

Microwave Myths



FACT VS. FICTION

By David Schardt

It all started with Hans Hertel.

The Swiss food chemist and seven fellow vegetarians confined themselves to a hotel for two months in the late 1980s. There, they consumed milk and vegetables prepared in the microwave oven and in other ways.

Hertel emerged with an astonishing pronouncement. Eating microwaved milk and vegetables caused changes in the men's blood that "appear to indicate the initial stage of a pathological process such as occurs at the start of a cancerous condition."

Hertel didn't actually find that microwaved food caused cancer. And his "study," which no researchers have tried to reproduce, was never peer-reviewed or published in a scientific journal.

"Without knowing more about how he conducted his study, what he measured, how he measured it, and what he found, it's impossible to even begin to evaluate his findings," says Barry Swanson, a food scientist at Washington State University in Pullman.

Hertel has dropped out of public view. So has William Kopp, described only as a "U.S. researcher," who wrote an article in 1996 claiming that Cold War research in the Soviet Union had proven the dangers of microwave ovens.

"People who ingested microwaved foods showed a statistically higher incidence of stomach and intestinal cancers, plus a general degeneration of peripheral cellular tissues and a gradual breakdown of the function of the digestive and excretory systems," Kopp wrote.

The Soviet research was never published and the institute where it was conducted, in what is now the Republic of Belarus, no longer exists. (The former Soviet Union may have banned microwave ovens for a short period, but no countries ban them today.) Kopp himself reportedly changed his name and van-

We are increasingly concerned about the damage done to food in the home microwave oven," the editor of an upstate New York newspaper e-mailed *Nutrition Action Healthletter* last November.

"According to the sources we find online and elsewhere, microwaving food creates carcinogens, and in parts of Europe, health authorities have banned microwaves as dangerous to human health."

It's not clear why so many people are uneasy about microwave ovens. "Maybe it's because there's no obvious reason why the food cooks," offers physicist Louis Bloomfield of the University of Virginia in Charlottesville, who answers questions about microwaves at howthingswork.virginia.edu.

And those questions are becoming more urgent, as charges and rumors speed across the Internet. Here's how to separate microwave fact from fiction.

ished, believing that the appliance industry was out to persecute him.

While Hertel and Kopp are no longer around, their unsubstantiated charges are all over the Internet.

"The prolonged eating of microwaved foods causes cancerous cells to increase in human blood," says "10 Reasons to Throw Out your Microwave Oven," an article by Joseph Mercola, an Illinois alternative-

medicine physician who operates what he says is the "#1 Natural Health Site" on the Internet (www.mercola.com).

Foods cooked in microwave ovens are "a recipe for cancer," adds medical journalist Simon Best on his Electromagnetic Hazard and Therapy Web site (www.em-hazard-therapy.com).

Hertel and Kopp aside, here's what we know about microwave ovens.

Inside the Microwave

"A microwave oven heats food using radio waves that are almost identical to radar," says Jim Felton of the Lawrence Livermore Radiation Laboratory in Livermore, California.

The frequency used in microwave ovens, about 2,500 megahertz (MHz), is more powerful than the frequency that's used to transmit radio, television, and cell phone signals. But it's thousands of times weaker than ultraviolet light, visible light, and X-rays and millions of times weaker than the gamma radiation that's used to irradiate some foods.

"While X-rays, gamma radiation [though not irradiated food], and even sunlight can cause cancer, microwave radiation cannot because it simply doesn't pack enough power to damage your DNA," says Gary Zeman of the Health Physics Society in McLean, Virginia. The Society is a nonprofit scientific organization that promotes radiation safety.

What 2,500 MHz microwaves *can* do is get absorbed by the water, fats, and sugars in food. That generates heat, which cooks the food. Once the oven is turned off, it produces no more microwaves. And those that it did produce are long gone.

"The lifetime of microwaves in the oven is something like millionths of a second," says physicist Louis Bloomfield.

Cancer

Forget the charges floating around the Internet. The “evidence” that microwaved foods cause cancer boils down to Hans Hertel’s and William Kopp’s claims.

“There is nothing solid,” says Lawrence Livermore’s Jim Felton, who is also associate director for cancer control at the Cancer Center at the University of California, Davis.

That may explain why scientists haven’t spent time and money looking for a link. “I can honestly tell you that I have never seen a valid scientific study—and I pay attention to most of the cooking research out there—that has given us

reason to test

whether microwaving food could cause cancer,” says Felton.

“In fact, my research suggests just the opposite.”

Grilling or frying meat and poultry can create heterocyclic amines, which may cause cancer. When Felton and his colleagues briefly microwaved meats and drained off the juices before grilling, most of the precursors of those potential carcinogens were lost along with the juices.¹

“I generally recommend that patients microwave their meats for one to five minutes and discard the juices before grilling,” says researcher Cyndi Thomson of the Arizona Cancer Center at the University of Arizona in Tucson.

Nutrients

If you microwave your food, “you’re zapping away nutrients and risking your health,” charges physician Joseph Mercola, who recommends that consumers get rid of their microwave ovens and eat at least a third of their food raw.

“Actually, microwaving retains more nutrients than other forms of cooking, if you don’t use a lot of water and don’t overcook the food,” says food scientist Barry Swanson.

“For some reason, people think heat breaks down vitamins, but most vitamins are really very stable to heat. Nutrients are mostly lost into the water, and there’s



Safe Microwaving

Cooking & Reheating

- Arrange food evenly in the dish and add some liquid if needed.

Cover with a loose lid to let any steam escape. (If you use plastic wrap, make sure it doesn’t come in contact with the food.)

- Don’t cook large cuts of meat on high power (100%). Use medium power (50%) and a longer cooking time, so the heat can reach the center without overcooking the outer areas.
- If your microwave doesn’t have a carousel, stir or rotate the food midway through the microwaving time.
- If you’re partially cooking food in the microwave before you finish it on the grill or in a conventional oven, transfer the microwaved food immediately. Warm, partially cooked food is a breeding ground for bacteria.
- Use a food thermometer or the oven’s temperature probe to verify that meat, poultry, and casseroles have reached a safe temperature. Place the thermometer in the thickest area of the meat or poultry—not near fat or bone—and in the innermost part of the thigh of whole poultry. Check in several places to be sure red meat reaches 160° F, poultry reaches 180° F, and egg casseroles reach 160° F. Fish should flake with a fork. Leftovers should reach 165° F.
- Food continues to cook after the microwave is turned off, as heat flows from hotter to cooler regions. So allow dense foods like meat, poultry, quiche, and casseroles to stand for five minutes before you check the internal temperature. Foods that aren’t dense—cut vegetables, bread, soup, and beverages, for example—don’t need to stand.
- Don’t cook whole, stuffed poultry in the microwave. The stuffing might not reach the temperature needed to destroy harmful bacteria.

- Heat ready-to-eat foods like hot dogs, fully cooked ham, and leftovers until they’re steaming hot.

Defrosting

- Remove food from its packaging before you defrost it in the microwave. Foam trays and plastic wraps can melt, which can cause potentially harmful chemicals to migrate into the food.
- If you’ve defrosted meat, poultry, egg casseroles, or fish in the microwave, cook it immediately.

Cookware, Containers, & Wraps

- The containers you use for cooking and reheating should be labeled “microwave safe.” Thick, non-decorative glass is also safe.
- “No way should you cook or reheat food in a yogurt, margarine, or dessert topping tub,” says the FDA’s Kristina Paquette, “because they haven’t been tested or approved.” They can warp or melt, which can cause chemicals—like the plasticizers that make the containers flexible—to migrate into the food.
- It’s okay to use wax paper, cooking bags, parchment paper, microwave-safe paper plates, and white microwave-safe paper towels (the dyes used in non-white paper towels haven’t been approved for use with food in the microwave).
- Never use thin plastic storage or grocery bags (they can melt), brown paper bags or newspaper (both sometimes contain bits of metal and the bags’ seams could contain glue), or aluminum foil (it can cause dangerous arcing).

Source: Adapted from U.S. Department of Agriculture (www.fsis.usda.gov/factsheets/cooking_safely_in_the_microwave/index.asp).

no reason to add water to vegetables or anything else that already contains a lot of water."

Too much water was apparently the problem in a 2003 study in which European researchers reported that microwaving broccoli in a bowl of water destroyed nearly all of several flavonoids, while steaming had only a mild effect on them.² (Flavonoids are plant compounds that may help protect against heart disease and cancer, though the evidence is scanty.)

That research isn't relevant to household microwaving, says Swanson. "Basically, the researchers added far too much water and microwaved the living day-lights out of the broccoli."

Wraps, Containers, & Packaging

How safe are plastic wraps, frozen-food trays, and "microwave-safe" containers and packaging?

■ **Plastic wrap.** E-mails widely circulating around the Internet warn that plastic wraps release the carcinogen dioxin when microwaved.

"It's a chemical impossibility because the precursors for dioxin are not in the plastic wrap," says George Sadler, a professor of food packaging at the National Center for Food Safety and Technology in Summit, Illinois. The center is a consortium of scientists from academia, the Food and Drug Administration, and the food industry.

"We are not aware of any plastics that yield dioxin as a breakdown product, absolutely none," adds Kristina Paquette of the FDA's Office of Food Additive Safety in College Park, Maryland.

"I've seen another e-mail recently warning against using plastic wrap because of the phthalates it supposedly produces," says Sadler. (Phthalates make plastic flexible.) "Manufacturers quit using those many, many years ago."

While plastic food wrap hasn't been approved by the FDA for use in microwave ovens, says Paquette, "as long as the wrap doesn't touch the food while it's cooking, there's little chance of



any chemicals migrating from the wrap into the food."

Besides, she notes, "there are no components of plastic wrap that are considered carcinogenic in humans."

■ **Containers & packaging.** "If it's food you buy in a store for microwaving, like a frozen dinner, I would be 100 percent confident in using the container it came in," says Paquette. "But remember, those are usually approved for only one use, because the polymer in the packaging can start to break down during a second use in the microwave."

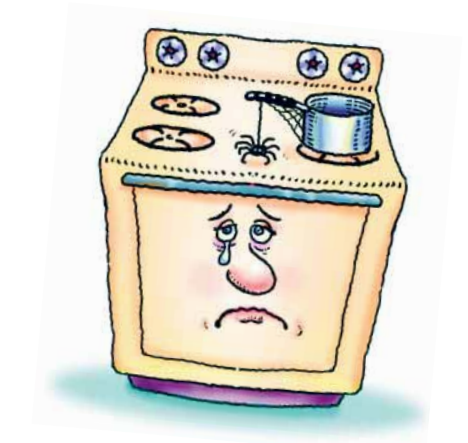
"The FDA has a rigorous protocol that manufacturers of food packaging must execute every time they have new packaging components they want to use," says George Sadler. "Companies must measure how much, if any, of the packaging materials migrate into the food when they're heated in the microwave. Then the manufacturer has to undertake a rigorous toxicological evaluation to show that those levels are safe."

("Safe" means that any packaging material that ends up in the food is at less than one-hundredth the lowest level that causes harm in animal studies.) The company has to test for cancer, genetic damage, and any impact on reproduction or development.

"The FDA's testing guidelines for microwave containers pretty much cover the gamut of anything anyone would do with something in a microwave," adds Paquette, "because everybody wants to make sure they have a cushion of safety there."

Do those safeguards extend to reusable plastic containers you buy at the supermarket? Yes, as long as they say "microwave safe," which means they've been tested for up to 240 hours in the microwave. (While other containers might be as safe, their components haven't been tested.)

■ **Heat susceptors.** Ever wonder why microwave popcorn bags are clearly marked "This Side Up" or "This Side Down"? The bottom of the package contains a metallized surface that absorbs microwaves and becomes



hot enough to pop the popcorn.

Can that "heat susceptor" generate enough heat to trigger the release of chemicals like packaging adhesives into the food? No, says the FDA's Paquette.

"If you look in a popcorn bag, you don't actually see the silver-colored heat susceptor," she explains. "It's sealed inside a pouch in the bag itself." That helps to dramatically reduce the migration of chemicals into the popcorn oil, says Paquette.

Radiation Leaks

Do microwave ovens leak radiation?

"The FDA discontinued field testing them in the early 1980s, in part because of budget cutbacks and in part because few ovens didn't meet federal safety standards," says George Kraus of the agency's Center for Devices and Radiological Health.

In 2000, Health Canada (the Canadian equivalent of the Department of Health and Human Services) tested 60 new microwave ovens and 103 used ovens. None of the new ones, and only one of the used ones, exceeded Canada's stringent leakage limits, which are similar to the U.S. limits. The one oven that failed was 23 years old.

"Leakage of microwaves can only occur if the cooking chamber—including the metal grid over the front window and the seals around the door—has holes in it," says the University of Virginia's Louis Bloomfield.

And even in the unlikely event that your microwave does leak, you're not going to be showered with radiation. Microwaves lose intensity rapidly as they spread out. By the time they've traveled a foot or so from a small leak, they've effectively disappeared. 🍌

¹ *Food Chem. Toxicol.* 32: 897, 1994.

² *J. Science Food Agric.* 83: 1511, 2003.