

# Microwave your foods safely

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For many consumers, microwaving has become the primary method of heating food, providing convenience and time savings. But a food-safety expert in Penn State's College of Agricultural Sciences says recent outbreaks of foodborne illness have been associated with microwaved foods, and several factors may be responsible.

Martin Bucknavage, food-safety extension associate in the Department of Food Science, points to a Centers for Disease Control report last year that linked 272 salmonellosis cases to the consumption of chicken potpies, many of which were cooked in microwave ovens.

"In these cases, it was believed that the microwave cooking process was inadequate or uneven, thereby allowing the Salmonella bacteria to survive and infect the individuals who ate the potpie," Bucknavage said. "Also, the microwave cooking instructions for the potpies may not have taken into account variations that exist in microwave heating. Studies have demonstrated that microwaving does not heat food evenly. Cold spots can exist if the food is not properly rotated or stirred during the heating/cooking process or if the product does not reach a proper internal temperature.

Microwave heating is very different from conventional cooking, he explained. Saturating a food with microwaves causes molecules within the food, such as water, to absorb microwave energy and begin to rotate. The rotating water molecules generate friction as they move past or collide with each other or with other molecules. Heat from molecular action then transfers throughout the food.

"Some believe that microwaving heats food from the inside out, but this is not entirely true," Bucknavage said. "During microwaving, most of the energy is absorbed just below the surface of the food. Heat is then transferred both inward and outward, and several different properties will determine the effectiveness of the heating process. Differences in product moisture and density, thickness of the crust or skin, and the amount of fat, sugar or salt in a food can affect the uniformity of heating by changing how much energy is absorbed and how well the heat is transferred within a food."

Cold spots within the food also can occur as microwaves bouncing around in the oven interfere with one another and cancel each other out, Bucknavage explained. The cancellations keep certain areas of the food from receiving adequate energy, resulting in cold spots.

"Cold spots can be found one inch or so away from heated spots," he said. "To deal with cold spots, microwave oven manufacturers have installed turntables."

Research also has demonstrated that frozen food does not heat as well as defrosted food in microwave ovens. The water molecules in frozen food are immobilized by ice crystals, thereby preventing them from rotating freely, so frozen foods need much more time to heat in a microwave oven than defrosted foods.

While manufacturer's instructions for microwaving often are listed on the product packaging, there are differences in the wattages of power levels of different makes of microwaves. The oven's age also can affect its heating ability: As it gets older, its power decreases. Consumers should follow manufacturer's instructions as a guideline but check the internal temperature of the product to make sure the food is sufficiently heated.

And, not all microwaved food will have the same risk of foodborne illness. "Ready-to-eat items such as microwave popcorn and canned soup pose little health risk," Bucknavage said. "But raw food items such as those containing meat, and partially cooked items such as breaded fish sticks may have pathogenic bacteria associated with them. So, these types of foods must be thoroughly cooked before eating. It is often difficult to tell whether an item is ready-to-eat, partially cooked or raw, so if you're uncertain, it is best to properly heat the product. While the manufacturers label should provide this information, it may be difficult to discern."

Bucknavage offers the following recommendations for good microwave cooking:

- 1) Rotate food frequently to help prevent cold spots. If your microwave oven does not have a turntable, be sure to stop the oven during cooking and rotate the food item by 90 degrees every couple of minutes.
- 2) Stir the food frequently during cooking if possible to help distribute heat throughout the product.
- 3) Let food sit for at least two minutes after microwaving to allow more time for the residual heat to distribute throughout the food.
- 4) Don't cut cooking time short. Allow enough time to get the product hot throughout, using manufacturer's instructions on the packaging as a guide to cooking times. Check temperatures in the food with a properly calibrated thermometer – product temperature must reach 165 degrees F throughout. Check the temperature in several places to assure that no cold spots exist.
- 5) Cook large pieces of meat on a lower power for a longer period of time. This allows more time for heat to reach the center.

6) Don't continue to eat food if the product seems cool; stop and reheat the product to get it to the right temperature.

7) Cover food to keep the product moist; the steam generated will help distribute the heat. Use a container that is manufactured for use in microwave ovens.

8) Continue cooking immediately after defrosting or precooking food in the microwave. Storing partially cooked food in the refrigerator may allow harmful bacteria to grow within the product.

Source: Penn State

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