



# COOKING WITH MICROWAVE OVENS

## *Nutrition and Food Safety Considerations*

Microwave ovens have become ubiquitous in home kitchens across the United States, with over 90 percent of homes having at least one unit. Microwave use is so widespread that it is almost a standard practice for manufacturers

*Microwaved foods have the benefit, when prepared properly, of being higher in nutritional value than food cooked with conventional methods...*

to place microwave cooking instructions on their product packaging. In the past two decades, many advancements in food formulation, processing and packaging have been made, greatly improving the quality and convenience and widening the selections of microwaveable foods available to consumers.

The purpose of these guidelines is to provide a brief review of microwave cooking and to present the ways in which consumers can prepare both safe and nutritious meals using a microwave oven. These guidelines address microwave cooking of all foods, not just frozen.

## HOW DO MICROWAVE OVENS WORK?

Inside every microwave oven is a device called a magnetron, which converts electrical power into very short (micro) radio waves that penetrate food to a depth dependent on the wavelength of the oven and the properties of the food. These waves are readily absorbed by water, fats and sugars, resulting in very fast vibrations. The friction between these rapidly moving food molecules, in turn, creates heat. On high power, food is subjected to the maximum amount of microwave energy. To produce a power level less than 100 percent, the magnetron cycles on and off. For example, at 50 percent power the magnetron is on only 50 percent of the time. Even when microwaves are not being emitted (while cycling off or when turned off), the vibrations of the



food molecules continue, and may even lead to an increase in temperature, continuing the cooking process. Cooking instructions provided on packaging often account for this effect and recommend a “standing time” after the microwave has turned off.

# HOW CAN I SAFELY COOK FOOD IN A MICROWAVE?

The shape and consistency of food affects how evenly they are cooked in microwave ovens. Food with symmetrical shapes, especially round or oval, and with even thickness (less than 1 inch) generally heat the most uniformly. For thicker portions, better results may be obtained with reduced power for longer periods such that the outer portions don't overcook before the center is heated thoroughly. To promote uniform cooking, arrange food items evenly in a covered dish and add some water, if the food is fairly dry, to promote more even absorption of microwaves. Bone can shield meat from thorough cooking, so, where possible, debone large pieces of meat. It is important that foods be stirred, rotated, and inverted, if possible, halfway through cooking for more even distribution of microwaves and heat throughout the food. Even if a turntable is used, it is best to place the food off-center and to stir foods top to bottom or turn foods over, if possible.

Use microwave-safe containers. Do not use foam containers for cooking or reheating foods unless labeled microwave-safe. Cover the dish with a lid, microwave-safe plastic wrap, or a clean, unprinted, white paper towel, but leave a small opening for steam to escape. Allow enough space between the food and the plastic



wrap so the wrap doesn't touch the food. The steam that is created by using a lid will help heat the food more evenly and will also help destroy any harmful bacteria.

Just as other types of ovens, microwave cooking can destroy bacteria and other pathogens; however, food can cook less evenly than in

conventional ovens, resulting in cold spots, due to factors described earlier. For best results in both the quality and safety of frozen or refrigerated foods, consumers should follow the cooking instructions on product labels and observe the standing times, if provided. Adjustments to the cooking time, due to oven wattage or other factors, may be necessary to reach the desired temperature before serving. For frozen or refrigerated foods that do not have labeled cooking instructions, it is suggested that the following cooking temperatures—as recommended by the United States Department of Agriculture (USDA)—be reached in all parts of the food.



conventional ovens, resulting in cold spots, due to factors described earlier. For best results in both the quality and safety of frozen or refrigerated foods, consumers should follow the cooking instructions on product labels and observe the standing times, if provided. Adjustments to the cooking time, due to oven wattage or other factors, may be necessary to reach the desired temperature before serving. For frozen or refrigerated foods that do not have labeled cooking instructions, it is suggested that the following cooking temperatures—as recommended by the United States Department of Agriculture (USDA)—be reached in all parts of the food.

☞ Ground meats - 160 °F (71 °C);  
ground poultry - 165 °F (74 °C)

☞ Beef, veal, and lamb steaks, roasts, and chops - 145 °F (63 °C); all cuts of fresh pork - 160 °F (71 °C)

☞ Poultry - 165 °F (74 °C)

☞ Eggs and dishes containing eggs (i.e. casseroles, soufflés, etc.) - 160 °F (71 °C)

☞ Fish/seafood - 145 °F (63 °C)

☞ Foods to be reheated that have previously been cooked and cooled by the consumer - 165 °F (74 °C)

The temperature of the food should be checked after the cooking time has ended, and proper standing time is allowed, by removing the food from the microwave and using a food thermometer to check the food in several places to ensure that a safe temperature has been reached throughout. Keep in mind all microwave ovens vary in power.

*\*Do not leave the thermometer in the food while microwaving, unless the thermometer is labeled as safe for microwave use, as this may result in arcing and could be a potential fire hazard.*

# HOW CAN I DEFROST FROZEN FOODS USING A MICROWAVE?

When defrosting packaged store-bought foods, check the label for microwave defrosting instructions. For foods with no instructions provided, remove food from its packaging before defrosting and place in a microwave-safe container, covered with a lid or plastic wrap, as discussed above. Refer to the microwave user manual, if available. If not, select the “defrost” setting or 30 percent power and set the time according to the size and amount of food to defrost. Without specific guidance, it is a good idea to test the progress by using a knife or fork to pierce the food and feel for frozen spots every minute or so until the food is completely defrosted. Also, while defrosting, rotate, stir or turn food upside down where possible, and for individual pieces, such as chicken parts, break them apart. When thawing ground meats, as the meat softens, scrape it from the frozen

mass and remove it from the oven. Continue this process, as often as necessary, to properly thaw the meat.



Cook meat, poultry, egg-containing dishes, and fish immediately after defrosting. Hold or store these foods at refrigeration temperatures (less than 41 °F; 5 °C) to prohibit the growth of hazardous bacteria, which may cause illness even if the food is cooked thoroughly at a later time.

The information provided above was obtained from the following resources:

United States Department of Agriculture (USDA). “Microwave Ovens and Food Safety”. July 2006. [http://www.fsis.usda.gov/PDF/Microwave\\_Ovens\\_and\\_Food\\_Safety.pdf](http://www.fsis.usda.gov/PDF/Microwave_Ovens_and_Food_Safety.pdf)

Food Science Australia. “The Safety of Microwave Ovens”. March 2005. [www.foodscience.afisc.csiro.au/micwave1.htm](http://www.foodscience.afisc.csiro.au/micwave1.htm)

Yale-New Haven Hospital. “Microwave Mania”. October 2006. [www.ynhh.org/online/nutrition/advisor/microwave.html](http://www.ynhh.org/online/nutrition/advisor/microwave.html)

*DISCLAIMER: The recommendations contained herein are meant to be used as guidelines only. There are many factors, including product handling and storage, that affect the quality and safety of food, therefore, the American Frozen Food Institute does not warrant and expressly disclaims that following these guidelines or manufacturer’s cooking instructions will necessarily guarantee food quality or safety.*