Chill Out and Prevent Temperature Abuse

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Affiliation or Financial Disclosure

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  • Nothing to disclose

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  • Project Coordinator at The Center for Food Safety in Child Nutrition Programs (Does not consult)
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Acknowledgements

The Center has been funded, in part, with Federal funds from the U.S. Department of Agriculture. The contents of this presentation do not necessarily reflect the views or policies of the U.S. Department of Agriculture nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government or the Center.
The Roadmap

- Background
- Time & Temperature Control
- Research
  - A. Cooling
  - B. Cold holding
- Tips & Applications
- Questions
Outbreaks in Schools in 2016

Only 1.0% of all outbreaks are school associated

8 Outbreaks in Schools

459 Outbreaks in Restaurants

CDC, 2016
Illnesses in School Associated Outbreaks

98 Illnesses per outbreak in schools

11 Illnesses per outbreak in restaurants

CDC, 2016
CDC Five Risk Factors

1. Improper temperature control
2. Inadequate cooking
3. Cross contamination
4. Poor employee health and hygiene
5. Food from unsafe sources
Improper Temperature Control

- Lack of temperature control
- Improper cold holding
- Improper hot holding due to equipment malfunction
- Improper hot holding due to procedure
- Improper adherence to approved plan to use time as a public health control.
- Improper or slow cooling
- Improper reheating
Time & Temperature Control Research
FDA 2017 Food Code

• 3-501.14 Cooling
  • Cooked potentially hazardous food (time/temperature control for safety food) 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 2017 Food Code

3-5013.15 Cooling Methods

- Placing the food in shallow pans;
- Separating the food into smaller or thinner portions;
- Using rapid cooling equipment;
- Stirring the food in a container placed in an ice water bath;
- Using containers that facilitate heat transfer;
- Adding ice as an ingredient;
- Other effective methods.
The Cooling Studies

• 2011 Passive Cooling of products from
  • Endpoint cooking temperatures

• 2015 Passive Cooling of products from
  • Hot holding temperatures

• Both Studies used three replications
2011 Cooling Study

- **Passive cooling**: chili con carne, taco meat, meatless marinara sauce, and steamed rice.

- Products were cooled starting at temperatures of **165°F** for all combinations of:
  - **2” and 3”** depths in full-size steam table pans
    - **Refrigerated cooling methods**: steam table pan, ice bath, frozen chill stick in a stock pot for the chili and marinara only
    - **Freezer cooling method**: steam table pan
2015 Cooling Study

• **Passive cooling** - chili con carne, taco meat, meatless marinara sauce, and steamed brown rice.

• Products were cooled starting at temperatures of 135°F for all combinations of:

  • 2” and 3” depths in full-size steam table pans
  • Ice bath in refrigerator and freezer
  • Pan covering - none, single cover, double cover
How we ensured accurate results

1. Calibrate the thermometers
2. Find the center of the product
3. Portion and plate the product
4. Chill
Ask the Audience

A B C D
What method would you choose?

Chili Con Carne @ 170°F

A. Chill stick in 3 gallons of product
B. 3 inch ice bath in the refrigerator
C. 2 inch in the freezer
D. 3 inch in the refrigerator
Cooling Curves for Chili
What method worked?

Chili Con Carne @ 170 F

A. Chill stick in 3 gallons of product
B. 3 inch ice bath in the refrigerator
C. **2 inch in the freezer**
D. 3 inch in the refrigerator
What method would you choose?

Steamed brown rice @ 135°F

A. 2 inch, ice bath, uncovered in the refrigerator
B. 2-inch, ice bath, covered in the refrigerator
C. 3 inch, ice bath, uncovered in the refrigerator
D. 3-inch, ice bath, covered in the refrigerator
Cooling Curves for Brown Rice

![Graph showing cooling curves for brown rice under different conditions: Freezer Covered 2 inch*, Freezer Covered 3 inch*, Freezer Uncovered 2 inch*, Freezer Uncovered 3 inch*, Refrigerator + Ice bath Covered 2 inch, Refrigerator + Ice bath Covered 3 inch, Refrigerator + Ice bath Uncovered 2 inch, Refrigerator + Ice bath Uncovered 3 inch.](image)
What method worked?

Steamed brown rice @ 135°F

A. 2 inch, ice bath, uncovered in the refrigerator
B. 2-inch, ice bath, covered in the refrigerator
C. 3 inch, ice bath, uncovered in the refrigerator
D. 3-inch, ice bath, covered in the refrigerator
## What really works at 165°F

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rice</th>
<th>Chili</th>
<th>Taco Meat</th>
<th>Marinara</th>
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<td>Chill Stick in Stock Pot</td>
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<td>3-in, Refrigerator</td>
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<td>✓</td>
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<tr>
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<td>2-in, Ice Bath, Refrigerator, Uncovered</td>
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The Cold Holding Studies

• 2016 Milk temperature simulation
  • Cold Holding & Alternative Breakfast Service

• 2015 Simulation of field trip sack lunches
  • Cold Holding & Transportation

• Both studies were based on information gathered from a national survey of School Nutrition Directors

• Both studies used three replications
Milk: What we did!

Container
- Soft Sided Cooler
- Hard Sided Cooler
- Steam table pan
- Sheet pan
- Milk crate

Cooling Product
- Ice
- Ice Sheet
- No Ice
What method would you choose?

30 milk cartons packed for Breakfast in the Classroom

A. Steam table pan, loose ice
B. Hard sided cooler, loose ice
C. Sheet pan, ice sheet
D. Soft side cooler, no ice
E. Milk crate, no ice
Temperature curves for milk

- Sheet Pan, Ice Sheet
- Sheet Pan, No Ice
- Steam Table Pan, Loose Ice
- Steam Table Pan, Ice Sheet
- Steam Table Pan, No Ice
- Soft Side Cooler, Loose Ice
- Soft Side Cooler, Ice Sheet
- Soft Side Cooler, No Ice
- Hard Side Cooler, Loose Ice
- Hard Side Cooler, Ice Sheet
- Hard Side Cooler, No Ice
- Milk Crate, No Ice
What method worked?

30 milk cartons packed for Alternate Breakfast Service

A. Steam table pan, loose ice
B. **Hard Sided, loose ice**
C. Sheet Pan, ice sheet
D. Soft side, no ice
E. Milk Crate, no ice
## What really worked?

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Ice</th>
<th>Ice Sheet</th>
<th>No Ice</th>
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</thead>
<tbody>
<tr>
<td>Milk Crate</td>
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<tr>
<td>Sheet Pan</td>
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<tr>
<td>Steam Table Pan</td>
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<td></td>
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<tr>
<td>Soft-sided Cooler</td>
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<td></td>
</tr>
<tr>
<td>Hard-sided Cooler</td>
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<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
Simulation: What we did!

Cooler 1: Ice Packs on Bottom

Cooler 2: No Ice

Temperature data loggers
What method would you choose?

Sack Lunches packed in hard coolers: Turkey sandwich, baby carrots, and sliced apples

A. Single layer of ice on bottom
B. No Ice
C. Ice on the bottom, middle, and top
Temperature Curves for field trip meals

No Ice
Average Temperature vs Time

Ice on Bottom
Average Temperature vs Time
What method worked?

Sack Lunches packed in hard coolers: Turkey sandwich, baby carrots, and sliced apples

A. Single layer of ice on bottom
B. No Ice
C. Ice on the bottom, middle, and top
Tips for Validating Your Cold Holding and Cooling Procedures
Tips

• Using your process
• Validate for each food product
• Select thermometer or data logger based on the method/budget
Basics of how to validate

- Test cooling method multiple times
- Keep records
- Averages are informative, but pay careful attention to outliers
- Review and adjust as necessary
- In the instance that you find your process did not work, you MUST discard the product
Validation Tips

• Calibrate your equipment

• Find geometric center of your food for placement

• Secure the probe in place
More Validation Tips

• MacGyver it if you need to
Questions
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