Lesson 6. Food Protection

Foodborne Illness

January 25, 2005

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& Occupational Health Sciences

ENVIR 202: Lesson 6 1

Lesson Overview

- Three Questions
  - Why do foods present a health risk?
  - How big is the problem?
  - What can be done about it?

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Lesson Objectives

- Know the four most important factors in preventing foodborne illnesses . . .
  - Proper hand washing
  - Proper cooking and reheating of foods
  - Eliminate cross contamination
  - Proper cooling of foods

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Food Properties

- Food should be . . .
  - Safe
  - Attractive
  - Abundant
  - Nutritious

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Food Properties *Continued*

- However, food is susceptible to:
  - Spoilage
  - Contamination
  - Adulteration
- which can render it unfit to eat

E. coli Bacterium

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Foodborne Disease

- There are two types of foodborne illness
  - Infections
  - Intoxications

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Foodborne Disease Continued

- **Infections are caused by:**
  - **The presence of micro-organisms in large numbers which multiply in the gut and overwhelm the body's defenses**

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Foodborne Infections

- Amebic Dysentery
- Brucellosis
- Campylobacter enteritis
- Diarrhea(Acute)
- Viral gastroenteritis

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Foodborne Infections Continued

- Salmonellosis
- Shigellosis
- Trichinosis
- Typhoid Fever
- Infectious Hepatitis

Mallon as she was portrayed in an illustration in the June 20, 1909, edition of The New York American

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Foodborne Disease Continued

- **Intoxications are caused by chemicals or "toxins"**
  - **Produced by micro-organisms, *or by***
  - **Contamination with natural or manufactured chemicals**

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Foodborne Intoxications

- Botulism
- Staphylococcal food poisoning
- Clostridium perfrigens
- Bacillus cereus

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Foodborne Intoxications Continued

- Scromroid fish poisoning (Histamine)
- Ciguatera fish poisoning
- Paralytic shellfish poisoning (PSP)
- Amnesic shellfish poisoning (domoic acid)
- Puffer fish poisoning (tetrodotoxin)

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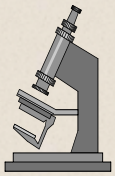
Types of Pathogens

- Sporeforming Bacteria
  - *Clostridium botulinum*
  - *Clostridium perfringens*
  - *Bacillus cereus*
- Non-sporeforming Bacteria
  - *Salmonella* spp.
  - *Campylobacter*
  - *E. coli* O157:H7
  - *Staphylococcus aureus*
  - *Listeria monocytogenes*
- Viruses
  - Hepatitis A
  - Norovirus



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Normal Symptoms
of Foodborne Disease

- Nausea
- Vomiting
- Diarrhea
- Cramps
- Headache
- Fever
- Chills
- Body Aches

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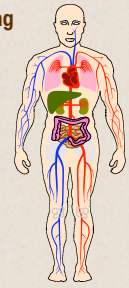
Complications
of Foodborne Illnesses

- Kidney Damage
- Blood Poisoning
- Pneumonia
- Arthritis (2% will trigger)
- HUS (5-20K cases/yr)
- Guillian Barre Syndrome



- Chronic Sporadic Toxoplasmosis
- Neurological Damage
- Pancreatic Infections
- Chronic Illness - likely to occur in 2-3% of FBIs

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High Risk Individuals

- Infants
- Children
- Pregnant Women
- Senior Citizens
- People taking medications:
  - Antibiotics
  - Antacids
  - Immuno-suppressive drugs
- Immuno-compromised people:
  - Recent major surgery
  - Pre-existing or chronic illness
  - HIV / AIDS
  - Diabetes
  - Cancer
  - Liver or Kidney Damage
  - Ulcers

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Contributing Factors

- Factors Contributing to an increased risk of Foodborne Illness
  - Aging Populations
  - Lifestyles of the Public
  - New and Emerging Pathogens
  - Increase in High Risk Individuals
  - New Processing Methods for Foods
  - New Sources of Foods - Geographic

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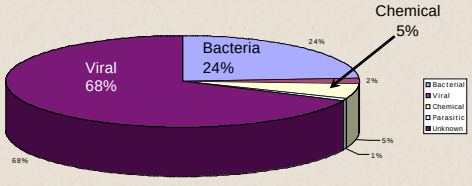
Foodborne Disease Outbreaks

United States, 1993-1997



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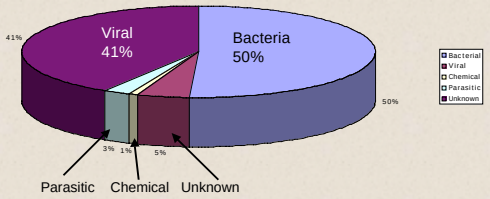
Foodborne Disease Cases

United States, 1993 - 1997



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Foodborne Disease

Reported Incidence

- Believed to be only the tip of the iceberg
- 1% or less are even reported
- 76 million cases annually

Image courtesy of Douglas Armand Digital Imaging
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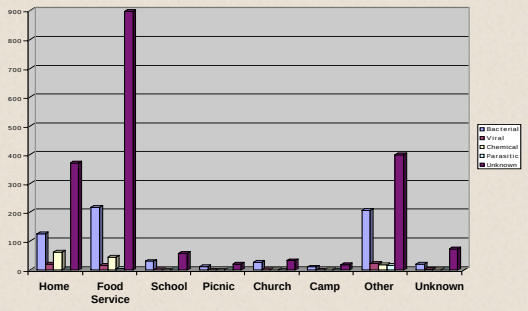
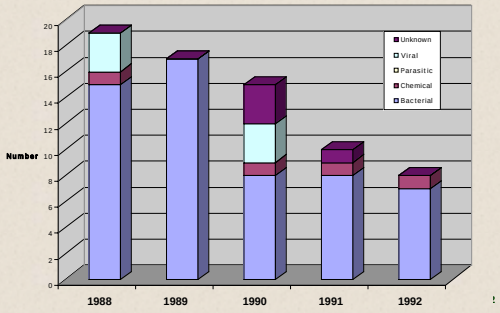
Foodborne Disease Outbreaks

United States, 1993-1997



Deaths from Food

United States, 1988 - 1992



Distribution of Outbreaks

United States, 1995

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Foodborne Illness in Washington

- **Estimated Annual Number of Food-borne Illnesses in Washington State**
  (extrapolated from CDC U.S. estimates - 2000)
  - **1.5 million illnesses**
  - **6500 hospitalizations**
  - **100 deaths**

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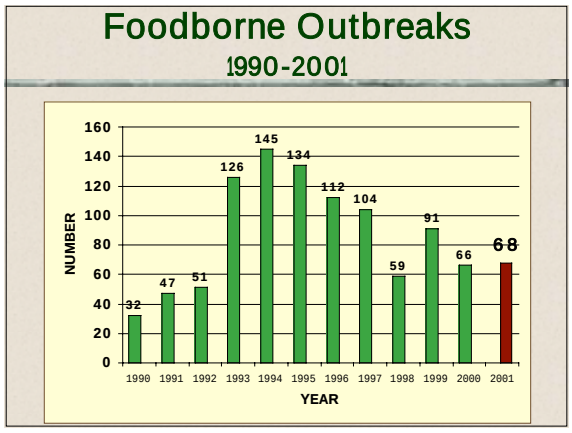
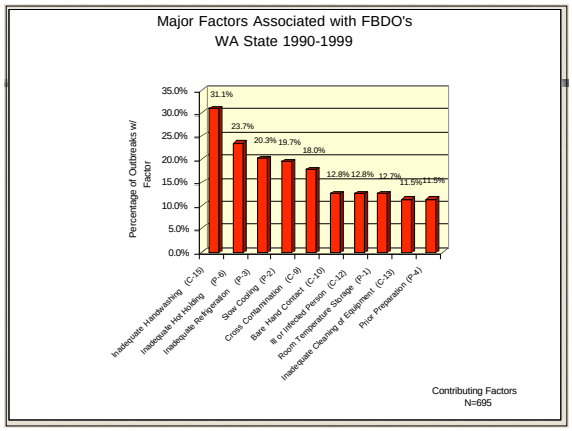
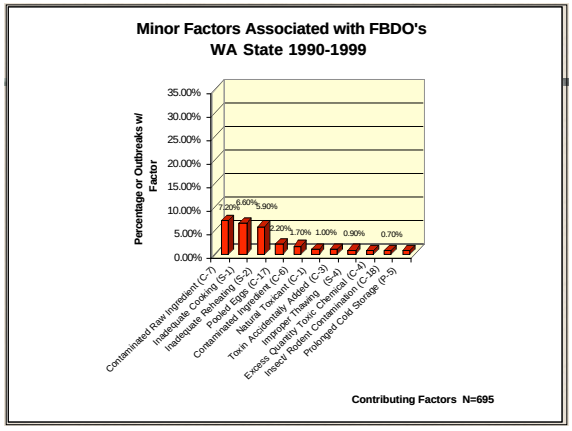
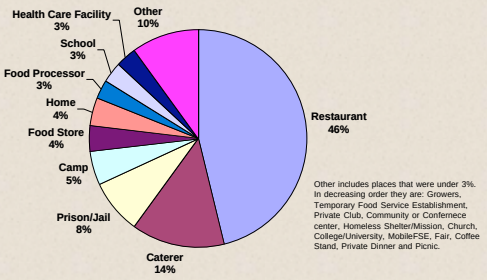

Foodborne Outbreaks
1990-2001
NUMBER
YEAR
32
47
51
126
145
134
112
104
59
91
66
68
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001


Major Factors Associated with FBDO's
WA State 1990-1999
Percentage of Outbreaks w/ Factor
31.1%
23.7%
20.3%
19.7%
18.0%
12.8%
12.8%
12.7%
11.5%
11.5%
Inadequate Handwashing (C-15)
Inadequate Hot Holding (P-8)
Inadequate Refrigeration (P-3)
Slow Cooling (P-2)
Cross Contamination (C-9)
Bare Hand Contact (C-10)
Ill or Infected Person (C-12)
Room Temperature Storage (P-1)
Inadequate Cleaning of Equipment (C-13)
Prior Preparation (P-4)
Contributing Factors
N=695


Minor Factors Associated with FBDO's
WA State 1990-1999
Percentage or Outbreaks w/ Factor
7.20%
8.60%
5.90%
2.20%
1.70%
1.00%
0.90%
0.70%
Contaminated Raw ingredient (C-7)
Inadequate Cooking (S-1)
Inadequate Reheating (S-2)
Pooled Eggs (C-17)
Contaminated Ingredient (C-6)
Natural Toxicant (C-1)
Toxin Accidentally Added (C-3)
Improper Thawing (S-4)
Excess Quantity Toxic Chemical (C-4)
Insect/ Rodent Contamination (C-16)
Prolonged Cold Storage (P-9)
Contributing Factors N=695

Foodborne Disease Outbreaks by Place, 1990 -1999, Washington State



Other includes places that were under 3%. In decreasing order they are: Growers, Temporary Food Service Establishment, Private Club, Community or Conference center, Homeless Shelter/Mission, Church, College/University, Mobile/FSE, Fair, Coffee Stand, Private Dinner and Picnic.

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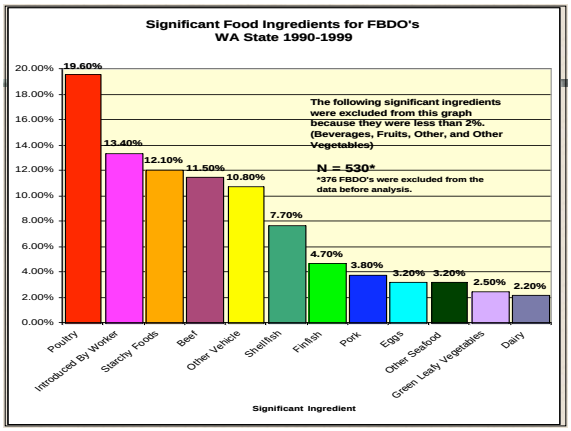
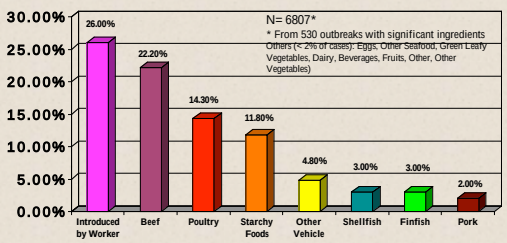


Cases of Illness

Significant Food Ingredients in Foodborne Disease Outbreaks in Washington State 1990-1999



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Trends

- In the 80's...
  - Was beef
  - Was turkey
  - Was roast beef and turkey
  - Some viruses
  - Was Salmonella
  - Some Mexican /Chinese
  - Was cooling
  - E. coli emerged
  - No Fruit/Vegetable outbreaks
- In the 90's...
  - Now hamburger
  - Now chicken
  - Now RTE foods & Starchy foods
  - Now nearly 1/2 the cases are viral
  - Still Salmonella
  - Increased Mexican/ Chinese + others
  - Now handwashing
  - O157:H7, Crypto, Etc.,
  - Lots of F/V – sprouts, juice, melons, green leafys, etc...

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Disease Causation Factors

- Food Handling Practices:
  - Poor Handwashing
  - Cross Contamination
  - Improper Heating
  - Improper Cooling

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Disease Causation Factors

Continued

- Diversity in the Food Industry
  - Changes in eating habits
  - More types of foods (ethnic, seasonal)
  - Greater shelf life (transportation)
  - More foods are imported
  - New food products are coming out
  - New food processes

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Questions

Lesson 6. Food Protections

Food Safety

January 27, 2005

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Department of Environmental & Occupational Health Sciences

Disease Causation Factors

- **Inherent properties of food:**
  - **Most foods are grown or raised in proximity to bacteria and other micro-organisms in the soil and water**
  - **A nutrient source by definition**
  - **Moisture + Nutrients**
    - **a substrate for bacteria and other micro-organisms**

Hazardous Foods

6.1 Potentially Hazardous Food.

- (a) "Potentially hazardous food" means a food that is natural or synthetic and that requires temperature control because it is in a form capable of supporting:
  - (i) The rapid and progressive growth of infectious or toxigenic microorganisms;
  - (ii) The growth and toxin production of *Clostridium botulinum*; or
  - (iii) In raw shell eggs, the growth of *Salmonella enteritidis*.
- (b) "Potentially hazardous food" includes an animal food (a food of animal origin) that is raw or heat-treated; a food of plant origin that is heat-treated or consists of raw seed sprouts; cut melons; and garlic-in-oil mixtures that are not modified in a way that results in mixtures that do not support growth as specified under Subparagraph (a) of this definition.

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Hazardous Foods Continued

- (c) "Potentially hazardous food" does not include:
  - (i) An air-cooled hard-boiled egg with shell intact;
  - (ii) A food with an Aw value of 0.85 or less;
  - (iii) A food with a pH level of 4.6 or below when measured at 24°C (75°F);
  - (iv) A food, in an unopened hermetically sealed container, that is commercially processed to achieve and maintain commercial sterility under conditions of non-refrigerated storage and distribution; and
  - (v) A food for which laboratory evidence demonstrates that the rapid and progressive growth of infectious or toxigenic microorganisms or the growth of *S. enteritidis* in eggs or *C. botulinum* can not occur, such as a food that has an aw and a pH that are above the levels specified under Subparagraphs (c)(ii) and (iii) of this definition and that may contain a preservative, other barrier to the growth of microorganisms, or a combination of barriers that inhibit the growth of microorganisms.
  - (vi) A food that does not support the growth of microorganisms as specified under Subparagraph (a) of this definition even though the food may contain an infectious or toxigenic microorganism or chemical or physical contaminant at a level sufficient to cause illness.

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Disease Causation Factors

Continued

- **Increasing Demand Leads to:**
  - Greater use of pesticides
  - Greater use of fertilizers
  - Use of growth promoters
  - Use of growth regulators
  - "Bio-engineered" foods

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Disease Causation Factors
Continued

- Nature of the Food Service Industry
  - Employee turnover
  - Insufficient supervision & training
  - Improper food handling
  - Time/Temperature abuse
  - Poor sanitation practices

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Disease Causation Factors
Continued

- Food Handling Practices:
  - Poor hand washing
  - Cross contamination
  - Improper heating
  - Improper cooling

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Contributing Factors

- Factors Contributing to an increased risk of Foodborne Illness
  - Aging Populations
  - Lifestyles of the Public
  - New and Emerging Pathogens
  - Increase in High Risk Individuals
  - New Processing Methods for Foods
  - New Sources of Foods - Geographic

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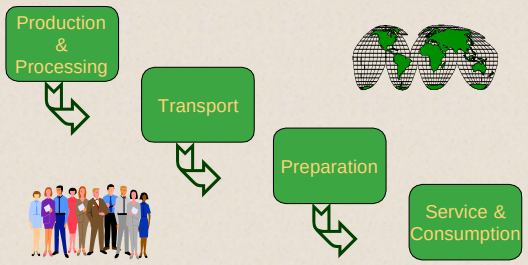
Foodborne Disease Causation



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Food Protection

- We need to do something to reduce the burden of foodborne disease in our state
- High risk establishments are extremely important
- If we know what is causing the people to become ill then we can effect change (regulatory, inspectional and educational emphasis)
- Concentrate our efforts where they will do the most good –the most bang for the buck!

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Food Hazards

- 10 most frequently observed hazards
  1. Improper cooling
  2. Prolonged holding of prepared foods (danger zone 70-120 F for 4 or more hours)
  3. Poor personal hygiene
  4. Failure to rapidly reheat food before serving
  5. Improper hot holding

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Food Hazards Continued

- Most frequently observed hazards
  6. Contaminated raw foods or ingredients.
  7. Use of food from unapproved sources
  8. Improper cleaning of utensils
  9. Cross-contamination from raw to cooked foods
  10. Inadequate cooking times.

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The Big Four

- Handwashing
- Cross contamination
- Improper heating / hot holding
- Improper cooling / cold holding

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What Can Be Done?

"Food Safety: You Make the Difference"

Video designed and produced by the Seattle-King County Department of Public Health for food service workers

Shows how these four simple concepts are put into practice

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HACCP

- **H**azard
- **A**nalysis and
- **C**ritical
- **C**ontrol
- **P**oints

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HACCP Approach

- A food protection system largely used in the food processing industry.
- Looks at the whole chain of events in a food operation.
- Identify and concentrate on the "critical" control points, i.e.,
  - If everything else goes wrong, what is the one thing we can do to keep people from getting sick?

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HACCP - 7 steps

- Conduct a hazard analysis of high risk foods (create a flow diagram)
- Identify critical control points (cooking, chilling, sanitation, etc.)
- Establish critical limits (boundaries of safety)
- Develop critical control point monitoring procedures

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HACCP Continued

- Pre-set corrective action
- Create effective record keeping system
- Establish verification procedures to make sure the system is working.

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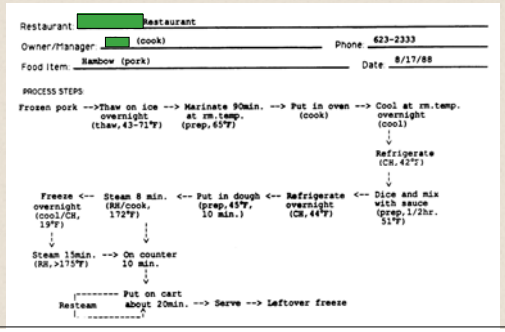
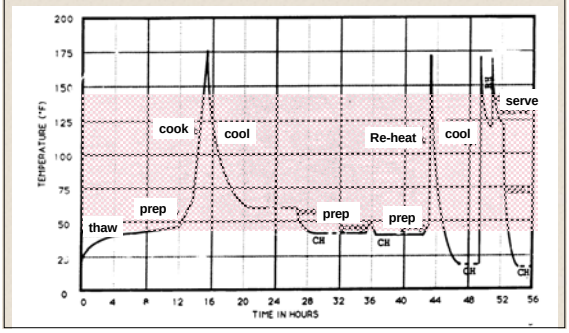
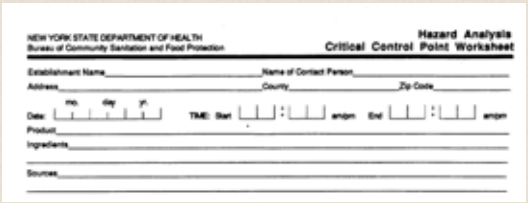
HACCP Example



HACCP Example



HACCP Worksheet



NEW YORK STATE DEPARTMENT OF HEALTH
Bureau of Community Sanitation and Food Protection

Hazard Analysis Critical Control Point Worksheet

Establishment Name_____ Name of Contact Person_____

Address_____ County_____ Zip Code_____

Date: mo. ___ day ___ yr. ___ TIME: Start ___:___ am/pm End ___:___ am/pm

Product_____

Ingredients_____

Sources_____

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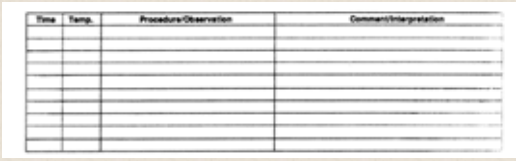
HACCP Worksheet



Time	Temp.	Procedure/Observation	Comment/Interpretation

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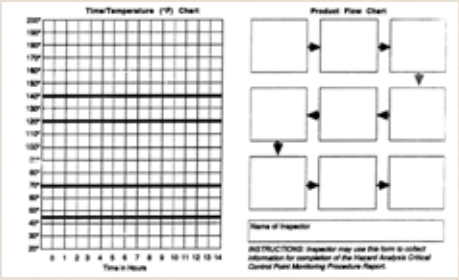
HACCP Worksheet



Time/Temperature (°F) Chart

Product Flow Chart

Name of Inspector

INSTRUCTIONS: Inspector may use this form to collect information for completion of the Hazard Analysis Critical Control Point Monitoring Procedure Report.

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Lesson Summary

- Foods inherently present a health risk.
- The problem is huge, but not usually fatal.
- There are simple yet effective solutions to most food safety problems

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Questions

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Next Lesson

Water & Wastewater

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