Foodservice Systems Management Education Council
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Food Safety Research Outcomes

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Outline

- **Food Safety at K-State**
- **Current Projects in HMD**
  - **Food Allergies**
  - **Produce Safety**
  - **Center of Excellence in Food Safety Research in Child Nutrition Programs**
  - **Consumer Food Safety**
- **Other Engagement**
- **Discussion**

Produce Safety

- **Kwon, Sauer, Todd, Ryu**
- **Assessment and Reduction of Produce Food Safety Risks in School Foodservice Systems**
  - **Development of risk model**
  - **Other current findings**
    - **produce handling/handwashing**

Methods

- **Four observers trained**
  - **Two individuals observed**
  - **Compared results to establish consistency**
- **Data collection**
  - **15 secondary school foodservice facilities**
  - **Behaviors were observed following flow of produce/service**

Observation Form

Time	Personnel	Occasion	
		Personal Hygiene ☐ AFT touching bare skin ☐ AFT touching clothing ☐ AFT coughing, sneezing ☐ AFT eating, drinking	**Food Preparation** ☐ BEF food production ☐ BEF handling different food ☐ Switching raw food to RTE food ☐ BEF putting gloves on ☐ After handling PHF
	Task ☐ Production ☐ Service ☐ Clean up	**Cleaning** ☐ AFT cleaning equip/ utensils ☐ AFT handling soiled equip/utensils ☐ AFT cleaning	**Other** ☐ When changing tasks ☐ AFT handling money ☐ AFT touching equip, doors, etc. ☐ Other:

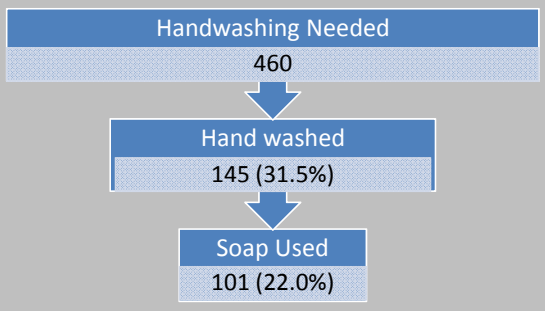
Occasions Needing Handwashing & Observation

Occasions	Hand washed	Not washed	% washed
Before putting gloves on	66	150	30.6
When changing tasks	62	123	33.5
After handling soiled equip/doors	11	74	12.9
Before handling different food	15	30	33.3
Before starting food production	25	17	59.5
After cleaning utensils/equipment	8	10	44.4
After eating and/or drinking	8	4	66.7
Switching from raw food to RTE food	0	10	0.0
After touching bare skin	0	4	0.0
After handling TCS food	4	0	100.0

Observation Form

Detailed Observation	Areas properly washed
☐ Hands washed? ☐ Soap used (lathering)? ☐ Dried with paper towel or dryer? ☐ Re-contamination? ☐ Touched faucet? ☐ Touched clothes? ☐ Other _____	☐ Palm ☐ Top of the hand ☐ Between fingers ☐ Finger tips ☐ Under nails (Brush used) ☐ Sanitizer used
☐ Duration (stopwatch reading) Lathering: _____ Seconds Rinsing: _____ Seconds	☐ Gloves used

Handwashing Adequacy: Soap use



Results

- **Handwashing was necessary upon 460 occasions observed**
  - **320 production tasks**
  - **128 service tasks**
  - **12 cleaning tasks**
- **Only 145 occasions (31.5%) employees washed their hands**
  - **The total exceeds 145 due to multiple occasion codes**

Handwashing Adequacy: Duration

Time (seconds) spent lathering soap (5.6±4.3)

Occasions when hands washed w/soap (n=101)

≤ 3 sec	3< t ≤5	5<t ≤10	10<t≤16.5
n=37 (36.6%)	n=19 (35.6%)	n = 28 (27.7%)	n = 17 (16.8%)

Summary

- Lack of proper handwashing at school foodservice facilities
- 460 instances where handwashing was necessary
  - Handwashing using soap: 101 times
  - Washing between fingers: 34 times
  - Lathering time: 5.6±4.3 seconds
    - Total time 10.8±5.2 seconds

The Center of Excellence for FOOD SAFETY RESEARCH IN CHILD NUTRITION PROGRAMS

Mission :
Seek science-based solutions to problems impacting food safety in Child Nutrition Programs across the U.S.

Implications

- Handwashing should be part of the food safety culture
- ***Know*** to wash hands and ***perceive*** it is important, but…
  - motivation continues to be a challenge

Research & Support Team

- Dr. Kevin Roberts
- Dr. Carol Shanklin, RD
- Dr. Junehee Kwon, RD
- Dr. Jeannie Sneed, RD
- Dr. Fadi Aramouni
- Kerri Cole, Coordinator
- Graduate Students
- Undergraduate Research Scholar
- Me

Food Allergies

- Sauer & Kwon
- USDA Challenge Grant – *Advancing Food Allergy Training for Hospitality & Dietetics Students using Storytelling*
- Example
- Other Findings –
  - 25 consumers (17 previous FA reactions)
  - Chain vs. Independent Restaurant, loyalty
  - Staff awareness, ingredients
- Food allergies/Schools

Overview

- Established at K-State in April 2011 as a result of a food safety initiative of the Secretary of the Agriculture
- 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

Learn More

- www.cnsafefood@ksu.edu
- Social Media
  - Facebook
  - LinkedIn
  - Twitter @cnsafefood

Background

- School lunches - 31 million children every school day under the federally funded National School Lunch Program (FNS, 2011).
- 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)

Recent Projects

- Cooling Study
- HACCP Study
- State and School Director Food Safety Program Guidance Study
- Hand Washing Study
- Health Inspection Study

Background

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

	Contributing Factor	Percentage
1.	Improper Cooling	43.7%
2.	Lapse of 12 or more hours between preparing & eating	22.6%
3.	Colonized person handling implicated food	18.1%

Cooling of Foods in School Foodservice Operations

Background

1) Large quantities of food produced
2) Food cooled and stored
3) Portions reheated & served as needed

Large volumes of food cooling slowly

↓

Exponential bacterial growth

↓

Foodborne illness

FDA 2009 Food Code

- Food and Drug Administration (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

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)

FDA 2009 Food Code

- Food and Drug Administration (FDA) 2009 Food Code - Section 3-501.15
- 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

- 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

- 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)

Results

- 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

- Passive chill stick not effective
  - Chill sticks need (active) replacing after ice melts
  - Passive cooling practices likely to occur in schools
- Ice bath effective for steamed rice at 2" depths
  - Not effective for chili, tomato sauce, taco meat
  - Rice is semi-porous – allowed for rapid cooling
  - Rice is not usually frozen, so effective alternative
- Ice bath not effective for products 3" deep
  - Ice bath not replaced once ice had melted
  - Melted ice actually inhibited cooling

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

Key Findings

- Freezer effective for products 2" deep
  - Rice not tested, as it is not usually frozen
  - Feasible if there is freezer space
  - Smaller freezers might not be able to handle load
  - Products served following day need time to thaw
- Freezer not effective for products 3" deep
  - No 3" freezer treatments cooled in 2 hours from 135°F to 70°F
  - Some treatments did cool in 6 hours from 135°F to 41°F or less.
  - Must meet both FDA Food Code standards

2004 HACCP Guidance Document

Key Implications

- No refrigerator treatment effective for cooling any food product either 2" or 3" deep
- Did not meet FDA Food Code Guidelines
  - However, may be most used method for cooling
- Demonstrates need for rapid cooling methods in school foodservice operations
- Blast chillers are another an option, but expensive
  - Low-cost solutions needed to cool food safely

Background

- State Agency Survey
  - Sent to 50 state agencies
  - Received 26 responses
- District Director Survey
  - Sent to 2,360 school foodservice directors
  - 2,329 delivered
  - 296 responses not usable

State Agency Highlights

- Use of Guidance Document
  - 15 of the 26 respondents reported use of information and resources provided in the Guidance document
  - 2/3 of respondents used all SOPs included in the *Guidance* document exactly as written

District Director Highlights

- Overall
  - The majority (53.7%) of responding school district directors had less than 10 schools in their district
  - Most (62.2%) had classified menu items into the three process categories (62.1%)
  - Over 1/3 of the respondents had either no awareness or were only minimally aware the Healthy, Hunger Free Kids Act included requirements for food safety

State Agency Highlights

Usefulness of Guidance document in completing key areas of the food safety program using the process approach			
	Frequency		
	Not at all Useful	Moderately Useful	Extremely Useful
Develop procedures for documenting critical limits	2	8	5
Establish monitoring procedures	1	11	3
Develop corrective actions	2	11	2
Develop appropriate record keeping procedures and forms	0	9	6
Conduct training	2	9	4

District Director Highlights

- Use of the Guidance Document
  - Most school districts used the *Guidance,* but modified it when developing their district's food safety program (73.4%), conducting training (66.2%), and reviewing their current school programs (67.9%)
  - The majority of directors used the standard operating procedures exactly as written

State Agency Highlights

- NFSMI Resources
  - All respondents who completed the survey reported they used the SOPs from NFSMI's website
  - Five agencies encouraged schools to use the SOP builder, six agencies did not know it existed
  - Only two states used NFSMI to conduct training, while their state agency staff were unaware of available NFSMI training.

District Director Highlights

Usefulness of The Guidance (N=218)				
	Frequency (%)			
Variable	Not at all Useful	Moderately Useful	Extremely Useful	Mean ± SD
Develop procedures for documenting critical limits	12 (5.5)	70 (32.1)	121 (55.5)	2.5 ± 0.6
Establish monitoring procedures	9 (4.1)	74 (33.9)	118 (54.1)	2.5 ± 0.6
Develop corrective actions	8 (3.6)	77 (35.3)	117 (53.7)	2.5 ± 0.6
Develop appropriate record keeping procedures and forms	10 (4.6)	71 (32.6)	122 (56.0)	2.5 ± 06
Conduct training	19 (8.7)	85 (40.0)	97 (44.5)	2.4 ± 0.7

District Director Highlights

- NFSMI Resources
  - Approximately 60% (129) of the directors utilized SOPs downloaded from the NFSMI website
  - Forty-five (20.5%) directors were unaware of this resource
  - Seventy five (34%) directors were unaware of *The SOP Builder*
    - Only 62 (28.4%) had used this resource
  - Most directors (171, 79.5%) responded that NFSMI had not conducted any training in their school district

Handwashing Study

State Agency Highlights

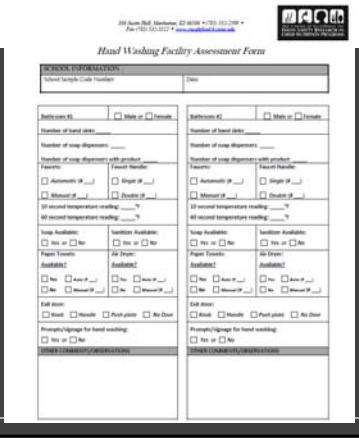
- Recommendations for improving the *Guidance* document:
  - SOPs need to be updated with 2009 FDA Food Code requirements, e.g. minimum cook temperatures, etc.
  - A streamlined version is needed for charter schools or small schools that use a caterer or purchase vended meals
  - Clearer guidance on conducting a hazard analysis, including what to look for, how to identify hazards, etc.

Background Information

- Bathrooms observed - closest in proximity to lunch room

State Agency Highlights

- Recommendations for improving the *Guidance* document:
  - Make the document interactive, allowing user to update, change, and/or type in additional information, then save, and print as needed?
  - Offer other ways to effectively monitor critical control points (e.g., use of invoices as receiving logs).


Hand Washing Facility Assessment Form

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, 2.36 ± 1.14

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
    - 32 double
    - Two contained both

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

- Temperature Readings
  - 10 seconds
    - Mean, 80.76 ºF ±14.52 ˚F
  - 60 seconds
    - Mean, 88.28 ºF ±19.34 ˚F

Results

- Soap vs. Sanitizer availability
  - 91.5% contained soap (54 bathrooms)
  - 5.1% contained sanitizer (3 bathrooms)
  - 3.4% had no soap or sanitizer (2 bathrooms)

Results

- 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

Results

- Exit Door
  - Handle: 32 (54.2%)
  - No Door: 16 (27.1%)
  - Push Plate: 9 (15.3%)
  - Knob: 2 (3.4%)

Health Inspections

Results

- Prompts/Signage for hand washing
  - 72.9% of bathrooms did not contain (43)
  - 27.1% of bathrooms contained (16)

Inspection Violations in Schools

- 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

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

Inspection Report Categories

- Person in charge
- Employee health
- Handwashing/hygiene
- Cleanliness
- Food: approved source
- Food: protected
- Cooling
- Reheating
- Cooking
- Thawing
- Time-temp requirements
- Adequate equipment
- Date marking/lables
- Thermometers/test kits
- Hand contact
- Utensils
- Wiping cloths
- Food contact surfaces
- Non-food contact surfaces
- Warewashing
- Water/ice supply
- Waster water/sewage
- Plumbing
- Toilets
- Premises
- Lighting & Ventilation
- Garbage/recycling
- Pests/Animals
- Toxic items
- Permits/postings

Inspections in Schools

- Results
  - 28,106 schools, 46,389 violations
  - 2,626 restaurants, 11,488 violations

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

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

Inspections in Schools

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

Inspections in Schools

- **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**

Schools vs. Restaurants

Violation	Schools %	Restaurants %
Premises	31.7	68.2
Non-food contact	11.5	37.5
Food protected	11.1	32.7
Food contact surfaces	8.7	39.5
Warewashing	7.7	16.7

Other Center Projects

- Working with FNS to develop guidance on food preservation in local schools.
- Provided review for new USDA Foods Fact Sheet on Tomato Paste Pouches.
- Reviewed data and research related to ammoniated beef for response to media inquires.
- Summarized 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.

Discussion
&
Thank you

Future Center Projects

- **Food Science Immersion Course – June 2013**
- **Going forward**
  - Employee Behavior – Change
  - Third Party Providers
  - Off-site meals

Other Engagement

- **Collaboration with Iowa State University**
- **Kansas Department of Education, Child Nutrition & Wellness**
  - Fruit & Vegetable Impact Student – secondary schools
    - Coordinated program students
  - Evaluation of the "Body Venture" health promotion program
    - KSU HMD Honors Project