The Public Health Rationale Behind FDA’s Model *Food Code* and Its Application to the Classroom

Presented by: Alan Tart

Tuesday, April 27, 2010
6:30 p.m. - 8:00 p.m. Eastern time
The Public Health Rationale Behind FDA’s Model *Food Code* and Its Application to the Classroom

Alan M. Tart
Regional Retail Food Specialist
U.S. Food and Drug Administration
Atlanta, GA
Presentation Objectives

- Describe the role of FDA and the Food Code in ensuring a safe food supply in the U.S.
- Identify select provisions of the Food Code and the public health rationale for each
- Provide examples of how you can incorporate food safety principles into the science curriculum
Role of FDA in Retail Food Protection
U.S. Retail Food Program

- An Integrated Program
  - U.S. Food and Drug Administration (FDA)
  - 2,700 federal, state, local and tribal regulatory agencies
  - Over 1.5 million restaurants, retail food stores, vending commissaries, hospitals, institutions
U.S. Retail Food Program

FDA’s Responsibilities:

- Develop and publish FDA Food Code (CFSAN)
- Standardization of state personnel
- Training and technical assistance
- Promotion of Voluntary National Retail Food Program Standards
- Establish national performance measures
U.S. Retail Food Program

- Components of the Retail and Foodservice Industry
- Industry’s Responsibilities:
  - Train managers and food employees
  - Actively control foodborne illness risk factors
  - Serve safe food
Remember that most high school students will work in a food establishment at some point.
Activity
Have you ever worked in a retail or foodservice establishment?

- Use clip art to indicate your answer in the space provided.

[YES] [NO]
Role of the *FDA Food Code*
FDA Food Code

- Set of regulatory provisions for retail food and foodservice establishments
- Consumer guidance may differ
- Is not preemptive
- Adoption by state, local, and tribal regulatory entities is optional
- Is based on the latest science and technology
- Is developed using a consensus building process
FDA *Food Code* Updates and Vetting Process
State Adoption of the *Food Code*

Activity – Where are you from? Use Clip Art.

States And Territories That Have Adopted The Food Code

- **HAVE ADOPTED THE FOOD CODE (51)**
- **HAVE NOT ADOPTED THE FOOD CODE; RULEMAKING IN PROGRESS (3)**
- **DID NOT RESPOND TO SURVEY; RULEMAKING STATUS UNKNOWN (2)**

November 20, 2007
Major Provisions of the FDA Food Code
FDA Food Code - Organization

- Chapter 1 – Purpose and Definitions
- Chapter 2 – Management & Personnel
- Chapter 3 – Food
- Chapter 4 – Equipment, Utensils & Linens
- Chapter 5 – Water, Plumbing & Waste
- Chapter 6 – Physical Facilities
- Chapter 7 – Poisonous or Toxic Materials
- Chapter 8 – Compliance & Enforcement
FDA Food Code – Key Provisions

- Food Code Interventions:
  - Demonstration of knowledge
  - Employee health controls
  - Controlling hands as a vehicle of contamination
  - Time-temperature control of pathogens
  - Consumer advisory
FDA Food Code – Key Provisions

- 5 Foodborne Illness Risk Factors:
  - Poor personal hygiene/ill food employees
  - Improper holding/cooling
  - Inadequate cooking
  - Contaminated equipment/cross-contamination
  - Unsafe food sources
Activity

- In the chat area, describe how you, as a consumer, know that a food purchased in a restaurant or grocery store is not safe. What do you look for?

- Give one example.
Activity

Let’s pause for two questions.
Key Food Safety Concept

Potentially Hazardous Food (PHF) (Time/Temperature Control for Safety Food – TCS Food)
A PHF (TCS Food) Includes . . .

- A food that requires time/temperature control for safety (TCS) to limit pathogenic microorganism growth or toxin formation

Includes:

- An animal food (a food of animal origin)
- A food of plant origin that is heat-treated
- Raw seed sprouts
- Cut melons, cut tomatoes, and cut leafy greens
- Garlic-in-oil mixtures that are not modified to prevent growth
- A food that is designated as Product Assessment Required (PA) in Interaction Table A or B
PHF (TCS Food) does not include . . .

- Food that is designated as non-PHF/non-TCS in either Interaction Table A or B
- Unopened containers that are hermetically sealed and “commercially sterile”
- Foods for which laboratory evidence shows that T/T control is not required
- Air-cooled, hard boiled egg – shell intact
PHF (TCS Food) does not include . . .

- Shell eggs treated to destroy all salmonellae (pasteurized shell eggs)
- A food that does not support the growth of pathogenic microorganisms even though they may be present
- Some foods that are refrigerated for quality, not safety
### Interaction Table A

**Table A. Interaction of pH and $a_w$ for control of spores in food heat-treated to destroy vegetative cells and subsequently packaged.**

<table>
<thead>
<tr>
<th>$a_w$ Values</th>
<th>pH Values</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.6 or less</td>
<td>&gt; 4.6 – 5.6</td>
<td>&gt; 5.6</td>
<td></td>
</tr>
<tr>
<td>0.92 or less</td>
<td>Non-PHF*/non-TCS**</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td></td>
</tr>
<tr>
<td>&gt; 0.92 – 0.95</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td>PA***</td>
<td></td>
</tr>
<tr>
<td>&gt; 0.95</td>
<td>Non-PHF/non-TCS</td>
<td>PA</td>
<td>PA</td>
<td></td>
</tr>
</tbody>
</table>

* PHF means “Potentially Hazardous Food”
** TCS means “Time/Temperature Control for Safety Food”
*** PA means “Product Assessment Required”
## Interaction Table B

### Table B. Interaction of pH and $a_w$ for control of vegetative cells and spores in food not heat-treated or heat-treated but not packaged.

<table>
<thead>
<tr>
<th>$a_w$ Values</th>
<th>pH Values</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 4.2</td>
<td>4.2 – 4.6</td>
<td>&gt; 4.6 – 5.0</td>
<td>&gt; 5.0</td>
</tr>
<tr>
<td>&lt; 0.88</td>
<td>Non-PHF*/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
</tr>
<tr>
<td>0.88 – 0.90</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td>PA***</td>
</tr>
<tr>
<td>&gt; 0.90 – 0.92</td>
<td>Non-PHF/non-TCS</td>
<td>Non-PHF/non-TCS</td>
<td>PA</td>
<td>PA</td>
</tr>
<tr>
<td>&gt; 0.92</td>
<td>Non-PHF/non-TCS</td>
<td>PA</td>
<td>PA</td>
<td>PA</td>
</tr>
</tbody>
</table>

* PHF means “Potentially Hazardous Food”
** TCS means “Time/Temperature Control for Safety Food”
*** PA means “Product Assessment Required”
## Activity - PHF/TCS Food?

For each, use clip art to indicate YES or NO.

<table>
<thead>
<tr>
<th>Food</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swiss cheese</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margarine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pumpkin pie</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unpasteurized orange juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thousand Island dressing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Prevention of Contamination from Hands
Prevention of Contamination from Hands

- Prevention of fecal-oral route transmission) is key
  - Exclusion/restriction of ill food employees
  - Proper handwashing
  - No bare hand contact with ready-to-eat food
Why Viruses are Such a Problem

- 1,000,000,000,000 - # of viral particles you start with in 1 ml of feces*
  - 10,000,000,000 - # of virus particles left after properly washing your hands (2 log reduction) (Ayliffe et al., 1978)
  - 1,000,000,000 - # of virus particles transferred from an ungloved hand to food (10%) (Montville, 2001)
- In contrast, it takes 1-10 virus particles to make you sick*

*Teunis & Moe, 2008
Viruses and Cooking

- Norovirus survives heating at 140°F for 30 minutes
  - Inactivated by boiling at 212°F
Handwashing alone is enough to control hazards associated with ill food workers or hand contamination in general.
Activity – Poll
Yes √ or No X

- Hand antiseptics/sanitizers can be used in place of handwashing to prevent contamination from hands.
Activity

Let’s pause for two questions.
Destruction of Pathogens
Cooking Temperatures

- Based on anticipated load of microorganisms
- What are D-values?
- 145°F for 15 sec (3D kill of Salmonella)
  - Fish
  - Meat including game animals & pork
  - Eggs, broken, cooked, and served immediately
Cooking Temperatures

- 155ºF for 15 sec (158 instant) (5D kill of *Salmonella*; 8D kill of *E. coli* O157:H7)
  - Eggs, broken but not cooked and served immediately
  - Hamburgers and other ground meat products
  - Injected or mechanically tenderized meat
  - Ratites
Cooking Temperatures

- 165°F for 15 sec (7D kill of *Salmonella*)
  - Poultry
  - Products stuffed with raw meat products
  - Wild game animals
Cooking Temperatures

- Roasts (6.5D kill of Salmonella)
  - Preset oven parameters & internal temp
  - 130°F for 112 minutes or other T/T relationship
- Whole muscle, intact beefsteak
  - 145°F surface temp, cooked color
Activity

Let’s pause for two questions.
Preventing Bacteria Growth
Preventing Bacteria Growth – Using Time or Temperature

- Hot and Cold holding PHF
  - Hot holding @ 135°F
  - Cold Holding @ 41°F
  - Eggs @ 45°F air temperature

- Time Alone As a Public Health Control
  - 4 hours
  - 6 hours
Time As a Public Health Control - Rationale

Logarithm_{10} of viable cells

1 2 3 4 6 8 10 12 13 14 15 16

Time (in hours)

LAG PHASE

LOG PHASE

STATIONARY PHASE

DEATH PHASE
Preventing Bacteria Growth – Proper Holding

- Date Marking Ready-to-Eat, Potentially Hazardous Food
  - Limits growth of *Listeria monocytogenes* which can grow at refrigeration temperatures
  - 7 days at 41°F
  - There are a few exceptions.
Preventing Bacteria Growth - Proper Cooling

- 135º to 41ºF in 6 hours, 135º to 70ºF within first 2 hours
- Ambient (@ room temp or pre-chilled) to 41ºF within 4 hours
- Controls for *Clostridium perfringens*, *Clostridium botulinum*, and *Listeria monocytogenes* mainly
Cleaning and Sanitizing Food-Contact Surfaces
Cleaning and Sanitization of Equipment and Utensils

- Three step process
  - Wash
  - Rinse
  - Sanitize

- Cleaning frequency
  - If used with PHF
  - If used with nonPHF
Basis for Sanitization Time Frames

Logarithm of viable cells

1 2 3 4 6 8 10 12 13 14 15 16

Time (in hours)

LAG PHASE

STATIONARY PHASE

LOG PHASE

DEATH PHASE
Cleaning and Sanitization of Equipment and Utensils

- Sanitization
  - 5 log (99.999%) reduction
  - Hot Water Sanitization – 160°F dish surface
  - Chemical Sanitization
Cleaning and Sanitization of Equipment and Utensils

- Chemical Sanitization
  - Concentration v. contact time
  - Chlorine
  - Quaternary ammonia
  - Iodine
  - Others?
Activity

• In the chat section, type one example of how you can apply the concepts learned today to teaching science in the classroom.

• With your answer, please indicate what grade you teach.
Science & Our Food Supply
Supplementary Curriculum
Science & Our Food Supply
Supplementary Curriculum

- Worked with NSTA and an advisory committee of science teachers and food scientists
- National Science Education Standards (NSES) – Based
"Science & Our Food Supply"
Supplementary Curriculum

- Five Modules
  - Understanding Bacteria
  - Farm
  - Processing and Transportation
  - Retail and Home
  - Outbreak and Future Technology
- More than 50,000 curriculum kits distributed nationwide
About Science and Our Food Supply

- Teachers Guides for middle level and high school
- Food Safety A to Z Reference Guide
- Dr. X and the Quest for Food Safety
- Order free from www.teachfoodscience.com
Thank you to the sponsor of tonight's Web Seminar:
http://learningcenter.nsta.org
http://www.elluminate.com
National Science Teachers Association
Dr. Francis Q. Eberle, Executive Director
Zipporah Miller, Associate Executive Director
Conferences and Programs
Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars
Paul Tingler, Director
Jeff Layman, Technical Coordinator