1 HOUR SAN CE CBDM Approved

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Thermometer Education

Appearance Does Not Guarantee Doneness

Time for some thermometer education! First and foremost, there's simply no way to know for sure if your food is cooked to the proper temperature without using a thermometer.

Many studies have concluded that color, look, texture, or "feel" of the food are simply not adequate indicators to determine doneness. You may get it right now and then, but the one time you get it wrong, you will regret it.

So take those thermometers out of your desk drawers or pockets and actually use them. It's very important to understand what kind of thermometer you have, its intended use, and its limitations. Read the manufacturer's instructions and keep them handy for reference if needed.

DIGITAL FOOD THERMOMETERS

Thermocouples

Of all food thermometers, thermocouples read and display the final temperature the fastest—within 2 to 5 seconds. The temperature appears on a digital display. A thermocouple measures temperature at the junction of two fine wires located in the tip of the probe. Thermocouples used in scientific laboratories have very thin probes, similar to hypodermic needles, while others may have a thickness of 1/16-inch. Because thermocouple thermometers respond so rapidly, the temperature can be quickly checked in a number of locations to ensure that the food is thoroughly cooked. This is especially useful for cooking large foods, such as roasts or turkeys, when checking the temperature in more than one place is advised. The thin probe of the thermocouple also enables it to accurately read the temperature of thin foods such as hamburger patties, pork chops, and chicken breasts. Thermocouples are not designed to remain in the food while it's cooking. They should be used near the end of the estimated cooking time to check for final cooking temperatures. To prevent overcooking, check the temperature before the food is expected to finish cooking.

Thermometers 101

- Thermometers must be in degrees Centigrade (C) or both in Celsius (C) and degrees Fahrenheit (F)
- Thermometers only in F must be accurate to +/-2˚F
- Thermometers dually scaled must be accurate to +/- 1˚C
- Examples of thermometers: Instant-read, thermocouple/thermistor, infrared, and time/temperature indicator

Digital Thermometers

- Thermocouples
- Thermistors
- Oven Cord Thermometers

Thermistors

Thermistor-style food thermometers use a resistor (a ceramic semiconductor bonded in the tip with temperature-sensitive epoxy) to measure temperature. The thickness of the probe is approximately 1/8-inch, and it takes roughly 10 seconds to register the temperature on the digital display. Since the semiconductor is in the tip, thermistors can measure temperature in thin foods as well as thick foods. Because the center of a food is usually cooler than the outer surface, the tip should be placed in the center of the thickest part of the food. Like thermocouples, thermistors are not designed to remain in the food while it's cooking. They should be used near the end of the estimated cooking time to check for final cooking temperatures. Once again, to prevent overcooking, check the temperature before the food is expected to finish cooking.

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Oven Cord Thermometers

Oven cord thermometers allow the cook to check the temperature of food in the oven without opening the oven door. A base unit with a digital screen is attached to a thermistor-type food thermometer probe by a long metal cord. The probe is inserted into the food, and the cord extends from the oven to the base unit. The base can be placed on the countertop or attached to the stovetop or oven door by a magnet. The thermometer is programmed for the desired temperature, and it beeps when the temperature is reached. While designed for use in ovens, these thermometers can also be used to check foods cooking on the stove.

DIAL FOOD THERMOMETERS

Bimetallic-Coil Thermometers

These thermometers contain a coil in the probe made of two different metals that are bonded together. The two metals have different rates of expansion. The coil, which is connected to the temperature indicator, expands when heated. This food thermometer senses temperature from its tip and up the stem for 2- to 2-1/2 inches. The resulting temperature is an average of the temperatures along the sensing area. These food thermometers have a dial display and are available as "oven-safe" and "instant-read."

Oven-Safe Bimetallic-Coil Thermometers

This food thermometer is designed to remain in the food while it is cooking in the oven, and is generally used for large items such as a roast or turkey. This thermometer is convenient because it constantly shows the temperature of the food while it is cooking. However, if not left in the food while cooking, these thermometers can take as long as 1 to 2 minutes to register the correct temperature. The bimetal food thermometer can accurately measure the temperature of relatively thick foods (such as beef roasts) or deep foods (foods in a stockpot). Because the temperature sensing coil on the stem is 2- to 2-1/2 inches long and the stem is relatively thick, it's not appropriate to measure the temperature of any food less than 3 inches thick. There is concern that because heat conducts along the stem's metal surface faster than through the food, the area of the food in contact with the thermometer tip will be hotter than the area a short distance to the side (the "potato nail effect"). To remedy this, the temperature should be taken in a second, and even third, area to verify the temperature of the food. Each time the thermometer is inserted into the food, let the thermometer equilibrate (come to temperature) at least 1 minute before reading the temperature. Some models can be calibrated. Check the manufacturer's instructions.

Dial Food Thermometers

- Bimetallic-Coil
- Instant-Read Bimetallic-Coil
- Single-Use Temperature Indicators

Instant-Read Bimetallic-Coil Thermometers

This food thermometer measures the temperature of a food in about 15 to 20 seconds. It is not designed to remain in the food while it is cooking in the oven, but should be used near the end of the estimated cooking time to check for final cooking temperatures. To prevent overcooking, check the temperature before the food is expected to finish cooking. For accurate temperature measurement, the probe of the bimetallic-coil thermometer must be inserted the full length of the sensing area (usually 2 to 3 inches). If measuring the temperature of a thin food, such as a hamburger patty or boneless chicken breast, the probe should be inserted through the side of the food so that the entire sensing area is positioned through the center of the food. Again, some models can be calibrated, so check the manufacturer's instructions.

Single-Use Temperature Indicators

One of the most recent developments in the retail food market is the emergence of disposable temperature indicators. These temperature sensors are designed for specific temperature ranges, for example, 160°F-170°F. These sensors should only be used with foods for which they are intended. Read the package directions to ensure that the temperature the sensor will reach is consistent with the recommended internal cooking temperature. The sensors on disposable thermometers are made from special temperature-sensitive materials. The sensor is inserted into a food. When the food reaches the proper temperature, the sensor changes color. They are designed to be used only once. However, if the desired temperature has not been reached, they can be reinserted until the temperature is reached. These sensors cannot be left in a food while it is cooking. They should

Other Food Thermometers

- Infrared Thermometers
- Liquid-Filled Thermometers

be used near the end of the estimated cooking time. To prevent overcooking, check the temperature before the food is expected to finish cooking. Disposable temperature indicators are made from materials approved by the FDA for contact with food. If used in a foodservice facility they must meet the accuracy required by the Food Code.

OTHER TYPES OF FOOD THERMOMETERS

Infrared Thermometers

Besides the fact that they're shaped like a gun and have a built-in laser, infrared thermometers are just plain cool. They're very fast (instantaneous), provide a good indication of temperature, and allow you to collect data at a distance. The problem is you've got to look past the novelty and learn how to use them properly before they'll give you excellent temperature returns. An infrared thermometer infers temperature from a portion of the thermal radiation emitted by the object being measured. It measures an optical range, not a specific location. They are sometimes called laser thermometers if a laser is used to help aim the thermometer, or non-contact thermometers or temperature guns, to describe the device's ability to measure temperature from a distance. The laser pointer in an infrared thermometer is a guide that indicates where you're pointing the instrument.

When measuring the heat coming from a large kettle (for example), the laser helps to steady your aim and ensure that you're close to the area you're trying to temp. Sometimes, especially near ambient temperatures, false readings will be obtained indicating incorrect temperature. This is most often due to other thermal radiation reflected from the object being measured, but having its source elsewhere, like a hotter oven or other object nearby—even the person holding the thermometer can be an error source in some cases. It can also be due to an incorrect emissivity on the emissivity control or a combination of the two possibilities. An infrared thermometer is a surface temperature tool—period! If you're grilling, baking, smoking, or roasting you'll need a penetration probe to tell you the internal temperature of the food you're cooking. Whipping out your infrared "laser gun" to temp burgers on the grill may have you explaining to your customers why they're undercooked.

Liquid-Filled Thermometers

Also called "spirit-filled" or "liquid in glass" thermometers, these devices are the oldest kind of food thermometer used in home kitchens. They have either metal or glass stems. As the internal temperature of the food increases, the colored liquid inside the stem expands and rises to indicate the temperature on a scale. Heat conduction in the metal stems can cause false high readings. They are designed to remain in the food while it is cooking. They should be inserted at least 2 inches deep in the thickest part of the food; therefore, they are not appropriate for thin foods. Some liquid-filled thermometers can be calibrated by carefully moving the glass stem within the holder. Glass thermometers are not permitted in food facilities unless they are in a shatterproof casing.

CHECKING YOUR THERMOMETER

Check the accuracy of all food thermometers:

- At least once a day
- Every time it is dropped
- After being exposed to extreme temperatures

If not correct, calibrate!

Methods to check the accuracy:

- Boiling water method
- Ice-point method

There are two ways to check the accuracy of a food thermometer: boiling water and ice water. Many food thermometers have a calibration nut under the dial that can be adjusted. Check the package for instructions.

Even if the food thermometer cannot be calibrated, it should still be checked for accuracy using either method. Any inaccuracies can be taken into consideration when using the food thermometer or the thermometer can be replaced. For example,

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Checking Your Thermometer

- Boiling Water Method
- Ice-Point Method

water boils at 212°F. If the food thermometer reads 214°F in boiling water, then it is reading 2°F too high. Therefore, 2°F must be subtracted from the temperature displayed when taking a reading in food to find out the food's true temperature. For another example, ground beef patties must reach 160°F for safety. In this instance, if the thermometer is reading 2°F too high, 2°F would be added to the desired temperature, meaning the hamburger patties must be cooked to 162°F.

Boiling Water Method

To use the boiling water method, bring a pot of clean tap water to a full rolling boil. Immerse the stem of a food thermometer in boiling water a minimum of 2 inches and wait at least 30 seconds. Without removing the stem from the pan, hold the adjusting nut under the head of the food thermometer with a suitable tool and turn the head so the thermometer reads 212°F or 100°C. For true accuracy, distilled water must be used and the atmospheric pressure must be one atmosphere (29.921 inches of mercury). Using tap water in unknown atmospheric conditions would probably not measure water boiling at 212°F. Most likely it would boil at least 2°F, and perhaps as much as 5°F, lower. Remember that water boils at a lower temperature in a high altitude area.

Ice-Point Method

To use the ice water method, fill a large glass with finely crushed ice. Add clean tap water to the top of the ice and stir well. Immerse the food thermometer stem a minimum of 2 inches into the mixture, touching neither the sides nor the bottom of the glass. Wait a minimum of 30 seconds before adjusting. Without removing the stem from the ice, hold the adjusting nut under the head of the thermometer with a suitable tool and turn the head so the pointer reads 32°F or 0°C.

MEASURING FOOD TEMPERATURES

You must measure the temperatures of food during storage, cooking, and holding.

- Use an approved thermometer.
- Locate the sensing portion of the thermometer.
- Clean and sanitize the probe before use.
- Insert the sensing portion of the thermometer into the thickest part or into the center of the food.

Using a Food Thermometer

The FDA Food Code requires thermometers dually scaled to be accurate to +/- 1°C. The reading will only be correct, however, if the thermometer is placed in the proper location in the food. If not inserted correctly, or placed in the wrong area, the reading on the thermometer will not accurately reflect the internal temperature of the food. In general, the thermometer should be placed in the thickest part of the food, away from bone, fat, or gristle. Before using a food thermometer, read the manufacturer's instructions. The instructions should tell how far the thermometer must be inserted in a food to give an accurate reading. If instructions are not available, check the stem of the food thermometer for an indentation or "dimple." This shows one end of the location of the sensing device. Dial thermometers must penetrate about 2 to 3 inches into the food. Most digital thermometers will read the temperature in a small area of the tip.

THERMOMETER CARE

Cleaning and Sanitizing Thermometers

The probe or stem of a thermometer must be cleaned and sanitized before it is used. The stem of a thermometer is a food-contact surface. Therefore, it needs to be properly washed, rinsed, and sanitized between uses. The stem can be sanitized by immersing in a properly prepared sanitizing solution or by wiping the clean step with an alcohol swab. Use caution that the probe of a thermometer is not the source of bacterial or allergen cross contamination.

There you have it—some thermometer education to ensure you're serving foods to your clients at appropriate and safe temperatures.

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