WHAT’S NEW IN EHS-NET RESEARCH?

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Leafy Green Study
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Cooling Study
- Lead Authors: Danny Ripley (TN) and Laura Brown (CDC)

Upcoming Studies

MN Specific Raw Fish Study

***Unpublished Data: Not for Distribution***
Leafy-Greens Study

The slow food movement is about taking time to appreciate what we eat—I grew this salad—see how fresh it is.

It's too fresh...

...You should have been slower to wash it...
Leafy Greens Study - Background

- Multiple foodborne illness outbreaks associated with eating leafy greens.
- Contamination can occur in the field, during harvesting, or during processing.
- Significant risk that leafy greens (LG) eaten in restaurants may result in foodborne illnesses.

***Unpublished Data: Not for Distribution***
Leafy Greens Study - Background

- CDC’s Electronic Foodborne Reporting System (EFORS):
  - 2004-2008: 127 outbreaks
  - 106 pathogen identified outbreaks
    - 80 of 106 (76%) were Norovirus outbreaks
    - 22 of 106 (21%) were bacterial pathogens
  - 74 (63%) of the outbreaks identified a restaurant or deli as where the implicated food was eaten.

***Unpublished Data: Not for Distribution***
Data were collected before 2009 FDA Model Food Code was issued and before FDA guidance documents on LG handling were created.

Sample of 439 restaurants (MN, CA, CT, NY, GA, IA, OR, RI, TN)

Manager interview

Observation portion

***Unpublished Data: Not for Distribution***
“Leafy greens” included 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. Herbs such as cilantro and parsley were not included.
Managers reported that 78% (330 of 422) of LG shipments received were transported in a refrigerated truck or vehicle.

93% (409 of 438) of managers reported keeping purchase records for shipments.

Data collectors took temperatures of 37 LG shipments in receiving:

- 73% (27) of these shipments were received at 45°F or less.
Most manager (65%, 265 of 411) indicated their restaurant had rejected a shipment of LG because of:

- Appearance (61%, 257)
- Product moisture (17%, 70)
- Bad aroma or taste (7%, 29)
- Required label missing (5%, 22)
- Product out of temp. (5%, 20)

***Unpublished Data: Not for Distribution***
Training

- 81% (354 of 435) of managers reported receiving instruction or training on how to handle LG
  - On the job training 44% (194)
  - Food safety certification 44% (194)

- 84% (366 of 435) of managers indicated that foodworkers in their establishments had training on handling LG
  - Most on the job 79% (345)

***Unpublished Data: Not for Distribution***
Storage

- 8% (64 of 777) of LG in walk-in coolers were measured at a temp. above 45°F
- More than 22% (79 of 355) of LG in reach-in coolers were measured at a temp. above 45°F
- LG were predominantly stored in plastic bag or plastic wrap-rarely stored in water.
- Managers at 65% (285 of 439) of restaurants indicated the restaurant had a policy on how long LG were kept in storage.
  - Majority of LG were reported to be stored for max. of 2-7 days.

***Unpublished Data: Not for Distribution***
### Storage

<table>
<thead>
<tr>
<th>Answer</th>
<th>Number of restaurants (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thrown away or composted</td>
<td>351 (80%)</td>
</tr>
<tr>
<td>No policy exists</td>
<td>30 (7%)</td>
</tr>
<tr>
<td>Given away or donated</td>
<td>7 (2%)</td>
</tr>
<tr>
<td>Other (a combination of thrown away, cooked, returned to supplier, and given away)</td>
<td>51 (12%)</td>
</tr>
<tr>
<td>Total</td>
<td>439</td>
</tr>
</tbody>
</table>

Table 5. Responses to the question, "what is done with leafy greens after the maximum time allowed for storage has elapsed?"

***Unpublished Data: Not for Distribution***
73% (319 of 439) of managers indicated LG were washed in the restaurant.
- 77% (463) washed once
- 19% (112) washed twice (did not note when these washes were occurring)

31% (187 of 600) of manager responses indicate that LG were washed only by soaking or submerging in water or ice.

In 67% (400 of 600) of responses, managers indicated single-use gloves were worn during washing of LG (25% did not wear gloves).
Washing

- In most instances (95%, 571), chemicals were not used during washing
  - Commercial produce wash (25 responses)
  - Chlorine (2 responses)
  - Baking soda solution (2 responses)
- Primarily dried by draining or shaking (56%, 336), or in a spinner (32%, 194)
- After washing, LG were either put in a cooling unit (64%, 382), used immediately for service (13%, 79), or a combination of both (18%, 109)

***Unpublished Data: Not for Distribution***
Managers at 73% (319 of 439) of restaurants indicated that at least one type of LG was prepared onsite—most were in head form (80%, 447 of 562).

- 97% (544 of 562) culled in restaurant
- Most cutting and chopping done by hand (90%, 508 of 562)
- 18% (59 of 319) of restaurants indicated they washed at least one type of LG that arrived as “fresh-cut, RTE”.

***Unpublished Data: Not for Distribution***
Preparation

- In only 13% (25 of 188) of observations were LG washed both before and after cutting
  - 41% (77 of 188) of LG washed only before cutting
  - 46% (86 of 188) of LG were washed only after cutting
- In 47% (101 of 214) of observations, produce-only cutting board was used.
- Temp. of LG after cutting was greater than 45°F in 74% (140 of 190) of observations.

***Unpublished Data: Not for Distribution***
Service

- Mangers in 10% (42 of 439) of restaurants indicated they held LG on buffet line or salad bar
- Most mangers (93%, 39 of 42) indicated LG were refilled/replaced during service hours
  - 38% (15) replaced as needed
  - 28% (11) replaced every 2-4 hours
  - 8% (9) replaced every 5-7 hours
  - 3% (3) replaced daily

***Unpublished Data: Not for Distribution***
22% (97 of 439) of restaurant managers indicated they re-packaged items containing raw LG for sale (held 2 days or less)

During observation period, more than 30% (129 of 405) of LG on service/prep lines were above 45°F (more than ½ being held less than 4hrs)

Glove use observed less than 60% (195 of 336) of time

In 10% (2 of 21) observations, LG were stored in water

***Unpublished Data: Not for Distribution***
The FDA Model Food Code indicates that Cut LG (CLG) must be stored at 41°F or below.

The FDA 2009 Model Food code also includes the following specifications related to leafy greens handling:

- LG that are cut on site must be discarded or sold/served within 7 days of cutting.
- Soaking or submerging produce during cleaning should be avoided.
- Washing fresh produce with soap, detergent, or other surfactants should be avoided.
- Except when washing, food employees may not contact exposed RTE food with their bare hands.
These documents recommended certain additional practices to prevent contamination at the level of retail and foodservice, including:

- Not using LG with visible signs of decay or damage.
- Not rewashing packaged LG labeled as "ready-to-eat," "washed," or "triple washed“.
- Rewashing LG after cutting.
- Using a barrier for LG handling, such as gloves or an appropriate utensil (in addition to hand washing).
- Storing and displaying fresh-cut LG under refrigeration throughout distribution to enhance the safety and quality of the product.
- Maintaining documentation and records related to operational information about the product and practices.
- Developing training programs that will educate all potential handlers of LG in retail and food establishments.
Conclusions

- Overall, this study indicates that many of the LG handling requirements and recommendations recently issued by the FDA were already being implemented by restaurants in this study population.

- Recommended practices that were observed less often include: re-washing leafy greens after cutting, using a barrier for LG handling, and avoiding soaking/submerging leafy greens during washing.

***Unpublished Data: Not for Distribution***
Cooling Study

"Well, I'm addicted. ... Have you tried Carol's sheep dip?"
Improper food cooling practices allow pathogen proliferation and contributed to 330 foodborne illness outbreaks reported to the CDC over a 5 year period (Lynch et al, 2006).

***Unpublished Data: Not for Distribution***
Cooling Study-Background

- FDA Food Code contains requirements and recommendations to reduce pathogen proliferation during food cooling:
  - Cooked potentially hazardous food cooled from 135°F to 70°F within 2 hours
  - From 135°F to 41°F within 6 hours

***Unpublished Data: Not for Distribution***
Study Design

- Focus on describing the extent to which restaurants meet FDA cooling recommendations
- 420 restaurants (CA, CT, NY, GA, IA, MN, OR, RI, TN)
- Manager interview
- Observation of cooling procedures

***Unpublished Data: Not for Distribution***
Most (86%, 361 of 420) managers reported that their restaurant had formal procedures/processes for cooling PHF.

- 61% (256 of 420) of managers said cooling procedures tested and verified.
- 59% (248 out of 420) said times and temperatures were monitored.
- Workers were observed monitoring temperatures in 39% (235 of 592) of cooling observations.

***Unpublished Data: Not for Distribution***
Cooling Study Results

- Most common cooling method was refrigeration (47%, 470 of 1,008 cooling steps)
  - 39% (183 of 466) of refrigeration observations, food depth was not shallow
  - 34% (160 of 466) of observations the cooling food was not ventilated
  - 14% (64 of 466) of observations, containers of cooling food were stacked on top of each other
  - 24% (111 of 466) of observations, open air space not provided
- 16% of cooling unit temperatures were above 41°F

***Unpublished Data: Not for Distribution***
This study revealed that some or many restaurants were not meeting FDA recommendations on specific cooling practices.

Many establishments reported formal cooling procedures and training on cooling procedures; however, many did not verify cooling processes or monitor food temperatures during cooling processes.

***Unpublished Data: Not for Distribution***
Conclusions

- Refrigeration was most common cooling process; however, recommendations for facilitating rapid cooling were not always followed.
  - Not refrigerating at shallow depths
  - Not ventilating cooling food (provide open air space)
  - Refrain from stacking cooling containers
- 17% of cooling steps food was kept at room temperature (need to be monitoring temperatures!)

***Unpublished Data: Not for Distribution***
“MR. SWEET POTATO HEAD DOES THE DISHES... MR. SWEET POTATO HEAD REALLY LISTENS... MR. SWEET POTATO HEAD BRINGS HIS WIFE FLOWERS...” – MAN, I HATE THAT @#$ YAM.
Kitchen Manager Knowledge Study

- **Study Goal:** Collect and analyze data that will help us better understand the relationship between KM certification and environmental antecedents and risk factors in restaurants.

- **Study Composition:**
  - Kitchen Manager Interview
  - Kitchen Manager Survey
  - Kitchen Observation
  - Food Worker Interview

- Catchment area and timeline

***Unpublished Data: Not for Distribution***
Listeria Study

- **Study Goal:** Collect descriptive data on deli departments’ policies and practices and on the behaviors of deli food workers to determine whether retail deli characteristics (e.g. size, ownership such as independent or chain), deli managers’ food safety knowledge and certification, and food workers’ practices, behaviors, and knowledge are related to proper food handling, cleaning and sanitation practices.
Listeria Study

- **Study Composition:**
  - Interviews (deli-manager and food-worker)
  - Survey to assess food safety knowledge
  - Observation of deli employees’ activities
  - Observation of deli environment

- **Catchment area and timeline**
  - Discussion with Department of Ag regarding collaboration

***Unpublished Data: Not for Distribution***
Allergen Study

- **Study Goal:** Collect descriptive data on restaurant knowledge, attitudes, policies, and practices concerning food allergies.

- **Study Composition:**
  - Manager Food Allergen Survey
    - Demographics
    - Knowledge
    - Attitudes
    - Policies/Practices
  - Server Food Allergen Survey

- **Catchment area and timeline**

***Unpublished Data: Not for Distribution***
MN Special Study: Raw Fish

- Sushi/Raw Fish Practices and Policies in Restaurants
  - Labeling Issues (invoice vs. menu)
  - Parasite destruction
    (temp./time requirements)
  - pH meter for acidified rice and proper calibration
  - Acidified rice: HACCP Plan or Time Control
  - Bare hand contact
  - Bamboo Mats

***Unpublished Data: Not for Distribution***
Study Goal: Our goal is to collect data, at those establishments in Minnesota serving raw fish products, to obtain baseline information on the knowledge of kitchen managers and the practices in place for preparing and handling raw fish related items.
Study Definition

Study population defined as:

- Those restaurants that serve raw fish in sushi, sashimi, ceviche, carpaccio, or tartare form. This study does not include establishments which serve only undercooked or partially cooked fish items such as seared tuna or salmon or those establishments serving sushi with cooked fish (California roll-imitation crab or shrimp tempura).

***Unpublished Data: Not for Distribution***
**Definitions:**

- **Sushi**: Rice with raw fish, often wrapped in seaweed.
- **Sashimi**: A type of sushi consisting only of thin slices of raw fish, served without sticky white rice.
- **Ceviche**: Raw fish marinated in lime or lemon juice with olive oil and spices, served usually as an appetizer.
- **Carpaccio**: Of Italian origin, thin shavings of raw fish with olive oil and capers, served usually as an appetizer.
- **Tartare**: Coarsely ground or finely chopped raw fish mixed with spices.
- **Seared**: To char, burn, or cook only the surface of a food item. (Not included in study)
Proposal/Timeline

- October: Email request to local agencies and district offices for all establishments in MN that fall under study population definition
- November-January: Develop data tools (observation and interview)
- February: IRB approval
- March-June: Collect data
- July-August: Analyze and interpret data
- September-December: Draft of Manuscript
- Determine if multiple studies needed or extend to multi-state study
Good news! At the current rate of global warming we should be able to just swim over there and eat him in under five years...!
Questions?

If you have any questions/would like more information about the studies or notification of when the manuscripts have been published, please contact me at:

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(651) 201-4075

http://www.cdc.gov/nceh/ehs/EHSNet/foodsafty.htm