



Microbiological Considerations Related to Poultry Products

For the FSIS “How to” Workshops

Spring 2009

Presented by

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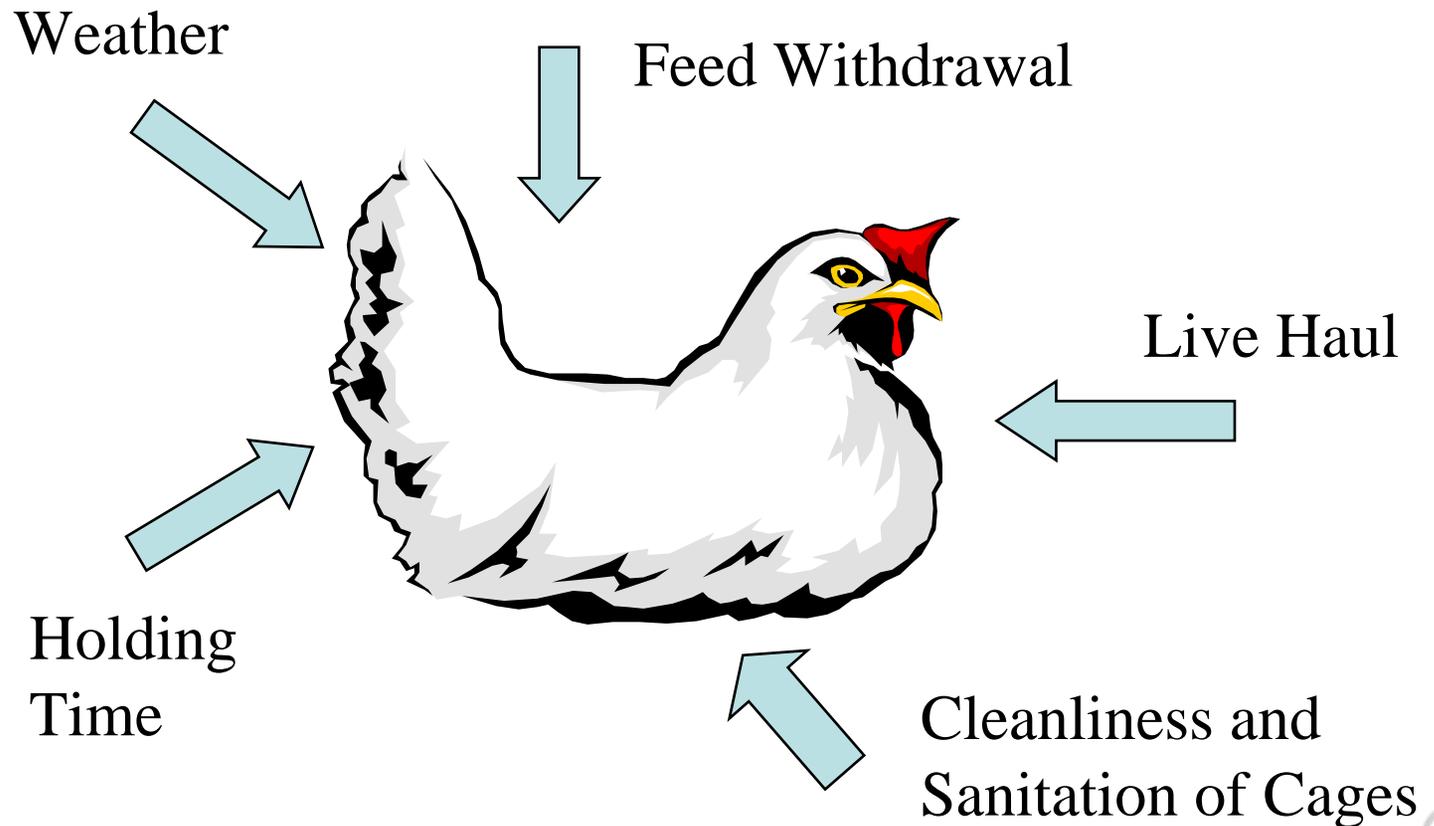
Objectives

By the end of this workshop, you will be able to

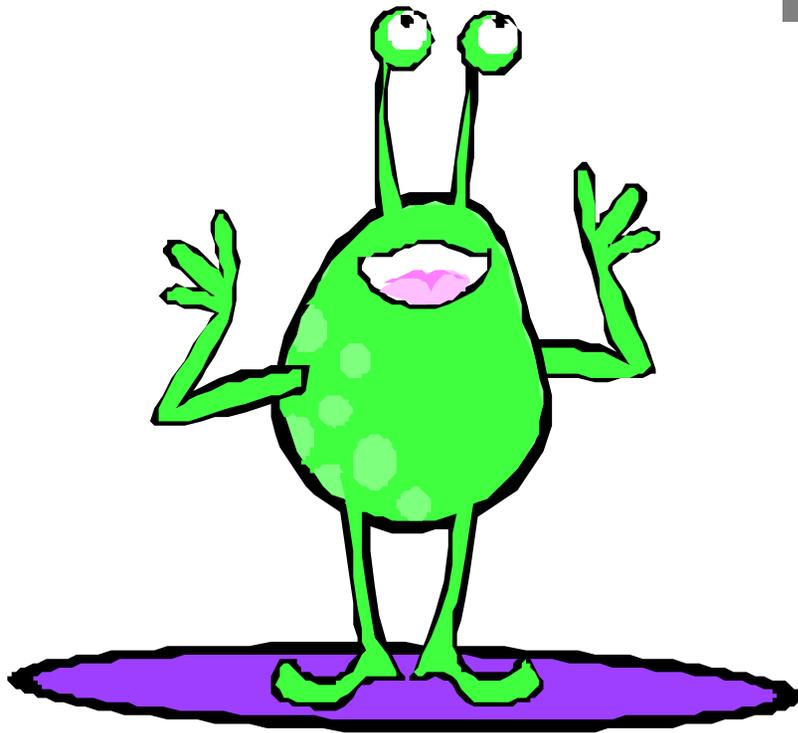
- Understand bacterial growth
- Understand sources of bacterial contamination
- Implement practices to help prevent the growth of bacteria in your operations



How Do Poultry Carcasses Become Contaminated?



How Rapidly Do Bacteria Grow?



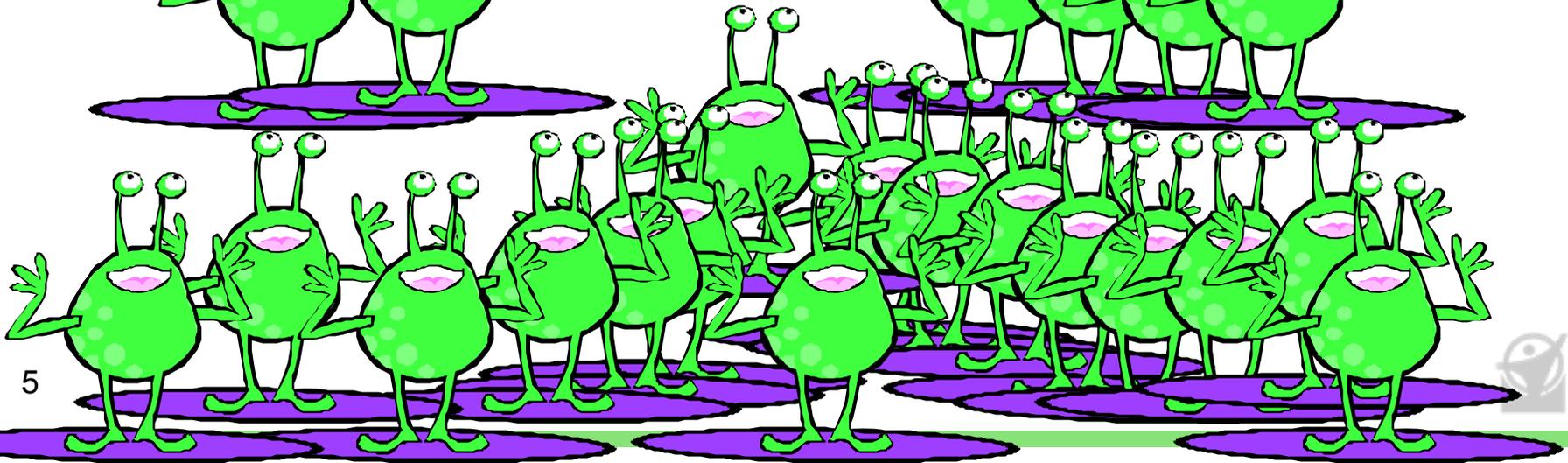
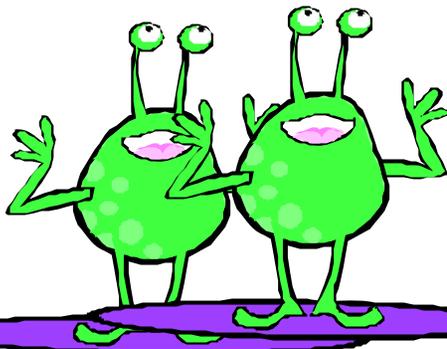
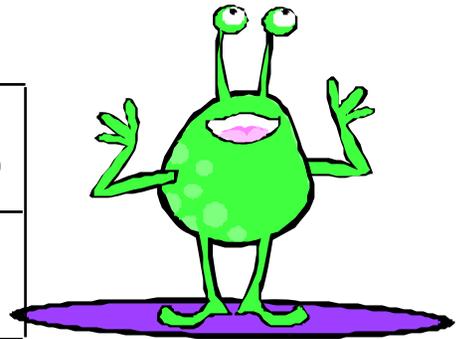
- Under optimum conditions, bacteria can grow in as little as 15 minutes



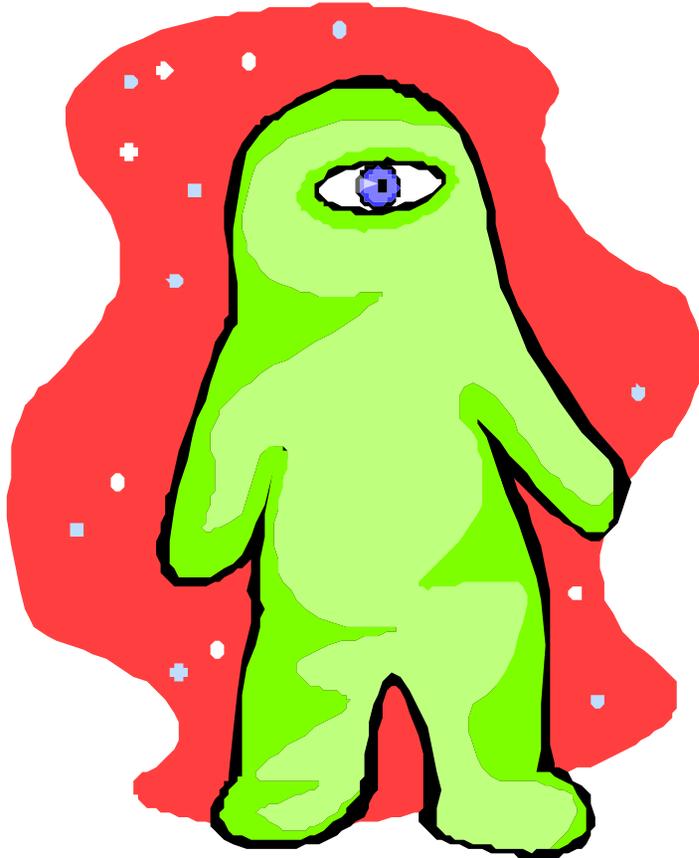
Bacterial Growth Rate



Cells:	40	80	160	320	640	1,280	2,560	5,120
Time:	0	15	30	45	60	75	90	105



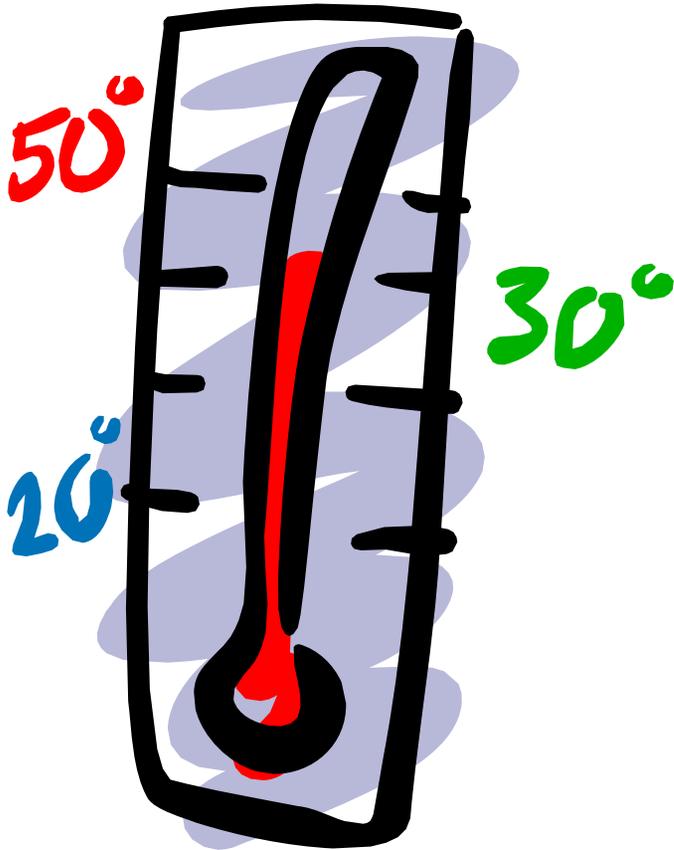
Bacteria



- Some bacteria have a slime layer or capsule around them
- Some bacteria produce spores
 - Spores allow bacteria to survive in adverse conditions



Psychrotrophs



- Grow at refrigerated temperatures
- Ice may serve as a source if it is not made, stored, and transported properly
- Water may serve as a source
- Many spoilage organisms are psychrotrophs



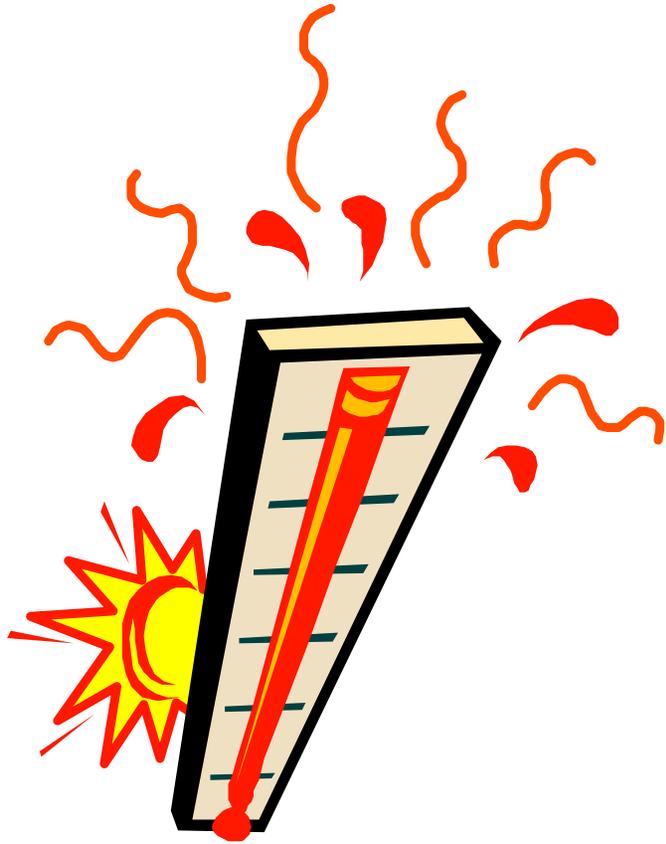
Mesophiles



- Grow optimally at temperatures similar to human and animal body temperatures
- Most pathogens are mesophiles
- *Salmonella* and *Campylobacter* are mesophiles



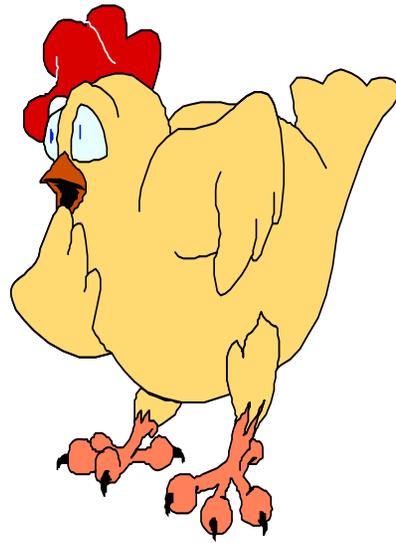
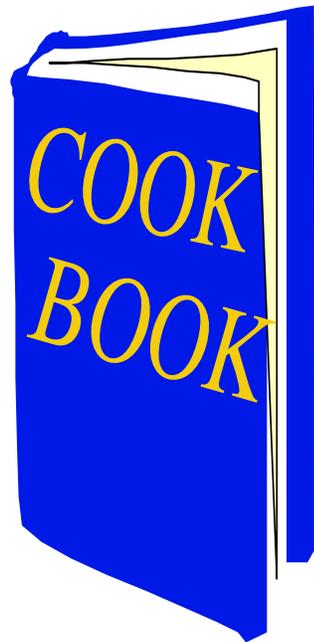
Thermophiles



- Grow at higher temperatures
- Not a problem for raw poultry
- Problems usually arise in canned foods that are not cooled properly



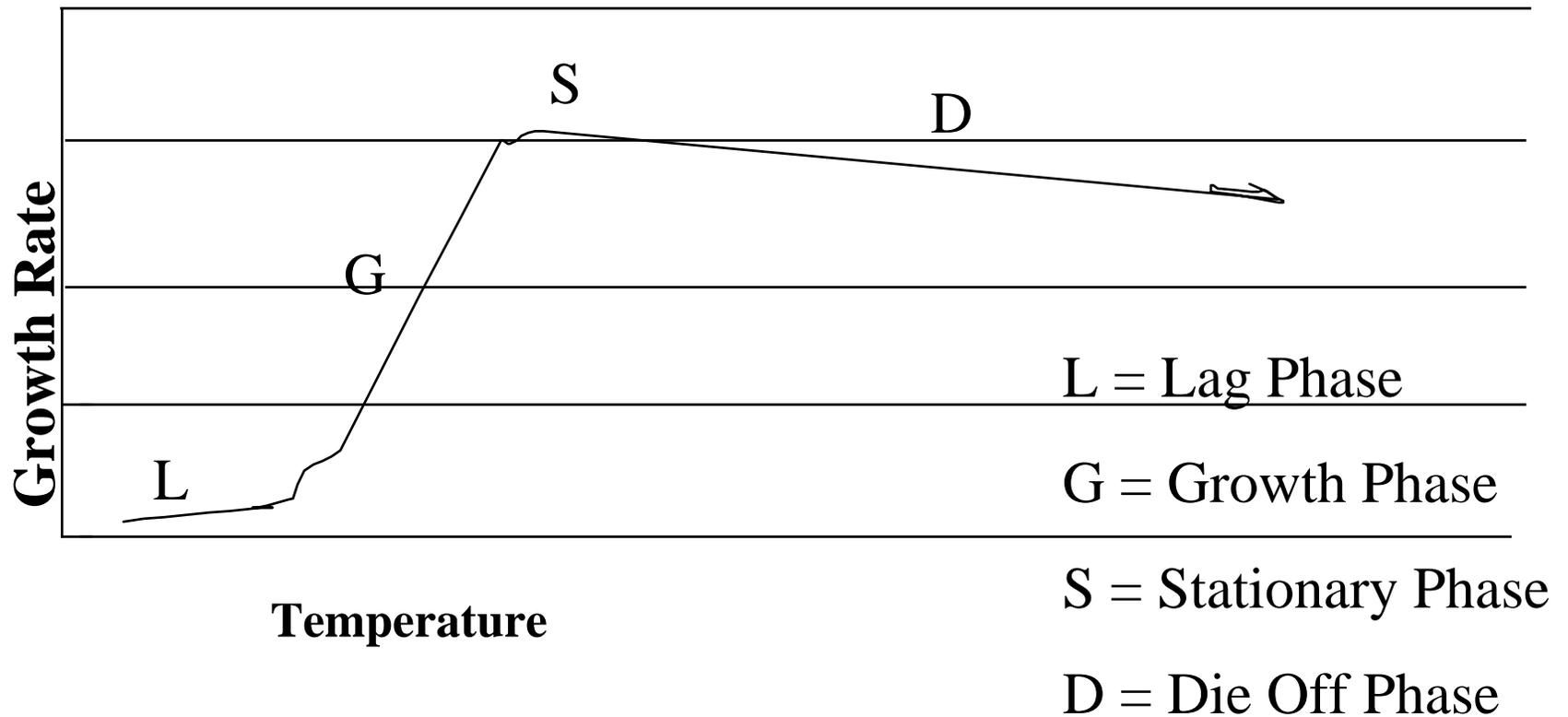
Major Factors Affecting Growth of Bacteria in Food



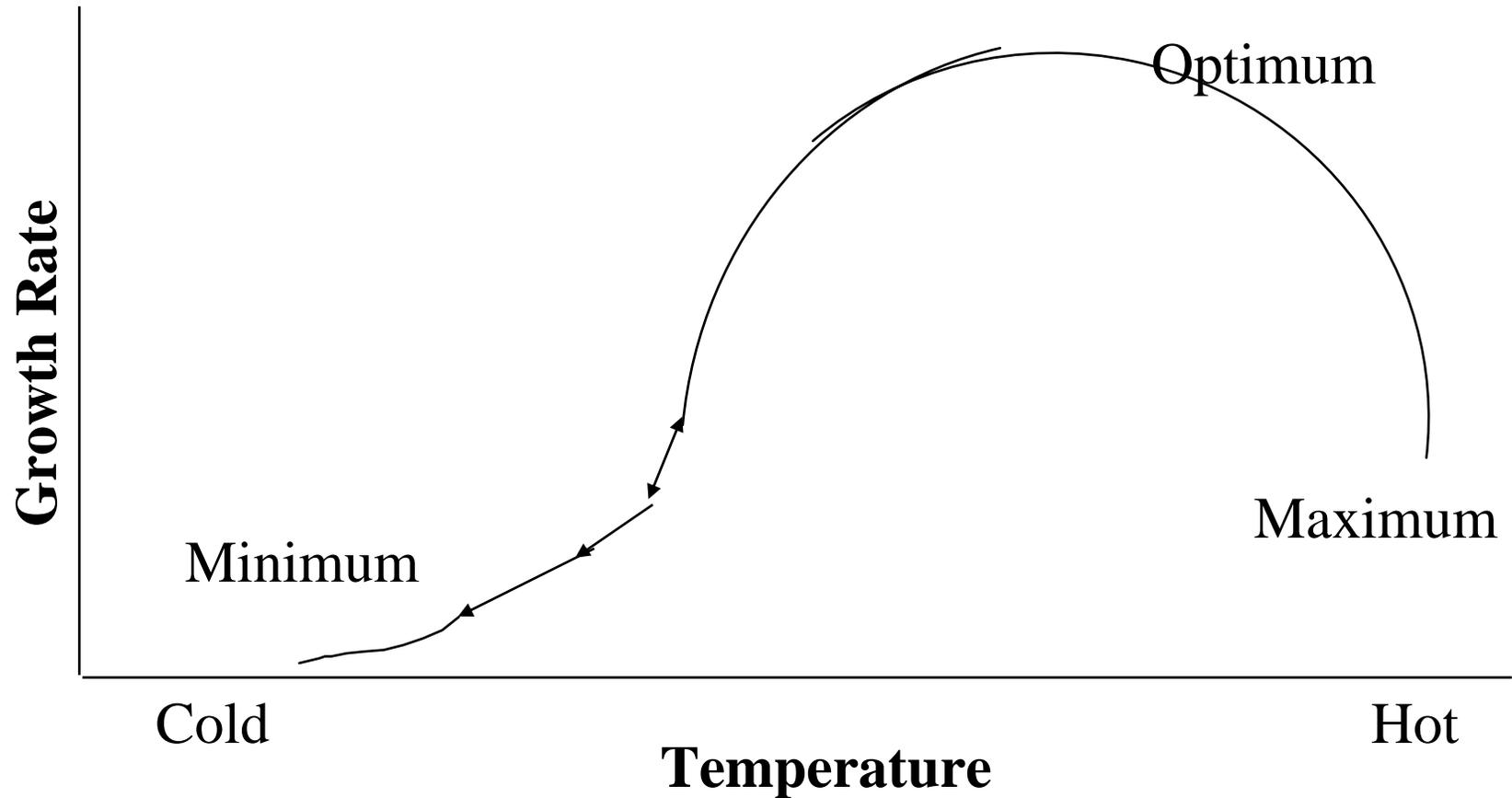
- Temperature
- Time
- Oxygen
- Nutrients
- Microbial interactions
- pH
- Water activity



Bacterial Growth Curve



How Temperature Affects Growth Rate of a Bacterial Population



Time/Temperature



- The length of time at a particular temperature directly affects the growth rate
- To minimize the growth rate of pathogens, it is important to minimize the time at which poultry is held at temperatures that allow growth



FSIS Microbiological Baseline Data for Broilers (1994–1995)



- This survey found that 98% of the samples contained one or more of the six pathogenic bacteria tested for in the survey



Prevalence of Selected Bacteria in Broiler Samples



Selected Bacteria	% Positive
<i>E. coli</i> (generic)	99.6
<i>Salmonella</i>	20.0
<i>Campylobacter jejuni/coli</i>	88.2
<i>Staphylococcus aureus</i>	64.0
<i>Listeria monocytogenes</i>	15.0



Numbers of Pathogens on Broiler Carcasses



<i>Campylobacter jejuni</i>	5,300 cfu
<i>Staphylococcus aureus</i>	3,200 cfu
<i>Clostridium perfringens</i>	1,800 cfu
<i>Salmonella</i>	40 cfu
<i>Listeria monocytogenes</i>	30 cfu

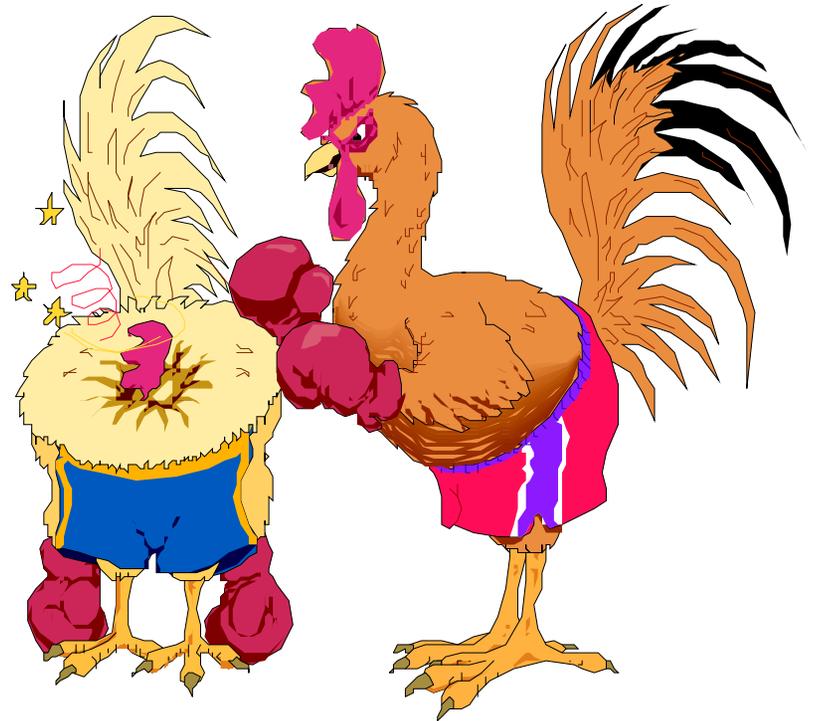
Calculated by Dr. Don Conner, Auburn University



Microbial Concerns for Poultry Products

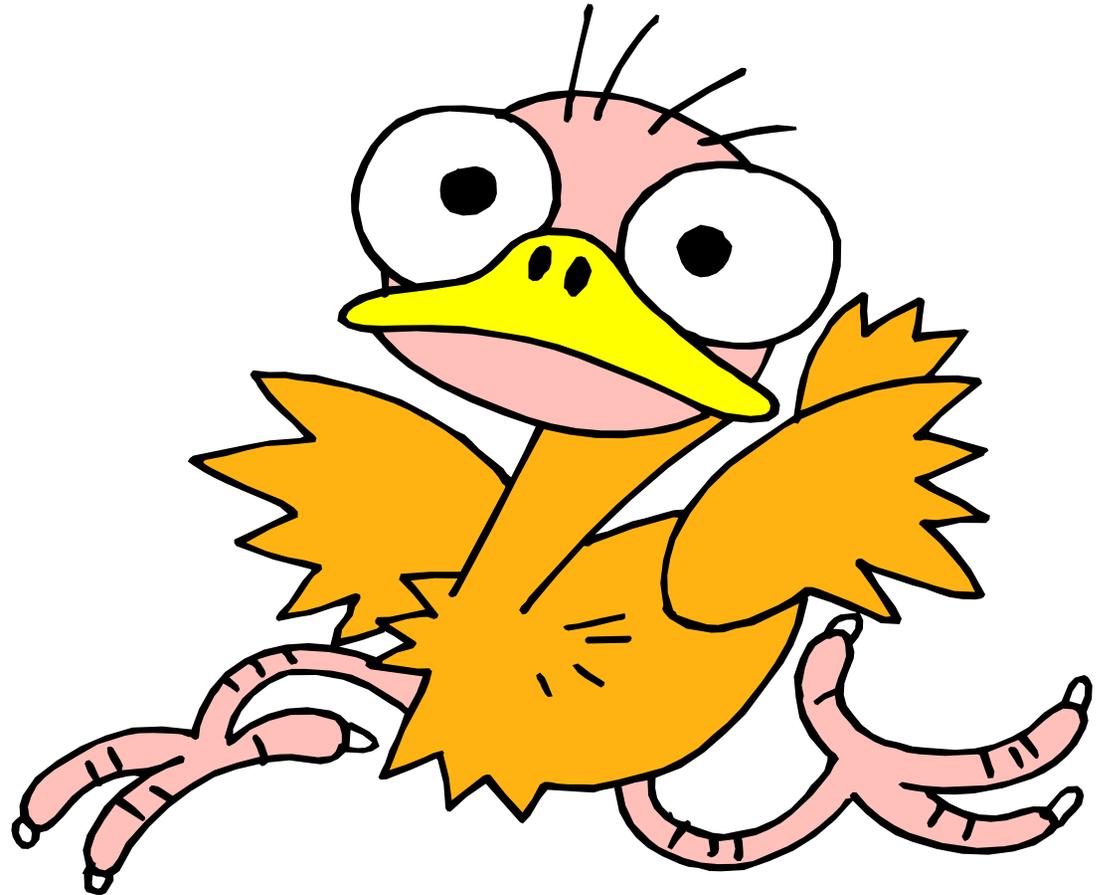


- Foodborne pathogens
- Fecal contamination
- Spoilage organisms



Primary Sources of Bacteria

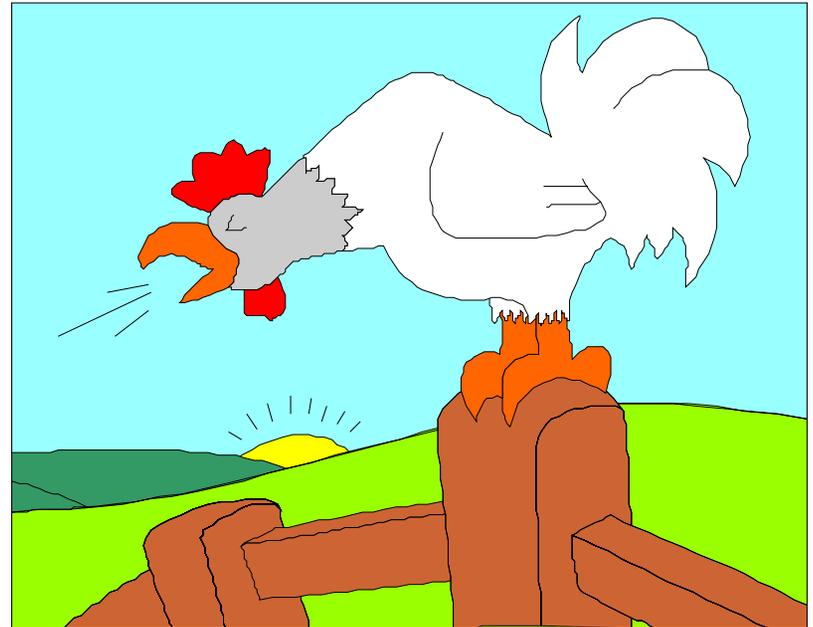
- Feces
- Ingesta
- Feathers
- Skin
- Feet
- Equipment
- People



Primary Sources of Contamination



- Growout
 - Farm sanitation
 - Feed withdrawal
 - Feral animals
- Livehaul
- Holding



Secondary Sources of Contamination



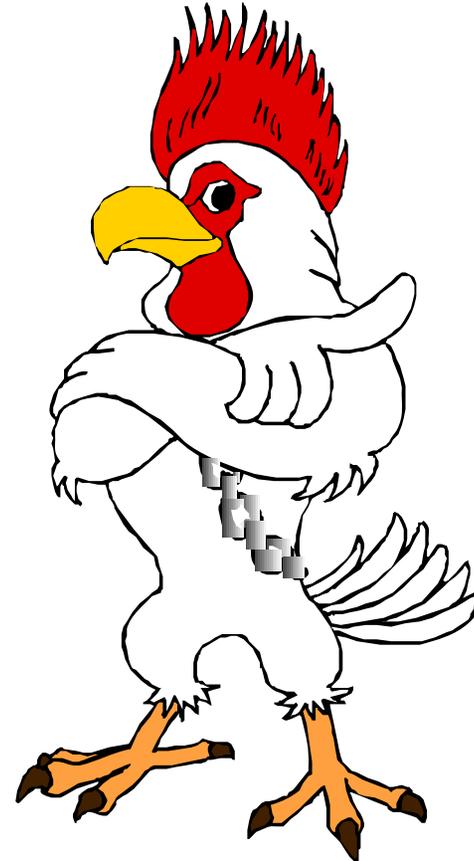
- Secondary sources
 - Workers
 - Water
 - Fomites
 - Pests
- Factors affecting secondary contamination
 - Sanitation
 - Good manufacturing practices (GMPs)
 - Worker practices
 - Worker training



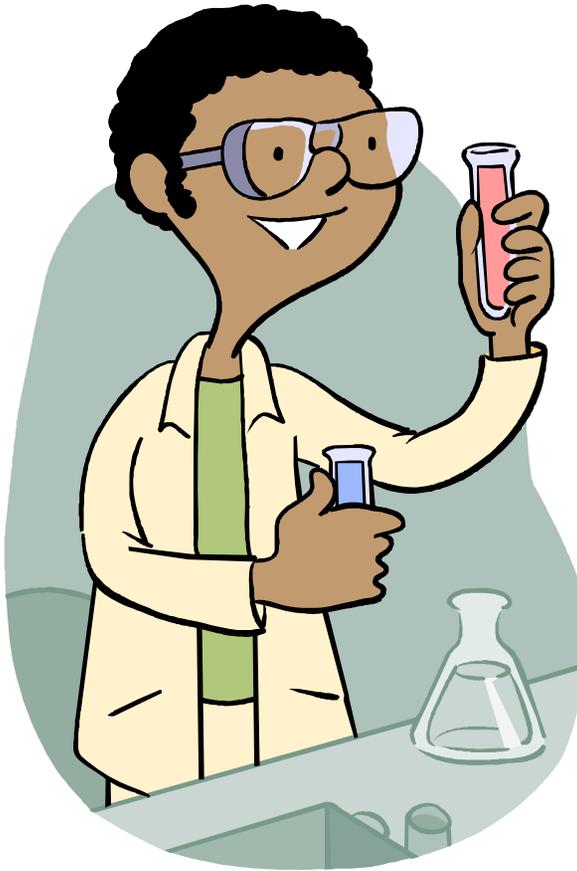
Principles of Controlling Bacteria



- Kill bacteria
- Prevent or reduce number of bacteria
- Inhibit growth of bacteria



Killing Methods



- Chemicals
 - Chlorine
 - Chlorine dioxide
 - TSP
- Temperature
 - Heat
 - Cold
- Irradiation



To Reduce Spread and Overall Numbers

- Prevent fecal contamination
- Prevent cross-contamination
 - Water and air
 - Handling (worker and equipment)
 - Bird to bird



Prevent Growth



- Time and temperature control
- Nutrients and water are difficult to control during processing
- Sanitation removes nutrients and excess water



Carcass Washing

- Carcass washing will NOT remove bacteria
- Varies in effectiveness

