Chapter 5 – Limitation of Growth of Bacteria

Notes

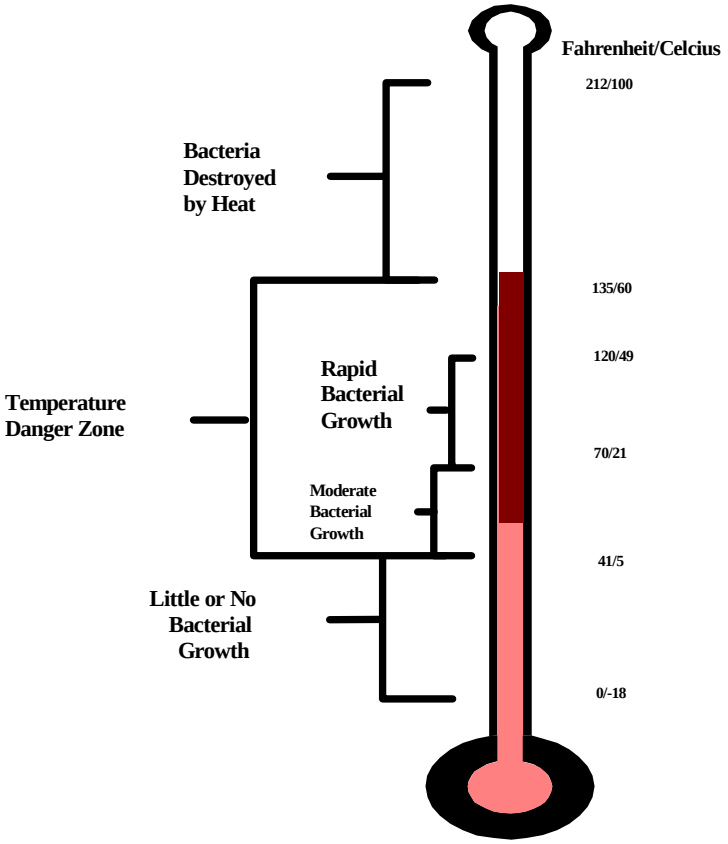
EFFECTS OF TEMPERATURE ON BACTERIA

Because of the unique survival capabilities of bacteria, it is important to limit their growth in food as much as possible. Bacterial growth is exponential. This means that bacteria can double every few minutes. Their growth potential is shown in the following table:

EFFECTS OF TEMPERATURE ON BACTERIA		
Commercial canning temperatures (can only be obtained under pressure)	250°F	Food products essentially sterile. *C. botulinum* spores destroyed. *S. aureus* toxin not inactivated at these temperatures.
	240°F	
Water boils	212°F	Spores of *C. botulinum* and *C. perfringens* can survive for hours. Toxin of *C. botulinum* inactivated.
	165°F	Most bacteria die; some spore-forming bacteria survive.
	140°F	No bacteria growth; some survive.
DANGER	135°F	
	125°F	Some

ZONE		
Hottest temperature hands can endure		bacterial growth; many survive.
Body temperature	98.6°F	Greatest bacterial growth and toxin production by some.
Room temperature	70°F	Rapid bacterial growth and toxin production by some.
Keep food safe: ***135°F or above OR 41°F or below***	46°F	
	41°F	Some bacterial growth.
Water freezes	32°F	No bacterial growth; many survive.
	0°F	Slow death for many bacteria; some survive.

The following diagram can also be helpful to visualize temperature effects.



Limiting bacterial growth is done by a time-temperature control process. This process is critical during thawing, holding, preparation, cooling and during the transportation of foods. Time-temperature control refers to a combination of both time and temperature to control for bacterial growth. Foods that have been maintained at unsafe temperatures for more than 4 hours MUST be discarded. This 4 hour time frame is **cumulative and includes** the time necessary for receiving, storing, preparation, cooking, cooling, holding, and reheating.

☞ **Thawing**. Potentially hazardous foods must be thawed as fast as possible to limit bacterial growth during the process.

The following methods of thawing potentially hazardous foods are acceptable:

- Under refrigeration;
- Under running water 70°F or less with sufficient water flow; or
- As part of a continuous cooking process.

Thawing at room temperature is not acceptable.

Holding. Potentially hazardous foods must be held outside of the bacteria optimum growth temperature zone (**DANGER ZONE**), which is 41°F to 135°F. Remember:

- **HOT HOLDING – 135°F OR ABOVE**
- **COLD HOLDING – 41°F OR BELOW**

Potentially hazardous foods held in the danger zone for **MORE THAN 4 HOURS** are considered ***adulterated*** and may cause a foodborne outbreak if consumed. Adulterated foods MUST be discarded.

Frozen food must be held in the frozen state in such a manner to preclude thawing.

Any foods that will be cold held for more than 24 hours, must be date marked and used or discarded within 7 days!

Preparation. Potentially hazardous ingredients for foods that will be consumed without further cooking (salads, sandwiches, filled pastry products, etc.) and reconstituted and fortified foods must be pre-chilled to **41°F OR BELOW** prior to preparation. Failure to do so may contribute to increased bacterial growth.

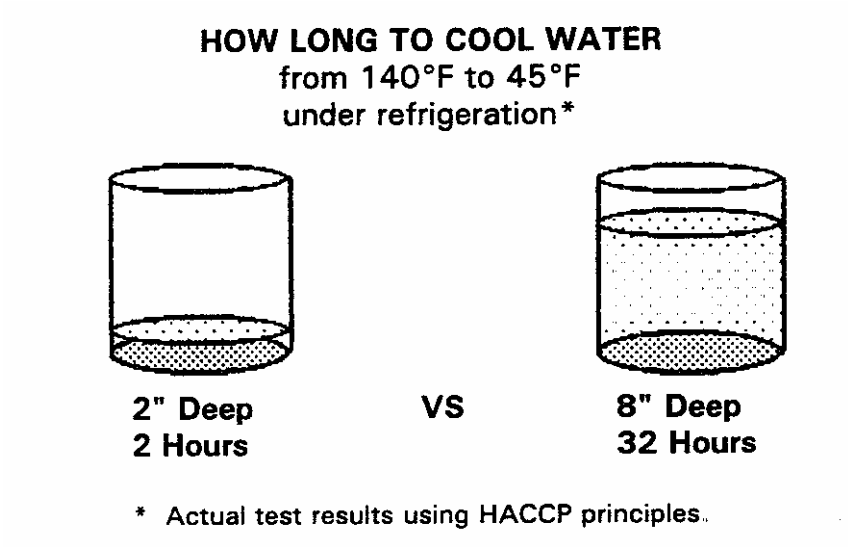
☞ **Cooling**. Cooling food is very important because improper cooling is one of the most frequent causes of foodborne disease outbreaks. The main consideration is cooling food fast enough so bacteria will not have enough time to multiply sufficiently to cause a problem.

There are two different methods to use when cooling foods and either one is acceptable. One method is to cool foods from 135°F to 70°F within 2 hours and then 70°F to 41°F within 4 hours, for a total of 6 hours. This method takes a little more time and effort on your part. If you choose to use this method, you will need to check the temperature of the food regularly, perhaps every 20-30 minutes, and document or write down that temperature.

Another method is to just cool the foods from **ANY TEMPERATURE BELOW 135°F TO 41°F OR BELOW WITHIN 4 HOURS**.

Regardless of the method you choose when cooling foods, the following cooling procedures are important:

- Place food in shallow pans or containers (maximum depth of 2 inches) in order to reduce the volume and/or increase the surface area, and breaking the food down into smaller or thinner portions. The following example of water cooling gives importance to this requirement:



- Stirring food in a container placed in an ice water bath.
- Use ice wands to help stir hot foods and get them to cool quickly.
- Using rapid chilling equipment. **HOME-STYLE EQUIPMENT IS NOT SUITABLE FOR THIS PURPOSE**.
- Arrange containers in refrigeration equipment for maximum heat transfer. Do not stack cooling containers or put them close together.
- Loosely cover during the cooling period to allow air circulation in the container.
- Some foods such as large roasts will need to be cut into smaller portions (generally 4 inches thick) in order to allow for proper cooling.

Transportation. The same temperature considerations mentioned above also apply when potentially hazardous foods are being transported.

Facilities. In order to ensure proper food temperatures, sufficient temperature controlling equipment must be provided.

CHECK TEMPERATURES OFTEN

Food temperatures cannot be accurately determined by touching the container with the hand. Just a few degrees in the "danger zone" is enough to allow some disease bacteria to grow. Use a metal or plastic stem thermometer to check food temperatures. **Use it often**.

Know how to properly use the thermometer. Review Section 4 of this manual, if necessary.

SUMMARY

Limit bacterial growth in potentially hazardous foods by adherence to the following time-temperature control processes:

- Thaw potentially hazardous foods under refrigeration, running water or during the cooking process.
- Keep potentially hazardous foods 135°F or above or 41°F or below.
- Cool potentially hazardous foods rapidly.
- Use pre-chilled ingredients for potentially hazardous foods not requiring cooking.

Check temperatures often with an approved thermometer.

Reference: ***Idaho Food Code,*** Section 3-5.