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Microwave Oven Q & A

- Q** Will eating microwaved foods have any effect on humans after several years?
Cooking foods in a microwave oven does not alter them other than to heat them. There are no known effects on humans from microwaved food as opposed to foods heated by other means.
- A** A microwave oven was placed in the operating room to heat fluid bags. Is this safe to use when a patient is under anesthesia of oxygen and isoflurane or sevoflurane?
- Q** A microwave oven is designed to operate inside a metal enclosure. The [Food and Drug Administration \(FDA\)](#) has rules about how much a microwave oven can leak through the door. RF (radiofrequency) leakage in an operating room can usually raise two concerns; one is the RF safety issues. The FDA limit protects this safety aspect as long as no one directly leans on the oven when it is on. The second is RF interference with other electronic instruments used in the room. This is also distance dependent. Shielding or increasing distance between the oven and the equipment solves the problem easily. The concern raised in your question is on a possible microwave interaction effect with oxygen and other gases. I see no reason to worry about radiofrequency safety more than electrical safety in an operating room.
- A**
- Q** A pregnant worker in her first trimester had used an older-model Litton microwave oven to heat her food. She was near the oven for approximately 2-3 minutes while it was "operating." Our maintenance person was nearby and decided to use a small handheld microwave tester to test for microwave emissions. The tester read 2 mW/cm². Is this a cause for concern for the pregnant worker? Is there a maximum allowable limit for commercial microwave oven radiation?
- A** The [US Food and Drug Administration \(FDA\)](#) has a regulation on microwave oven leakage. In Title 21 it states that the power density limit from an operating microwave oven "shall not exceed 1 milliwatt per square centimeter at any point 5 centimeters or more from the external surface of the oven, measured prior to acquisition by a purchaser, and, thereafter, 5 milliwatts per square centimeter at any such point."

The power leakage from the microwave oven will be even lower once an individual is a foot (12 inches) or more away from the oven, since the power is inversely proportional to the square of distance. A recently published review paper in *Bioelectromagnetics* (Volume 24, Supplement 6, Page S174-S186, 2003) on "Radiofrequency Fields and Teratogenesis" indicated in the conclusion of the review that only if the fetal tissue is heated could there be biological effects. The microwave oven leakage would not cause heating of the fetal tissue.

- Q** I went to school to check out my grades and before class I leaned over an old-looking microwave oven. My testicle area was about 1-3 inches away from it and I was in front of it for 1-3 seconds (the door was closed). Would this cause birth defects, etc., since old microwaves have been known to leak radiation?
- A** Testicular effects of microwaves have been reported in the scientific literature following high-level exposures in experimental situations. In those experiments, effects occurred only after exposures with sufficient intensity to cause heating of the testes. The US Food and Drug Administration (FDA) regulates leakage from microwave ovens. The allowable leakage levels outside operating ovens are well below the levels required for any adverse health effect. And there is no leakage and there are no residual microwaves when the oven is off. Even if the old oven you mention predates FDA regulations, it is highly unlikely there would be sufficient leakage to cause any harmful effects in short time periods like you mentioned.
- Q** I received third-degree burns and destroyed nerves during an operation from a hot pack taken out of the microwave oven. Are there any lasting radiation effects from this?
- A** Heat imparted to any article from a microwave oven is no different than heat from any other source. There is no lasting or special effect of the microwaves other than the effect of the heat.
- Q** The microwave oven at work remained on after the door had opened. No one really thought anything of it until later that day when we all had headaches. What risks do we have from the microwave oven staying on?

A Commercial microwave ovens are doubly interlocked, making it highly unlikely that the microwaves could be ON when the door is open. It is more likely that the fan stayed on; this is not unusual. So the first thing you might consider is what evidence was there that microwaves were actually being generated versus just the fan being on when the door was opened. The main effect of the microwaves would have been to heat. The heating power inside the oven is sufficient that if microwaves were still being generated when the door was open then there would be a substantial tissue-heating effect outside the open door if you were close enough. Unless you felt or observed heating outside the oven door, then it is unlikely that microwaves were being generated. In any case, microwave radiation wouldn't cause headaches.

I would recommend, however, that if microwaves are being generated even after the door has been opened, the microwave should be taken out of service and repaired or replaced.

Q What intensity levels of radiation does a microwave oven produce?
The microwave radiation intensity inside an oven depends on the rated power of the oven, typically 500 to 1200 watts.

A When the oven is ON, on the high setting, the entire rated power is delivered to objects in the oven. This power is sufficient to cause rapid heating of objects placed inside the oven. At lower settings the power delivered is less.
When a microwave oven blows up, how hazardous is the smoke that billows out?

Q I think this question is related to microwave cooking. When microwaves cook food, the food gets hot because the microwave energy is absorbed by the food. Water is the most dominant absorber of microwave energy. When any material is overheated, it gets burned. The smoke is due to the burning of the food material, the same as during barbecuing. Overheating in a microwave oven is no different from other heating methods.

A Is it safe to put a tea bag **that has a staple in it in the microwave? Will this cause sparks? Why or why not? And does it make a difference if the staple is submerged in water?**

Q
A A microwave oven operates by exciting the molecules of the item inside the oven. In the case of foods, the microwaves are absorbed more readily by molecules of water, sugars, fats, etc. In these cases, the excited molecules show up to us as heated food.

Generally speaking, most metal items in a microwave oven actually deflect the microwaves. Something with sharp metal edges, like a fork, when in an operating microwave oven, can lead to arcing. That is because the item is metal and the sides of the microwave oven are metal. The sharp tines of the fork deflect the energy to the metal of the walls, thus an arc. If the metal object is against the metal wall when the microwave is operating, you can end up with a burn or a hole through the wall. In the worst case, you might start the oven on fire.

There are some small metal items that don't deflect the microwaves very well and will heat up fast. This is where the staple comes in. There have been reports of staples on popcorn bags overheating and causing fires. You don't get arcing but the overheating of the small metal item causes overheating in the packaging (assuming, for instance, a staple is holding some packaging together).

The formation of sparks, arcing, or heating from metal objects may be prevented by placing the utensil in some food or liquid while in the microwave. This preferentially dissipates the charge (e.g., for a fork) or the extra heat (e.g., for a staple).

It would seem that the possible hazards of a staple overheating and the initiation of a fire would both be overcome by the staple being under water. However, keep in mind that there do not appear to be any reports in the literature on the safety or lack thereof of staples under water in microwave ovens.

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