

MICROWAVE TECHNIQUES

LESSON 2

Extension Family Resource Management Specialists
The Texas A&M University System

The purpose of this lesson is to study the techniques and factors which influence length of cooking, and reheating and defrosting times. This lesson re-

fers to the text of Lesson 1. You may want to get out your copy of Lesson 1 before you begin.

CONTENTS

	page
I. Cooking Time Factors	2
• temperature	2
• quantity	2
• size and shape	2
• density	2
• composition	2
• power levels	2
II. Uniformity of Cooking	2
• similar foods	2
• different foods	3
III. Defrosting	3
IV. Containers and Covers	3



I. Cooking Time Factors

In conventional cooking, you control time and heat. In microwave heating, you control time and power. Remember that microwaves produce energy, not heat.

As food absorbs microwave energy, moisture and fat molecules in the food move rapidly. This friction produces heat energy.

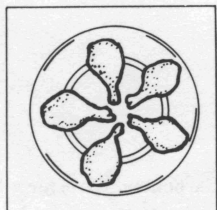
Because microwaves create heat within food, the oven controls regulate how long microwaves are produced, not the temperature of the oven cavity.

Microwave ovens produce energy at a given rate with no direct relationship to temperature. When more food is being cooked, cooking time increases. This is referred to as *doubling time*. This means that when you double the amount, you nearly double the cooking time. For this reason, some amounts of food can be cooked conventionally in the same or less time than it takes to microwave. Other factors related to length of cooking time are:

- **Temperature.** Cold or frozen foods take longer to cook and defrost than foods at room temperature or canned foods.
- **Quantity.** At any power level setting, a microwave oven produces a constant quantity of microwaves. The increase in time required to cook more food is not quite proportional to the increase in weight. For example, one potato in the oven absorbs all the microwave energy available. When two potatoes bake, the same amount of energy is divided between them. Small foods cook faster than large foods; a small potato will cook faster than a larger one.
- **Size and Shape.** The most uniform heating takes place in flat, doughnut-shaped foods. This is because microwaves cannot penetrate a depth of more than 2½ to 3 inches. For this same reason, choose rolled roasts no more than 5 to 6 inches in diameter, or flat roasts which are wider than they are deep.

Separate small portions often have better results than one large one. For example, prepare several small casseroles instead of a large one, or cakes in custard cups instead of one large cake pan.

Slim or fine parts will cook faster than thick or tough portions. Place drumsticks with ankles to the center; broccoli spears should have flowers to the center and spears to the outside of the dish. The fat side of a ham slice will not overheat when placed to the center of the cooking plate rather than toward the outside.



● **Density.** The denser a food, the longer it takes to cook. Casseroles, baked potatoes and roast beef are examples of dense foods which require standing time. This is also called *carryover cooking* and means that heat continues to move to the center and the food continues to cook. Allow for this when planning cooking time. Remove from the oven when still underdone and let carryover cooking finish the job.

● **Composition.** Foods high in sugar or fat heat rapidly. Parts of foods which are sugary or fatty will heat more rapidly than the rest. Foods with a high water content absorb more microwave energy than those with little or no water, but high water content may slow cooking time. Three or more cups of liquid can be heated faster on most surface units than in a microwave, for example.

● **Power Levels.** Varying the power level alters the speed of heating. If you lower the power, you'll lengthen the cooking time needed.

● **High power** is used for fast-cooking foods such as fish, hamburgers and most poultry.

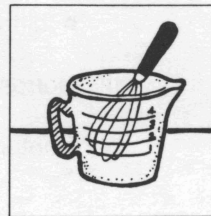
● **Medium power** is for foods that need extra attention such as beef and pork roasts, turkey and cheese dishes.

● Use **low power** for delicate foods or those needing tenderizing. Examples of these are stews, pot roasts and souffles.

II. Uniformity of Cooking

Microwave energy penetrates food to a depth of only 2½ to 3 inches. Heat for cooking the rest of the food is transferred into uncooked layers.

For purposes of this lesson, we'll divide food into similar and different categories. Similar foods have similar composition throughout, for example: cake batter, casseroles, spaghetti sauce or meat loaf. Different foods may be made up of different components, for example: sandwiches (meat and bread), ham slices (fat and meat) and sticky sweet rolls (sugar and bread).



● **Similar Foods.** Food which is not flat or doughnut-shaped is uniformly heated by:

1. Using a lower power setting. This will result in less heat building up in the outer layer and more time for heat to move toward the cooler food in the center.

2. Covering with a glass lid or plastic wrap will capture steam and cause more even and faster cooking.

3. Using a final standing time. After the power is off and food is removed from the oven, heat in the outer layer will move toward the cooler food in the center. This will equalize the temperature.

4. Stirring midway during the heating time. The most effective stirring replaces the cooler food at the center with the hotter food at the sides. Follow the manufacturer's cookbook, or stir two or three times during cooking.

5. Shielding food with foil, if permitted by the oven manufacturer. This will prevent overheating of the covered portion. This is especially effective on poultry wings and legs, and the corners of a square or rectangular cake pan.

6. It may be necessary to turn or rearrange foods.

7. Turn or shield tall foods. If a food is more than 5 inches high, the parts near the top of the oven will cook most quickly.

● *Different Foods.* Several different foods on one dish, such as leftovers, will heat more uniformly if they are similar in amount, size, shape or moisture content. Food will heat less in the center of any arrangement. Use these adjustments when heating unlike foods together:

1. Place foods with the shortest heating time (low moisture, high fat, high sugar) in the center of the plate, with the smallest or narrowest part nearest the center.

2. Reduce the size of portion or make two portions; change the shape of food. For example, depress center of mashed potatoes.

3. Increase the initial temperature of food. A frozen or refrigerated product will take longer than the same food from a can.

4. Equalize cooking time by combining easily-heated items with harder-to-heat items. For example, make foods more compact by putting them in custard cups; add sauce or gravy; hide under other food (gravy over potatoes, chicken stew over biscuits). Make hard-to-heat items easier to heat by cubing, dicing, adding butter, thinly slicing or depressing.

5. When heating sandwiches use day-old bread or toast to reduce moisture; use bread with added eggs or fat; heat on a napkin (uncovered) to promote moisture absorption.

When placing fillings on the bread:

- Slice meat thinly;
- Keep fillings inside the edges of the bread;
- Don't add condiments;
- Undercook hamburgers (remember standing time);
- Be sure bread and fillings are same temperature (better yet, heat separately, then combine);
- Place cheese on the bottom; cut in triangles; place points to center.

III. Defrosting

This can be accomplished automatically, or manually if your oven has no defrost setting. Good defrosting techniques can keep food from beginning to cook while defrosting.

- Turn or rotate foods which can't be stirred.
- Separate pieces such as chicken or fish as soon as they are pliable.
- Let large items stand to complete defrosting.
- Place foods such as fish or chicken pieces under running water until they can be separated.

Cover foods with waxed paper during defrosting to promote even heat distribution. The defrost setting is usually at 30 to 50 percent of full power. You can defrost manually by setting full power for 30 seconds and turning it off for 30 seconds. Or, you can choose a level, such as simmer, which cycles off and on automatically. Cycling is essential to defrosting because microwaves are attracted to water rather than to ice crystals.

When the outside is thawed, microwaves will cook it before going to the icy interior unless cycling provides a rest period. You can achieve some interesting results by applying this knowledge—how about hot apple pie with ice cream?! (See Experiment 4.)

IV. Containers and Covers

The doughnut, or ring-shaped pan, exposes the most food surface to microwave activity. This shape results in good cooking. As a substitute, place a heavy-bottomed glass in the center of a cooking container. Place small items, such as potatoes, in a ring.

High liquid foods boil vigorously during microwaving. Select a large container so food will not boil over. This is important with puddings, scalloped potatoes and pasta. (See Lesson 1, dishes and utensils.)

EXPERIMENTS

Microwaves produce energy, not heat. Practices including stirring, rearranging, covering and shielding contribute to uniform cooking or warming of food. Many of these techniques also aid in defrosting.

Experiment 1—Standing Time

Review the section on cooking time.

Baked Apples

Take one thin circle or peel off top of two large apples. Remove cores. Fill each apple with sugar, cinnamon and butter. Place one apple in oven. Microwave on high for 2 minutes. Remove, and describe its appearance. At intervals, test with fork; describe doneness and appearance.

2-minute description (after 30-second standing time): _____

3-minute description (after 30-second standing time): _____

4-minute description (after 30-second standing time): _____

Place second apple in the oven. Microwave on high for 3½ minutes. Remove, and describe its appearance.

3½-minute description (after 30-second standing time): _____

4½-minute description (after 30-second standing time): _____

5½-minute description (after 30-second standing time): _____

Your Reactions

1. What amount of time produces the most acceptable product for you? _____

2. Did you observe a difference in texture and appearance after the first 30 seconds of standing time?
Yes ___ No ___

If so, what was it? _____

Baked Potatoes

Select two potatoes, 6 to 8 ounces each. Pierce with fork. Place one on paper towel and set in oven. Microwave 4 minutes on high. Remove. Pierce with fork. Describe the results at 1-minute intervals. Place second potato in oven. Microwave on high for 6 minutes. Remove. Pierce with fork. Describe the results.

Potato #1

4 minutes _____

5 minutes _____

6 minutes _____

7 minutes _____

8 minutes _____

Potato #2

6 minutes _____

7 minutes _____

8 minutes _____

What changes did you observe? _____

Is it better to undercook or overcook? _____

Why? _____

Experiment 2—Doubling Time

Review section on cooking time factors.

Soups

Prepare a can of cream of tomato soup as the label directs. Place on the range burner. Turn unit on high. Time the soup until it first boils. Be sure that the temperature is the same throughout. How long did it take? _____

Repeat the procedure, but place the soup in a glass casserole in the microwave. Turn microwave on high. Count the time until boiling. Be sure you have a uniform temperature throughout. How much time did it take?

_____ Which was quicker? _____

Questions or comments:

The microwave should have taken longer; foods with high water content have high mass and density which slow cooking time.

Your Reactions

1. Refer to your microwave cookbook for baked potatoes. How long does it recommend for one potato? _____ For two? _____ For six? _____ For eight? _____
2. How long does it take you to prepare the same number in your regular oven? For one? _____ For two? _____ For six? _____ For eight? _____
3. At what point would it be more time-consuming to use the microwave? _____

Questions or comments:

Experiment 3—Stirring

Review section on uniformity of cooking.

Meat and Noodle Casserole

- | | |
|--|----------------------------------|
| 8 ounces egg noodles | 2 7-ounce cans drained |
| 3 tablespoons butter or | tuna or |
| margarine | 2 cups chopped turkey, |
| $\frac{1}{2}$ cup finely chopped green | chicken or ham |
| onions | $\frac{1}{3}$ cup cracker crumbs |
| $\frac{1}{2}$ teaspoon salt | 2 tablespoons minced |
| $\frac{1}{8}$ teaspoon pepper | parsley |
| $\frac{1}{4}$ cup unsifted flour | 2 tablespoons melted butter |
| $1\frac{1}{2}$ cups milk | 1 clove garlic, minced |

1. Microwave noodles in 8 cups of water with 1 teaspoon salt and 1 teaspoon oil until partially cooked (about 10 minutes). Use high power. Stir once or twice. Drain and set aside.
2. In a 3-quart casserole, combine butter, garlic, onion, salt and pepper. Microwave on high 2 to 3 minutes, stirring after 1 minute.
3. Stir in flour until smooth. Gradually stir in milk. Microwave on high 4 to 6 minutes, stirring every 2 minutes until smooth and thickened.
4. Gently stir meat and noodles into sauce. Cover. Microwave on high 15 to 17 minutes, stirring every 8 minutes.
5. In small bowl, mix crumbs, parsley and butter. Sprinkle over casserole before serving.

Your Reactions

1. How long, from start to finish, did it take to prepare the casserole? _____ Compare the time involved with preparing a similar casserole by conventional oven. Was it shorter _____ or longer _____ by conventional oven?
2. Do you think the results would have been different without stirring? Yes _____ No _____ If so, how? _____
3. Describe your own and your family's evaluation of the final product. _____

Did they like it, more _____, less _____, or about the same _____ as a conventionally prepared meat and noodle casserole?

Why? _____

Experiment 4—Defrosting

Review section on defrosting.

Pie-a-la-Mode

Put a dipper of freezer-hard ice cream on a serving of fruit pie. The pie can be at either room or refrigerator temperature. Heat 15 seconds.

Your Reactions

1. Was the fruit filling hot? Yes _____ No _____
2. Was the ice cream melted? Yes _____ No _____
3. What was your family's reaction? _____
4. In your own words, explain how this happened. _____

Remember that microwaves prefer water molecules (fruit fillings) to ice crystals (ice cream). This is why foods can begin to cook on a defrost setting.


Questions or comments:

Experiment 5—Reheating

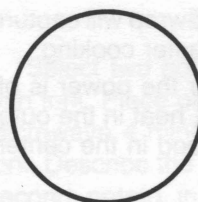
Review section on different foods.

To the right are four plates and four menus. Sketch and label the food as it should be placed for uniform reheating.

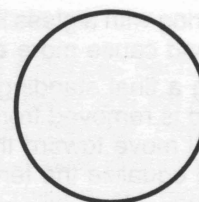
Example: Beef stew
Green beans
Mashed potatoes



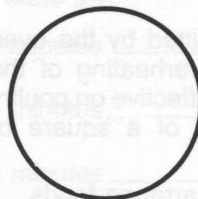
Arrange green beans in long, flat strings.
Cover potatoes with stew.



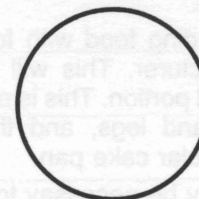
Fried chicken
Mashed potatoes and gravy



Pork chops
Applesauce
Whole kernel corn



Ham slice
German potato salad
Spinach



Creamed chip beef
Biscuits
Harvard beets (whole)

Experiment 6—Sandwiches

Review section on heating sandwiches. Evaluate three of the following or use three of your favorites.

Sandwich	Type of Bread	Method	Heating Time	Comments
Sloppy Joe	hamburger bun, untoasted	pickles	30 seconds	soggy on bottom
Hot dog (heat separately)	plain bun	wrap in napkin	_____	_____
Hot dog	plain bun	mustard/catsup wrap in napkin	_____	_____
Hog dog	plain bun	on paper plate	_____	_____
Hot dog, split	plain bun	wrap in napkin	_____	_____
Ham and cheese	plain bread	cheese on top wrap in napkin	_____	_____
Ham and cheese	plain bread	cheese on bottom on china plate	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

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