

Identifying Biological Hazards and Controls

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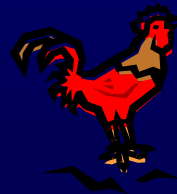
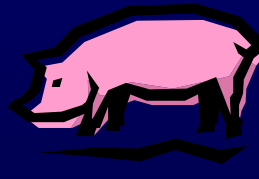
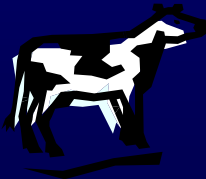


Food-Borne Disease

- **6.5 Million Cases Annually**
- **9100 Fatalities**
- **\$1 Billion to \$10 Billion Annually**
 - **Industry Losses**
 - **Medical Expenses**
 - **Lost Work Time**

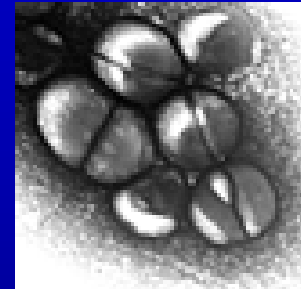
Foods Involved in Outbreaks

- **Primarily of Animal Origin**
 - 48% from Beef, Poultry, Eggs, Pork, Fish, Dairy Products
 - **Animal Products**
 - High in Nutrients
 - High Water Activity
 - Provide an Excellent “Food” for Microorganisms
 - Intestinal Tract is a Source of Pathogens

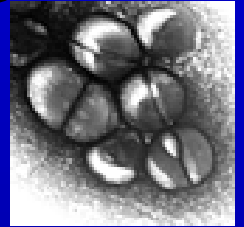


Food-Borne Pathogens

- *Staphylococcus aureus*
 - Food Intoxication
 - Pathogen Must Grow in the Food and Produce Toxin
 - Toxin Causes Illness and is Heat Stable
 - Live (vegetative) Cells do NOT have to be Consumed



Food-Borne Pathogens



- ***Staphylococcus aureus***
 - Food Must be Temperature Abused for this Illness to Occur
 - Humans are Carriers of this Illness
- **Control**
 - Good Personal Hygiene
 - Keep Foods out of the Temperature Danger Zone

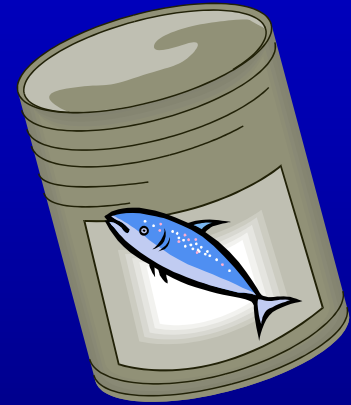
Food-Borne Pathogens

- ***Clostridium perfringens* and *C. botulinum***
 - ***C. perfringens* - Poultry**
 - **Must Consume Vegetative Cells**
 - ***C. botulinum* - Bacon (soil is original source)**
 - **Toxin**
- **Spore Forming Bacteria**
- **Survives Heating/Cooking Process**

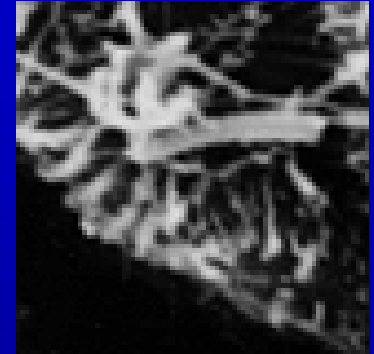


Clostridium spp. - Control

- *C. botulinum*
 - Nitrates and Nitrites
 - pH
 - Toxin is NOT Heat Stable
 - Retort (canned products)
- *C. perfringens*
 - Will survive in Cooked Product
 - Avoid Temperature Abuse After Cooking



Food-Borne Pathogens



- ***Salmonella***
 - **All Meats can be Sources**
 - **30% of Poultry Carry *Salmonella***
 - **Some Humans are Carriers**
 - **Intestinal Tracts of Animal**
 - **Live Cells Must Be Consumed to Cause Illness**

***Salmonella* - Control**

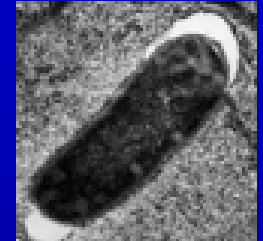
- **Proper Cooking**
- **Avoid Cross-Contamination After Cooking**
- **Use only Pasteurized Egg Products or Cook any Product That has Eggs Added**
- **Good Personal Hygiene**

Food-Borne Pathogens

- *Campylobacter*
 - #1 Cause of Food-Borne Illnesses
 - Harbored in the Intestinal Tract of Animals
 - Very Sensitive to Environment
 - Cooking
 - Oxygen
 - Drying



Food-Borne Pathogens



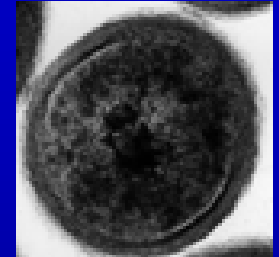
- ***E. coli* O157:H7**
 - This organism does not have to Grow in Food to Cause Illness
 - Low Infectious Dose
 - Harbored in the Intestinal Tract of Animals
 - Cattle, Sheep, Deer, other Farm Animals

***E .coli* O157:H7 - Control**

- **Cooking**
 - **160 F for 15 Seconds**
- **Temperature Control**
 - **Less than 45-40 F**
 - **Fewer Cells = Less Likely to Cause Illness**



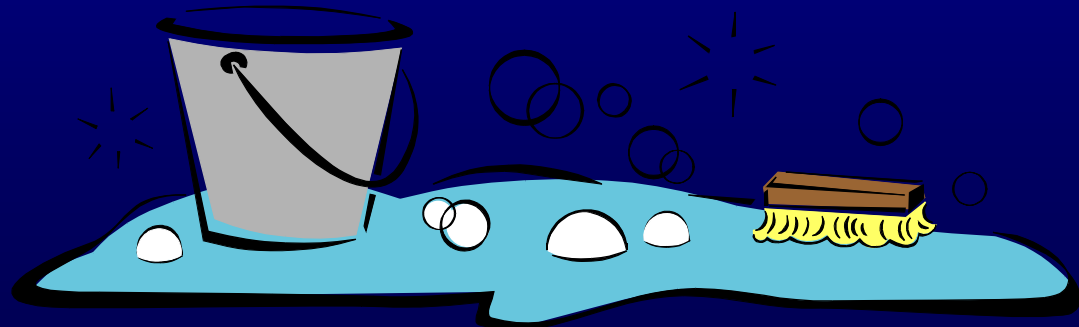
Food-Borne Pathogens



- ***Listeria monocytogenes***
 - **Concern in Processed Products**
 - **Harbored in Intestinal Tract of Animals and the Environment**
 - **Believed to Originate in Plant Environment**
 - **Grows at Refrigeration Temperature**

Listeria monocytogenes - Control

- Control
 - Plant Sanitation
 - Proper Cooking
 - Low pH
 - Low Aw



Addressing LM in RTE Foods

- *Listeria monocytogenes* is a **SANITATION** issue
- Should be Addressed in Sanitation SOP's
- Testing for “generic” *Listeria*
- If counts Increase then Test for LM and Product Testing
- Guidelines to Prevent Post-Processing Contamination from *Listeria monocytogenes* DFES 19: 551-562.

Exponential Growth of Bacteria

Bacteria Held at Room Temperature

<u>Time</u>	<u>Bacteria/Gram</u>
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0	1000
30 min	2000
1 Hour	4000
1.5 Hour	8000
2 Hours	16000
5 Hours	1000000

Holding at Refrigeration Temps will Slow Growth

General Control Measures

- **Prevent Contamination**
- **Temperature Control**
 - **Less Than 40-45 F**
 - **Proper Cooking Temperatures**
- **Good Sanitation**
 - **Remove Residual Bacteria from Equipment**
- **Prevent Cross Contamination**
 - **Employee Hygiene**

Intrinsic Factors that Affect Microbial Growth

- Temperature
- Nutrients
- Water Activity
- Oxygen
- pH
- Naturally Occurring Antimicrobial Factors
- Biological Structure



Identifying Hazards Within Your Plant

- **Know Your Product**
 - **Cooked vs Raw**
 - **Intrinsic Factors**
- **Know What Outbreaks have Been Associated with Your Product**
- **Be Aware of Potential Dangers**