2013 Summer Institute
Food Safety Research

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The Center of Excellence for Food Safety Research in Child Nutrition Programs

Background

- The USDA Food and Nutrition Service (FNS) sought to establish a Center of Excellence for Food Safety Research in Child Nutrition Programs.

- A new and holistic research approach was needed to determine how new initiatives and emerging science affect food safety in these programs.

- To examine food safety in the school and child care environments, there is a clear need for multidisciplinary research, both basic and applied, that draws expertise from multiple areas of study.
Background

- Established at K-State in April 2011
- Funded by USDA Food and Nutrition Service at $1.6 million for two years; additional two year funding approved
- Work with NFSMI to link research findings with educational resources

Current Initiatives

- Cooling Foods in School Foodservice Operations.
- Evaluating the Status of Food Safety Programs based on HACCP principles.
- Develop Benchmarks for Evaluating Food Safety Programs.
**Current Initiatives**

- Evaluation of Student Handwashing Facilities in School Foodservice Operations
- Efficacy of Produce Washes
- Serving-Up Science: The Path to Safe Food in Schools

**Health Inspections**

**Health Inspection Violations**

- School foodservice operations serve a large number of children and gather frequent attention from the media
Health Inspection Violations

Method

- Randomly selected three states from each USDA Geographic Region (21 states)
- Inspection reports from state health agency
- Inspection reports were tallied for violations
- Collapsed into common categories
- Compared inspection data to restaurants in three states

Health Inspection Categories

1. Person in charge
2. Employee health
3. Handwashing/hygiene
4. Cleanliness
5. Food: Approved source
6. Food: Protected from Contamination
7. Cooling
8. Reheating
9. Cooking
10. Thawing
11. Time-temp requirements
12. Adequate equipment
13. Data monitoring/traceability
14. Thermometers/test kits
15. Raw hand contact
16. Utensils
17. Wiping cloths
18. Food contact surfaces
19. Non-food contact surfaces
20. Wastewater
21. Water supply
22. Waste water/sewage
23. Plumbing
24. Toilets
25. Premises (walls, floors, ceilings) & equipment
26. Pesticides (poisons, fumes, inorganic & organic)
27. Lighting & Ventilation
28. Garbage/trash bags
29. Pests/Animals
30. Toxic items
31. Permits/postings

Health Inspection Violations

Results

- 28,106 schools, 46,389 violations
- 2,626 restaurants, 11,488 violations
Health Inspection Violations

• Results
  • Top five observed violations
    1. Premises (walls, floors, ceilings) & equipment
    2. Non-food contact surfaces
    3. Food protected from contamination
    4. Warewashing
    5. Food contact surfaces

Health Inspection Violations

• Top five
  1. Premises (walls, floors, ceilings) & equipment
    - 8,915 violations, average 425 per state
  2. Non-food contact surfaces
    - 3,230 violations, average 170 per state

Inspections in Schools

• Top five
  3. Food protected from contamination
    - 3,129 violations, average 149 per state
  4. Warewashing
    - 2,149 violations, average 113 per state
  5. Food contact surfaces
    - 2,163 violations, average 108 per state
Inspections in Schools

- Least observed (<300 violations)
  - Reheating, 63 violations
  - Cooking, 70 violations
  - Thawing, 174 violations
  - Employee health, 183 violations
  - Cooling, 261 violations

Schools vs. Restaurants

<table>
<thead>
<tr>
<th>Violation</th>
<th>Schools %</th>
<th>Restaurants %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premises</td>
<td>31.7</td>
<td>68.2</td>
</tr>
<tr>
<td>Non-food contact</td>
<td>11.5</td>
<td>37.5</td>
</tr>
<tr>
<td>Food protected</td>
<td>11.1</td>
<td>32.7</td>
</tr>
<tr>
<td>Food contact surfaces</td>
<td>8.7</td>
<td>39.5</td>
</tr>
<tr>
<td>Warewashing</td>
<td>7.7</td>
<td>16.7</td>
</tr>
</tbody>
</table>

Schools vs. Restaurants

- Overall, restaurants had more total violations (4.75 ± 4.51) than schools (1.99 ± 1.98)

- Schools performed better in every violation classification (i.e., behavioral, non-behavioral, critical, and non-critical) than restaurants
Schools vs. Restaurants

- Restaurants were
  - 3.5 times more likely to have behavioral violation citations
  - 3.02 times more likely to have critical violation citations than schools.

Take-Home Message

- School foodservice operations incur far fewer violations than restaurants, especially high risk violations.

- School foodservice still must remain aware of their facilities, equipment, and overall food safety programs to minimize risks.

Cooling of Foods in School Foodservice Operations
• From 1973 – 1997, 604 foodborne disease outbreaks were reported in U.S. schools, a median of 25 per year (Daniels et al., 2002).

• Inadequate or “slow” cooling of food prepared on school premises was ranked #3 in the top 10 factors for 298 school-associated foodborne outbreaks from 1998 – 2006 (Pogostin et al., 2008).

Factors contributing to the occurrence of 1,918 outbreaks of foodborne disease from 1961-1982 in the United States (Bryan, 1988).

<table>
<thead>
<tr>
<th>Contributing Factor</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>1. Improper Cooling</td>
<td>43.7%</td>
</tr>
<tr>
<td>2. Lapse of 12 or more hours between preparing &amp; eating</td>
<td>22.6%</td>
</tr>
<tr>
<td>3. Colonized person handling implicated food</td>
<td>18.1%</td>
</tr>
</tbody>
</table>

Large volumes of food cooling slowly
Exponential bacterial growth
Foodborne illness
FDA 2009 Food Code

• Section 3-501.14
  - Cooked potentially hazardous food (time/temperature control for food safety) shall be cooled within 2 hours from 135°F to 70°F, and
  - Within a total of 6 hours from 135°F to 41°F or less

FDA 2009 Food Code

• Cooling methods specified based on type of food being cooled:
  - Placing food in shallow pans
  - Separating into smaller or thinner portions
  - Using rapid cooling equipment
  - Stirring food in containers placed in ice bath
  - Using containers that facilitate heat transfer
  - Adding ice as an ingredient
  - Other effective methods

Materials / Methods

• Four different food products were tested:
  - Chili con Carne with Beans (USDA D-20)*
  - Steamed Rice (USDA B-03)*
  - Beef Taco Meat (USDA D-13)*
  - Tomato Sauce (Meatless) (USDA G-07)*

*USDA Recipes obtained from the National Food Service Management Institute (NFSMI)
Materials / Methods

• Cooling treatments tested:
  – Walk-in cooler (uncovered)
  – Walk-in cooler (uncovered) using ice bath
  – Walk-in cooler (uncovered) using a chill stick (chili and tomato sauce only)
  – Walk-in freezer (uncovered – rice excluded)
Materials / Methods

- University Residence Hall Kitchen
  - Weekends – no concurrent food production

- Standard Foodservice Equipment
  - Steam Jacketed Kettle
  - Convection Steamer
  - Walk-In Cooler & Freezer
  - Stainless Steel Steamtable Pans
  - Stockpots
  - Ice Machine & Chill Stick

- Data Logging Thermometers
Materials / Methods

- Mean cooling time tables for each treatment
  - 3 replications per treatment
  - Means of replicates compared with FDA 2009 Food Code standards

- Cooling curve graphs for each food product
  - Temperature (y-axis) plotted over time (x-axis)
  - Shows all data points for each cooling treatment
Key Findings

- Refrigerator **not** effective for cooling any food product either 2” or 3” deep
- Ice bath **not** effective for products 3” deep
- Ice bath **effective** for steamed rice at 2” depths
- Passive chill stick **not** effective
- Freezer **effective** for products 2” deep
- Freezer **not** effective for products 3” deep
Key Implications

• Demonstrates need for rapid cooling methods in school foodservice operations

• Blast chillers are another option, but expensive
  – Low-cost solutions needed to cool food safely

Recommendations

• Active cooling should be promoted in school foodservice operations

• Validation of FDA Food Code Standards, microbiological growth

• Scratch cooking in school foodservice may require more sophisticated cooling methods

• Further research should be conducted on other food products and systems in school foodservice

School Food Safety Program Study
Small Group Discussion

- What is the role of employees in ensuring food safety in a school district?

- What can managers do to increase the likelihood that employees will follow the plan?

Changing Food Safety Culture

<table>
<thead>
<tr>
<th>Traditional</th>
<th>Behavioral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hierarchical</td>
<td>Inclusive</td>
</tr>
<tr>
<td>Prescribed</td>
<td>Customer focused</td>
</tr>
<tr>
<td>Job specific</td>
<td>District specific</td>
</tr>
<tr>
<td>Task buried</td>
<td>Communicated</td>
</tr>
<tr>
<td>“Must do”</td>
<td>Marketed</td>
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School Food Safety Program Study

- Summary of study
  - 34 schools
    - 11 small districts in six states, nine medium districts in seven states, six large districts in six states, and eight mega districts in seven states.
School Food Safety Program Study

- Four areas of assessment
  - Facility Observation
  - Food Safety Observation
  - HACCP Verification
  - Hand Washing Facility Assessment

Key Findings - Overall

- HACCP plans and documentation
- Food safety training
- Storage temperatures
  - Cold food held, some improvement
- Employee health/other
  - Food & beverages
  - Bare hand contact
- Dishmachines/utensils/cleaning

Key Findings - Handwashing

- 31 school managers trained on personal hygiene and proper cleaning and sanitizing.
- 29 schools documented a Standard Operating Procedure for handwashing.
- Nearly all (36) hand washing facilities were conveniently located and accessible for employees
- However...
Key Findings - Handwashing

- 575 employee handwashing observations
  - 342 (59.4%) instances where employees failed to wash hands when required
  - Top observations:
    - 75 - Soiled equipment, dishes, or utensils
    - 74 - Before donning new gloves or changing gloves
    - 66 - Soiling hands during food prep/service
    - 64 - After touching body parts, coughing, eating, drinking
  - 111 observations, employees washed, but improperly
  - 122 observations, employees washed properly

Key Findings – Sanitation/Other

- 31 managers indicated that they had training on personal hygiene and proper cleaning and sanitizing.
- 29 managers indicated that they offered training sessions for employees on the proper use of chemicals.
- However...

Key Findings – Sanitation/Other

- Two observations related to sanitation practices had an in-compliance rate less than 50%.
- In 46% of observations, the sanitizing solutions were not being changed as needed.
- Water only with no sanitizer added.
- Separate wiping clothes being used for contact surfaces, 48% of observations were in compliance.
Managerial Behavior & Food Safety

Key Findings

• Less than half (16) had updated the food safety plan since it was initially developed.

• Seven revised the document in 2011, or about five years after it had been developed.

Recommendations

• Schools should customize the food safety program to their operation.

• Schools need to be encouraged to have dedicated hand sinks.
  – An emphasis should be placed on handwashing education for school foodservice employees.

Bathroom Facilities Study
Background Information

• Bathrooms observed - closest in proximity to lunch room

Results

• N = 59 Bathrooms with Hand Sinks
  • Every bathroom contained 1 working hand sink
  • Most bathrooms had three sinks or less (89.8%)
  • Sinks per bathroom, 3.36 ± 1.14
Results

• Soap dispensers
  • Available
    • Range: 1-3
    • Mean: 1.46 ± 0.54
  • Containing Product
    • 55.9% of the bathrooms had only one
    • Mean: 1.24 ± 0.63
    • 10.2% of the bathrooms had none

Results

• Soap vs. Sanitizer availability
  • 91.5% contained soap (54 bathrooms)
  • 2.1% contained sanitizer (3 bathrooms)
  • 6.4% had no soap or sanitizer (2 bathrooms)

Results

• Faucet Availability
  • Type
    • 44 manual (74.6%)
      • Mean: 2.70 ± 1.19
    • 16 automatic (27.1%)
      • Mean: 2.31 ± 1.66
    • One contained both
  • Single vs. Double (Manual only)
    • 14 single
    • 30 double
    • Two contained both
• Temperature Readings
  * 10 seconds
    * Mean, 80.76 °F ±14.52 °F
  * 60 seconds
    * Mean, 88.38 °F ±14.34 °F

• Means of drying hands
  * Paper Towels
    * 46 bathrooms containing (78%)
    * 12% automatic; 88% manual
  * Air Dryer
    * 14 bathrooms containing (23.7%)
    * 85.7% automatic; 14.3% manual
  * Three had no means of drying hands
  * Four contained both paper towels and air dryers

• Prompts/Signage for hand washing
  * 73.9% of bathrooms did not contain (45)
  * 27.1% of bathrooms contained (16)
Additional Observations

- Hall pass can be a source of contamination
- Hand washing sign was peeling off the wall and was unreadable
- Hand sanitizer dispenser in dining room
- Many spring loaded and push button faucets
  - Do they stay on long enough?
  - Noted that one only stayed on for 12 seconds

Other Center Projects

- Working with FNS to develop guidance on food preservation in local schools.
- Reviewed data and research related to ammoniated beef for response to media inquiries.
- Summarizing research related to handling ground beef in schools for FNS input to NACMCF.
- Center Faculty presented produce risks for the SNA/FNS Webinar series on produce safety.

Future Center Projects

- Food Science Immersion Course – October 2013
- Going forward
  - Employer Behavior – Change
  - Third Party Providers
  - Off-site needs
Recap from Today

- School foodservice operations perform very well – but keep improving and remain vigilant in regards to food safety.

- Review and update your HACCP plans!

- Work with your employees to overcome barriers to safe food handling.

Learn More

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Questions/Comments

Find us on the web at: www.cnsafefood.ksu.com