The data do not include illnesses transmitted from person-to-person.
4. Illness data represent only the number of illnesses reported to CDC, FDA, and state/local health departments in association with an outbreak. The data do not include illnesses that may have occurred but were not reported, sporadic cases of illness, and illnesses not associated with a food vehicle.
5. Information on outbreaks/illness reported prior to 2004 has been compiled from paper records; information on outbreaks/illnesses since 2004 has been entered into the CFSAN Outbreak Surveillance Database.
6. The outbreaks tracked by FDA are a subset of all the outbreaks tracked by CDC. CDC also tracks outbreaks/illnesses where the point of contamination is the retail food setting or the home. Due to lags in reporting of illnesses, some differences in numerical tallies may exist between FDA and CDC data.