

LESSON 7

Hot Tips: Cooking, Hot Holding, and Reheating

GOAL

To understand safe time and temperature guidelines for cooking, reheating, and hot holding foods.

OBJECTIVES

- To describe the temperature Danger Zone for time/temperature control for safety food (TCS) and to understand the four-hour time limit for food within this range.
- To identify recommended cooking temperatures for raw animal foods.
- To describe how to hot hold and reheat food safely.
- To demonstrate the proper use and cleaning of a food thermometer.

TEACHER BACKGROUND INFORMATION

Lesson 7 covers

1. The Danger Zone temperature range and the allowable time limits for time/temperature control for safety food (TCS) within this range
2. Proper temperatures for cooking raw animal foods and for hot holding and reheating time/temperature control for safety foods
3. Food-service thermometer usage and cleaning procedures

Approximate time to teach lesson: 30–45 min.

Definitions

approved thermometer—A thermometer safe for use in food service. Approved thermometers must be numerically scaled, have plastic or metal stems, and be accurate to within 2°F.

bain-marie or steam table—A steam or hot-water-heated holding unit for food service. It is not approved for heating or reheating food.

calibrate—To check the accuracy of a measuring instrument by comparing it with a standard. With thermometers in food establishments, the ice water slurry calibration method is recommended.

chafing dish—A metal pan over a gas or electric heater used to hold hot foods. It is not approved for heating or reheating food.

Danger Zone—The temperature range within which pathogenic bacteria grows—from 41°F to 135°F.

hot-holding temperature—A safe temperature range of 135°F and above that maintains properly cooked foods until served.

ice water slurry—A mixture of equal parts crushed ice and cold water used to test the accuracy of instant-read thermometers.

instant-read thermometer—A thermometer designed to measure the temperature of food within 10 to 30 sec, generally after the food has been removed from the heat source, such as a grill or oven, because the thermometer is not heat resistant. However,

it can be used to measure temperatures directly in a hot-holding unit or when heating food in a pan on the stove. Two types are commonly available in food service: dial and digital (described in Lesson 4).

reheating—Heating previously cooked food within 2 hrs to at least 165°F and holding for 15 sec.

time/temperature monitoring—A defined procedure for checking foods during the food-flow process to prevent abuse that could lead to unsafe food.

The Temperature Danger Zone

See Lesson 2, Teacher Background Information, for a full discussion of the Danger Zone. Time/temperature control for safety food may not be held in the Danger Zone for more than four hours or it is considered adulterated and must be discarded.

Checking and Calibrating Instant-read Thermometers

Accuracy of instant-read thermometers should be checked on a regular basis and also after dropping them.

There are two methods for checking and calibrating thermometers: ice water slurry and boiling water methods. The boiling water method is not recommended for two reasons: altitude adjustments are needed because of Idaho's varied elevations and holding the thermometer over boiling water could risk a steam burn injury.

For the ice water slurry method, prepare a slurry that is equal parts crushed ice and cold water. Most bimetal coil (dial) instant-read thermometers can be corrected for accuracy by adjusting the nut under the head of the thermometer. To test the thermometer, immerse the stem 2–3 in into the ice water slurry long enough to stabilize the temperature reading (15–40 sec). Use pliers or a thermometer wrench to turn the hex-adjusting nut so that the dial pointer reads 32°F. Many digital instant-read thermometers do not allow calibration adjustments, but they should be accurate within 2°F. Discard if not accurate.

Microwave Usage for Cooking and Reheating TCS

If a microwave oven is used to prepare or reheat TCS, the food must be rotated or stirred to compensate for uneven heating and cooked to an internal temperature of 165°F in all parts of the food. The food must also be covered to retain moisture and be allowed to stand covered for 2 min to allow the heat to equilibrate (*Idaho Food Code* 3-401.12).

Prepared Food (Ready-to-Eat) Hot-Holding Guidelines

More food establishments are using ready-to-eat food provided by suppliers in sealed packages rather than making their own menu items from basic ingredients. Packaged food is convenient because it has already been cooked, chilled, or frozen safely and properly. The food-service establishment's responsibility is to heat and hold this food to a temperature of at least 135°F (*Idaho Food Code* 3-403.11).

MATERIALS NEEDED

Slow Cooker/Crock Pot Use

Slow cookers/crock pots are designed for consumer, not food-service, use. When meat is cooked in a slow cooker, it takes several hours for it to reach a bacteria-killing temperature, so the meat or other food cooks in the Danger Zone for a period of time. Slow-cooker instructions are written to minimize the food's exposure to the Danger Zone by recommending that cooks keep the lid in place, fill the pot half to two-thirds full, avoid using frozen meat, or use a high setting at the start, etc. Sometimes food-service establishments use slow cookers for reheating and holding hot foods, but the rules require that reheated foods must reach 165°F within 2 hrs of being removed from a refrigerator/walk-in cooler. Because slow cookers are unable to heat a mass of food from about 40°F to 165°F within 2 hrs, they do not meet the requirements for food-service reheating.

2016 Food Code

The *Idaho Food Code* is currently based on the Food and Drug Administration's (FDA) 2013 *Food Code*. Two updates have been incorporated into the code:

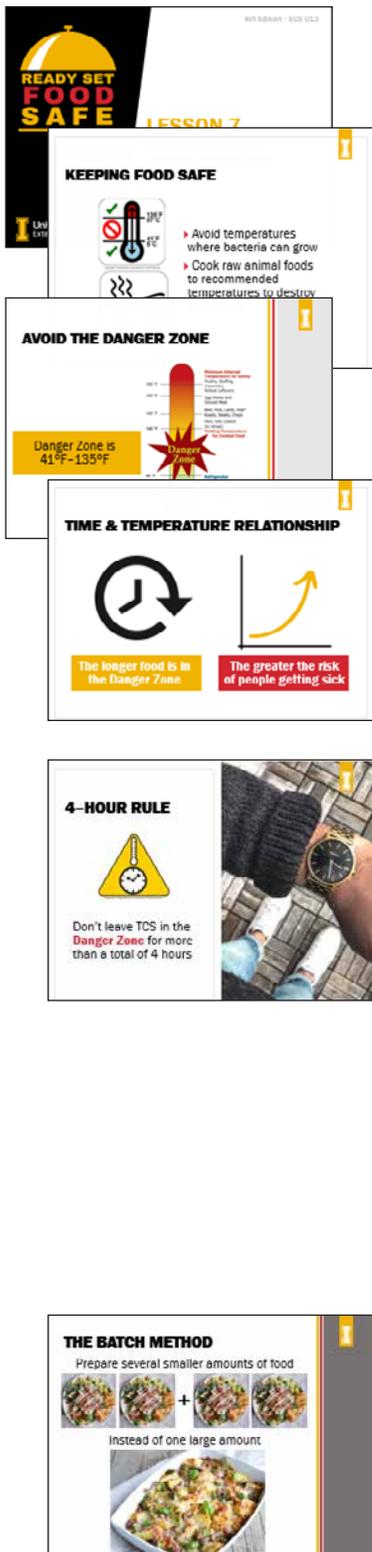
- Serving hamburgers and other ground meats in an undercooked form upon a consumer's request is no longer an option for items offered on a children's menu (*Idaho Food Code* 3-401.11).
- A new definition for noncontinuous cooking of food comprised of raw animal foods (*Idaho Food Code* 3.401.14). It has specialized use, however, and will not be described here.

Thermometer Education Handout

A handout urging thermometer use while cooking ground beef patties (an important but seldom-practiced behavior) was developed for students to take home to their families. Remind students that the food service requires workers to cook ground beef patties to 155°F for 15 sec, but recommends consumers cook them to 160°F with no hold time (both cooking procedures effectively destroy pathogens).

Additional Related Activities Not Included in the Lesson

- Ask students to design, reproduce, and distribute an easy to understand guide for clubs and organizations that serve food to the public, one that covers all the basics discussed in this course.
- Assign students to contact a food-service establishment and interview the owner or manager regarding how they ensure that the food they serve is cooked, held, and reheated to recommended temperatures. Report back to the class, without using business names.
- Bimetal instant-read thermometer with adjusting wrench or case and crushed ice for the "Calibrating a Thermometer" activity.
- Alcohol wipes for the "Calibrating a Thermometer" activity.
- "Safe Eats?" case studies, copied for each student to review during class. Master and answer key are at the end of the lesson.
- If desired, make copies of "Cooking Hamburgers Safely at Home" for students to share with their families. The master is on the RSFS website.



(Slide 1) **Lesson 7**

Hot Tips: Cooking, Hot Holding, and Reheating

(Slide 2) **Introduction.** Safe food preparation and service includes

- Avoiding temperatures where bacteria can grow.
- Cooking raw animal foods to recommended temperatures to destroy pathogens (disease-causing microbes).

1. (Slide 3) **The Danger Zone and Time That TCS Can Be in This Temperature Range.** The temperature where bacteria grow best is known as the Danger Zone. It is defined as the range from 41°F to 135°F.

(Slide 4) When studying FAT TOM in Lesson 2, we learned that time and temperature are important factors that affect how microbes grow. There is a direct relationship between the time food is held at various temperatures and the safety of that food. The longer a food is held in the Danger Zone, the more pathogens may increase in number and the greater the risk of people getting sick from a foodborne illness if the food is eaten.

- a. (Slide 5) **The 4-Hour Rule.** The food service rule (*Idaho Food Code 3-501.19*) for safety is to not leave time/temperature control for safety foods in the Danger Zone any longer than four hours.

- Add together all the time that TCS food is out of the refrigerator or the oven. The clock starts ticking when perishable food is brought into the kitchen.
- Count the time that TCS food is being sorted, handled, and prepared, as well as the time it takes to plate a customer's order or prepare it for a food bar.
- If perishable food is not kept hot or cold on an approved holding unit, this time counts in the four-hour limit.
- Time/temperature control for safety food held between 41°F and 135°F for longer than four hours must be discarded.

- b. (Slide 6) **The Batch Method.** The batch method of preparation is useful when a large amount of a TCS is needed. Because several smaller batches are made rather than one large one, the time that perishable ingredients are in the Danger Zone is limited.

- Example 1: If a class were making 200 chicken salad-filled cream puffs, they could fill 50 cream puffs four times. Only $\frac{1}{4}$ of the filling could be out at room temperature at a time. The remainder would either be in a bowl in the refrigerator or in the filled cream puffs, also stored in the cooler.
- Example 2: Cook smaller batches of prepared chicken fried steak patties during lunch on an "as needed" basis rather than preparing all that will be used during the two-hour lunch period ahead of time.



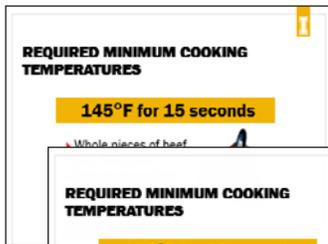
2. Proper Temperatures for Cooking Raw Animal Foods and for Hot Holding and Reheating Time/Temperature Control for Safety Foods.

a. (Slide 7) Food-service regulations require thorough cooking of raw animal foods to kill foodborne-illness-causing bacteria; there are three required temperatures, depending on the food. Of the foods handled in food service, raw animal foods are the ones that most frequently contain pathogens. Some ballpark examples of raw animal food contamination, all of which are destroyed by cooking, include

- Raw poultry—20% carry *Salmonella*; 20% to 100% carry *Campylobacter*.
- Ground beef—fewer than 1% contain *E. coli* 0157:H7.
- Eggs—1 in 20,000 contains *Salmonella*.

b. Required Minimum Cooking Temperatures

- (Slide 8) 145°F for 15 sec. Intact (not injected or ground) beef, pork, lamb, fish, and eggs for immediate service must be cooked to at least 145°F in the center of the food and held at that temperature or higher for 15 sec.
- (Slide 9) 155°F for 15 sec. Eggs prepared for hot holding (for example, on a buffet) must be cooked to a minimum temperature of 155°F for 15 sec. Many meat cuts are injected with a brine to aid moisture retention during cooking for a more flavorful and tender product. Injected and ground meats or fish must also be cooked to an internal temperature of 155°F for 15 sec.
- (Slide 10) 165°F for 15 sec. Poultry, wild game, stuffed meat, and pasta must be cooked to an internal temperature of 165°F for 15 sec.
- Microwave cooking. If a microwave is used for cooking raw animal foods, the food must be heated to 165°F and left to stand for 2 min after cooking to allow the temperature to equalize throughout the food. Verify the temperature after the two-minute stand time.
- (Slide 11) Summary of cooking temperature requirements. The chart below summarizes the required minimum cooking temperatures for Idaho food establishments by the *Idaho Food Code* discussed so far.



Type of Food	Idaho Food Code Section 3-401.11 & 3-401.12
Beef, Pork, Lamb, Fish, Eggs*	145°F for 15 seconds
Injected Meat, Ground Meat, and Fish	155°F for 15 seconds
Poultry, Wild Game, Stuffed Meats, Microwaved Foods**	165°F for 15 seconds

*If eggs are prepared for hot holding, minimal cooking temperature is 155°F
**Microwaved food must be allowed to stand for 2 minutes

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**Microwaved food must be allowed to stand for 2 min



c. **Variations and Exceptions to Requirements**

- **Roasts.** Oven-temperature requirements depend on roast size as do a variety of internal temperature-time cooking options for beef and pork roasts and ham. These can be found in section 3-401.11 of the *Idaho Food Code*.
- (Slide 12) **Serving Undercooked Meat and Eggs.** Rare steaks may be served in food-service establishments if certain requirements are met (section 3-401.11). Raw or undercooked eggs, steak tartare, fish, and other foods may be served if the consumer has been informed that there is a food-safety risk, but only if the establishment does not predominantly serve people who are at high risk of foodborne illness (children, the elderly, or hospital patients).

d. (Slide 13) **Required Hot-Holding Temperature** (*Idaho Food Code* 3-501.16). Sometimes hot food is held before serving. To prevent microbial growth, food must be kept out of the Danger Zone by

- Using the proper equipment to cook or reheat. Never use a holding unit (steam table, bain-marie, or chafing dish) to cook or reheat food. For example, do not put frozen or chilled soup in a holding unit in the morning to heat it for lunch. Heat it on top of the range and then transfer it when fully heated to a holding unit.
- Keep hot food in a holding unit capable of holding food throughout the container at 135°F or higher (an oven or stove top may also be used).
- Use a clean and sanitized thermometer to check food temperatures at least every four hours to make sure they remain at 135°F or higher.

(Slide 14) Some approved holding units include steam tables and bain-maries that use steam or hot water to keep the food hot. Chafing dishes are metal pans over gas or electric heaters that are used to keep food warm on a table or for a buffet.



e. (Slide 15) **Required Reheating Rule** (*Idaho Food Code* 3-403.11). Food served to a consumer cannot be reused. However, in food service, food may be cooked properly, cooled rapidly, and reheated later for service to customers. Reheating quickly is essential to prevent the growth of any microbes as the food temperature rises through the Danger Zone.

Reheat foods on top of the range or in the oven to 165°F and hold for 15 sec. This must be accomplished within two hours of removing time/temperature control for safety food from the refrigerator.

After thoroughly reheating food, hold it in an approved holding unit at 135°F or higher.

3. **Thermometer Usage and Cleaning Procedures** (*Idaho Food Code* 4-302.12). Food-service establishments are required to have food thermometers. A thermometer is the most important food-safety tool in a commercial kitchen. Use it often and correctly, check it for accuracy, and clean and sanitize it between uses.

(Slide 16) **“Thermometers”**

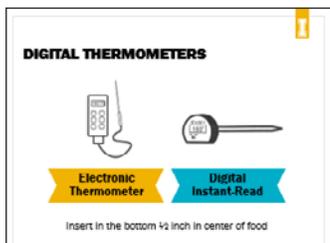
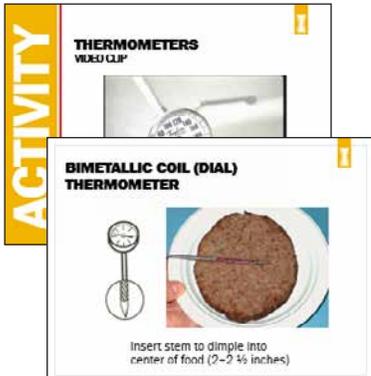
Show video clip (1:25) by clicking on the picture in Slide 16. The clip reviews the basics of dial (bimetal) food-thermometer usage.

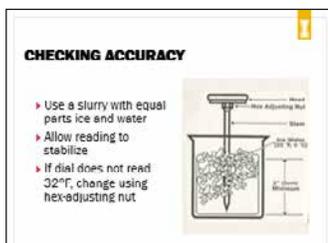
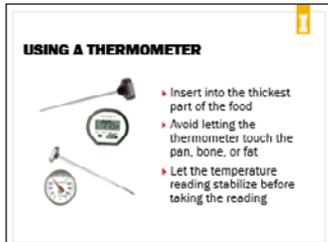
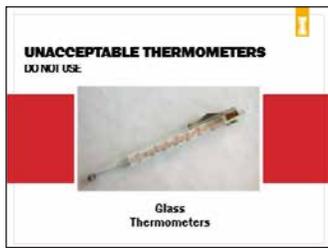
- a. (Slide 17) **A Closer Look at the Dial or Bimetallic Thermometer.** A dial (bimetal) thermometer is a type of an instant-read thermometer that registers a temperature within 15 to 40 sec. This slide shows a cut-away view. In the photograph, the outer metal stem of the thermometer has been removed to show the inside of the stem. You can see the bimetal coil that measures temperature.

- The coil expands and contracts with temperature change. The moving coil changes the pointer location on the dial.
- Temperature registers along the coil; therefore, the thermometer stem must be inserted at least 2–2½ in into the food.
- Don't leave these thermometers in food during cooking, because they are not heat resistant. They are only used to periodically check temperatures. Remove food from the cooking unit, insert the thermometer, check its temperature, and remove the thermometer. If the target temperature has not been reached, place the food back into the cooking unit and continue cooking.

- b. (Slide 18) **Digital Thermometers.** Instead of a bimetal coil, digital thermometers have a temperature-sensing unit called a thermistor, which requires a battery to power it. Because the thermistor occupies the bottom ½ in of the stem, the stem must be inserted at least ½ in into the food to obtain an accurate reading. Two types of digital thermometers are shown in the slide.

- An electronic thermometer has a digital readout and can be programmed to ring when it reaches a preset temperature. A timer feature may be included. The thermometer face stays outside the oven; the probe or stem attaches to the display portion by a wire. The probe on this type of thermometer can be left in food during cooking.
- A digital instant-read thermometer is battery operated, so it must be turned on to take a temperature reading. Digital instant-read thermometers cannot be left in food during cooking. They are only used to periodically check temperatures. Most digital thermometers cannot be adjusted for accuracy, so if it isn't reading properly, it should be replaced.





- c. (Slide 19) **Unacceptable Food Service Thermometers.** Most glass thermometers are not allowed in food-service establishments because they could break into a food and contaminate it, meriting its discard. However, glass thermometers with a shatterproof coating may be used. (They are typically used for candy making, not for measuring the temperature of meat.)
- d. (Slide 20) **Using a Thermometer.** It is important to use a thermometer properly to get an accurate temperature.
- When checking cooking temperatures, insert the thermometer into the center or the thickest part of the food to measure the temperature of its coldest spot. Be sure the entire sensing area of the thermometer stem (½ in for digital models and 2–2½ in for dial models) is in this part of the food.
 - Avoid letting the thermometer touch the pan, bone, or fat. These areas may conduct heat more quickly and thus are not the coldest spots.
 - Leave the thermometer in place until the temperature reading stabilizes (no longer changes), usually between 10–40 sec for either dial or digital instant-read thermometers.
- e. (Slide 21) **Make Sure Thermometers Are Accurate and Clean.** Avoid having a thermometer become a cross-contamination tool instead of a food-safety tool.
- After each use, wash and rinse thermometers well. Immerse the thermometer in a sanitizing solution for 10 sec and air dry.
 - Store thermometers in clean, sanitized protective sheaths and handle carefully.
 - Alcohol wipes can also be used to sanitize a clean thermometer stem.
 - Check thermometer accuracy on a regular basis, especially if it has been dropped.
- f. (Slide 22) **Checking and Calibrating in Ice Water Slurry.** The recommended procedure for checking a thermometer for accuracy is to immerse it in an ice water slurry.
- This slurry is made with equal parts crushed ice and cold water.
 - Immerse the thermometer stem in the slurry and wait 15–40 sec until the temperature reading has stabilized.
 - Do not allow the stem or tip to touch the sides or bottom of the container.
 - For dial thermometers, if it does not read 32°F, use a thermometer wrench or a pair of clean needle-nose pliers to adjust the hex-adjusting nut under the head of the thermometer so the dial reads 32°F. Many digital thermometers cannot be calibrated; check them and, if not accurate within 2°F, discard.



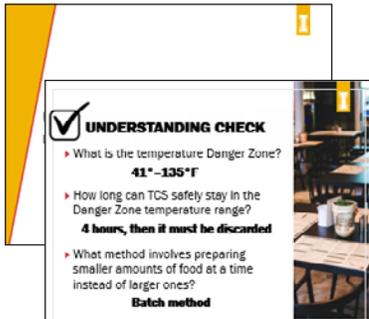
(Slide 23) Calibrating a Thermometer

Provide ice, containers, several inaccurate bimetal thermometers, and either thermometer wrenches or needle-nose pliers to teams of students. Have the students take the temperature readings and adjust the thermometers. Discuss with students about how easy or difficult this was to do and how long it took to readjust the reading. Did they consider whether the thermometers should be cleaned and sanitized before or after readjusting the hex-adjusting nut? (**After** is better to ensure that the thermometers are sanitized for the next use.)



(Slide 24) "Safe Eats?" Case Studies

Divide the class into three groups and hand out one of the case studies (located at the end of this lesson) to each group. Ask students to analyze the food- safety situation and report back to the class, giving the groups an opportunity to share different results and other concerns. Review the main points covered in the Answer Key found at the end of the lesson.

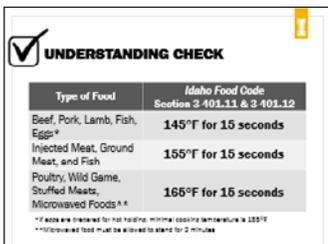


(Slide 25) UNDERSTANDING CHECK

(Slide 26) **Question:** What is the temperature Danger Zone?
Answer: 41°F–135°F

Question: How long can TCS safely stay in the Danger Zone temperature range?
Answer: 4 hrs, after which it must be discarded

Question: What method involves preparing smaller amounts of food at a time instead of larger ones?
Answer: Batch method



(Slide 27) **Question:** What temperatures are required for each type of food?

Answer:

Type of Food	Idaho Food Code Section 3-401.11 & 3-401.12
Beef, Pork, Lamb, Fish, Eggs*	145°F for 15 sec
Injected Meat, Ground Meat and Fish	155°F for 15 sec
Poultry, Wild Game, Stuffed Meats, Microwaved Foods**	165°F for 15 sec

*If eggs are prepared for hot holding, minimal cooking temperature is 155°F

**Microwaved food must be allowed to stand for 2 min

✓ UNDERSTANDING CHECK

What are the cooking temperatures for...

- ▶ Chicken? **165°F for 15 seconds**
- ▶ A salmon fillet? **145°F for 15 seconds**
- ▶ Microwaved soup? **165°F**
- ▶ A hamburger? **155°F for 15 seconds**



✓ UNDERSTANDING CHECK

- ▶ How far must a dial thermometer be inserted into a food to get an accurate reading? **2 1/2 inches**
- ▶ When should thermometers be cleaned and sanitized? **Before and after each use**
- ▶ How is a dial thermometer calibrated? **Place in ice slurry. If it does not read 32°F, change temperature using the hex-adjusting nut under the head of the thermometer**



(Slide 28) **Question:** What are the minimum cooking endpoint temperatures for chicken, salmon file, microwaved soup, and a hamburger?

Answer: Chicken—165°F for 15 sec
 Salmon fillet—145°F for 15 sec
 Microwaved soup—165°F (and it must stand covered for 2 min)
 A hamburger—155°F for 15 sec

(Slide 29) **Question:** How far must a dial thermometer be inserted into a food to get an accurate reading?

Answer: 2–2½ in

Question: When should thermometers be cleaned and sanitized?

Answer: Before and after each use

Question: How is a dial thermometer calibrated?

Answer: Place in ice water slurry. If it does not read 32°F, change the temperature using the hex-adjusting nut under the head of the thermometer.

(Slides 30–33) **Stomachache Tonight (4:20)**

This song discusses the importance of thoroughly cooking food before serving it to the public. The song is based on the songwriter’s own experience with *Salmonella*, one of the pathogens studied in previous lessons.

STOMACHACHE TONIGHT (“Heartache Tonight” by The Eagles)

Some chef is gonna hurt someone
 Before the night is through
 Serving up some chicken that’s undone
 There’s nothin’ we can do

On the road I found a nice cafe’
 With some Georgia friends
 Didn’t know I’d soon be entertained
 By Sal Monella and the Pathogens

There’s gonna be a stomachache tonight
 A stomachache tonight, I know
 There’s gonna be a stomachache tonight
 A stomachache tonight, I know, Lord, I know

Some chefs will cook their chicken great
 But some just don’t cook it that long
 I rolled the dice and I ordered some
 But things just came out wrong

ACTIVITY

STOMACHACHE TONIGHT

Some chef is gonna hurt someone
 Before the night is through
 Serving up some chicken that’s undone
 There’s nothin’ we can do
 On the road I found a nice cafe’
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ACTIVITY

STOMACHACHE TONIGHT

Some chefs will cook their chicken great
 But some just don’t cook it that long
 I rolled the dice and I ordered some
 But things just came out wrong
 The night is gonna last forever
 Last all, last all summer long
 In the early mornin’ when my food comes up
 The porcelain gods are gonna break my nose

There’s gonna be a stomachache tonight
 A stomachache tonight, I know
 There’s gonna be a stomachache tonight
 A stomachache tonight, I know, Lord, I know
 There’s gonna be a stomachache tonight
 From a bad chicken bite
 So turn on the light
 My infections aren’t right
 There’s gonna be a stomachache tonight

This night is gonna last forever
 Last all, last all summer long
 In the early mornin' when my food comes up
 The porcelain gods are gonna hear my song
 There's gonna be a stomachache tonight
 A stomachache tonight, I know
 There's gonna be a stomachache tonight
 A stomachache tonight, I know, Lord, I know

There's gonna be a stomachache tonight
 From a bad chicken bite
 So turn on the light
 My intestines aren't right
 There's gonna be a stomachache tonight
 A stomachache tonight, I know

Some chef is gonna hurt someone
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There's gonna be a stomachache tonight
 A stomachache tonight, I know
 There's gonna be a stomachache tonight
 A stomachache tonight, I know, Lord, I know

We can sanitize the kitchen
 And can educate the cooks
 Maybe try irradiation
 But either way, there's gonna be

A stomachache tonight
 A stomachache tonight, I know, oh, I know
 There'll be a stomachache tonight
 A stomachache tonight, I know

ACTIVITY

STOMACHACHE TONIGHT



Some chef is gonna hurt someone
 Before the night is through
 Serving up some chicken that's
 undone
 There's nothin' we can do
 On the road I found a nice cafe'
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ACTIVITY

STOMACHACHE TONIGHT



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