KIMS HOSPITALS™

# NEWSLETTER ON WELLNESS

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# Health Effects of Using a **Microwave Oven**

## A Scientific Review

# Editor's Desk

Dear Reader,

Welcome to the 12th issue of the KIMS e-newsletter on health and fitness. This issue is titled "**Health Effects of Using a Microwave Oven: A Scientific Review".** I'd like to write about a common fear people have about microwave ovens and their safety. Contrary to popular myths and unfounded concerns circulating online and in public media, science has proven that microwave ovens are safe and do not cause cancer. In the USA, Japan, Denmark, and Argentina, more than 95% of homes have microwave ovens. In India, only 15% of homes have microwave ovens.

The World Health Organization (WHO), the ICMR, the National Cancer Institute (NCI) USA, and other reputable health groups have done a lot of study on how microwave ovens affect people's health. Microwave ovens are safe, efficient and highly beneficial cooking method. There is no evidence that they cause harm and some evidence that they are better than other cooking methods at preserving nutrients and preventing the formation of harmful compounds under correct heat.

Non-ionizing radiation, which is different from ionizing radiation (like X-rays, gamma rays, and ultraviolet rays), is what microwave ovens stoves use. Radiation that doesn't ionize doesn't have enough power to damage DNA or break chemical bonds. There is not enough proof that using a microwave oven causes DNA damage or cancer, according to several scientific studies.

There isn't strong evidence to back claims that microwave ovens cause health problems like ADHD, Alzheimer's, or Parkinson's. I hope you benefit from reading this newsletter.

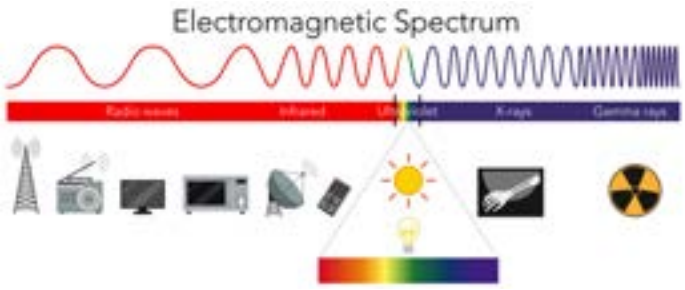
As always, we value your comments.

Thank you

**Dr. Bhujanga Rao Vepakomma**
Chief Editor

## Health Effects of Using A Microwave Oven: A Scientific Review

At this point in time, knowledge in the media, like TV or the internet, often shapes how people feel. But this knowledge doesn't always match up with scientific evidence. Even though people are becoming more aware, there are still a lot of worries about the health and safety of using microwave ovens at home. This newsletter examines the latest scientific evidence on the health effects of microwaves and microwave cooking, focusing on its potential relationship to cancer and other diseases. It also brings out the pros of cooking in the microwave and gives safe ways to use a microwave oven.




### Microwave ovens use non-ionizing radiation

Broadly speaking, there are two types of radiations with which we often deal with in day-to-day operations.

One is ionizing radiation like X-rays, gamma rays, and ultra-violet rays, while the other non-ionizing radiation like microwaves, radiofrequency radiation, infrared and visible light etc. All non-ionizing radiations are safe for the human body, as they do not harm the body. Microwaves belong to this category. Ionizing radiations like X-rays and gamma rays are harmful, and the ions produced in the cells cause serious injuries to the DNA of the human body, causing cancer. However, they are not used in microwave ovens.

We heat food in a microwave oven with microwaves that have frequencies around 2.45 GHz.This frequency is used to match with the natural resonance frequency of water molecules, which makes them vibrate and produce heat through friction. This heat in turn heats food layer by layer, covering the complete food in a short period of time with sensors monitoring cooking time and power level. Microwave ovens work efficiently and safely to cook, reheat, and defrost food.

Microwave ovens are different from regular ovens like toasters because they can heat up very quickly. As a thermal processing method, microwave heating has many possible benefits, such as volumetric heating, which raises the temperature more quickly and useless energy. The chemicals in our food can't be changed by microwave energy. So there's no reason not to use microwaves and eat food that was cooked in them.

## Microwave ovens have become a common kitchen appliance

For the past 60 years, microwave ovens have been a common kitchen appliance. If they were linked to a high risk of cancer, public health records would probably show that. Please see the table below for a list of countries where microwave ovens are used in almost all homes.

**Household-microwave-penetration in some countries (collected from websites)**

| Country | % of households using microwave ovens |
|---|---|
| India | 15% |
| USA | 97% |
| UK | 93% |
| Germany | 94% |
| Japan | 96% |
| China | 80% |
| Canada | 69% |
| Denmark | 95% |
| Belgium | 93% |
| Argentina | 97% |

### The effects of microwave irradiation on human health

When the human body is exposed to microwaves, the primary effect is tissue heating due to the absorption of energy, which can lead to skin burns, if the exposure is

intense enough .Essentially, the microwaves heat the body tissue in the same way they heat food in a microwave oven causing a thermal effect without directly damaging DNA like ionizing radiation does.

While microwave ovens are generally safe, regulatory bodies recommend avoiding near proximity while operation. Maintaining distance from the device will mitigate radiation exposure in the unlikely event that a microwave oven is damaged or malfunctioning. They possess shielding that prevents radiation leakage. Radiation does exist within these devices, but it remains contained .Manufacturers produce microwave-ovens in compliance with governmental safety regulations, which assure their safety for public use by containing all microwave radiation within the appliance.

The oven design, in accordance with U.S. Food and Drug Administration (FDA) guidelines, IEEE standards, and ICMR rules, guarantees that the released quantity is substantially below the threshold and do not cause thermal injuries caused by heat, flames or hot liquids.

**Importance of Microwave cookware**

In principle, exposing specific foods and polymers at elevated temperatures may produce carcinogenic chemicals. Elevated temperatures may also diminish minerals that safeguard against cancer. Health regulators recommend for glass and stainless steel bottles as more secure alternatives in microwave ovens. The majority of plastic ware is not suitable for microwave use, even at moderate temperatures.

**Microwaving and Caramelization**

Caramelization is a chemical reaction that transpires when

sugars or sugary fruits, such as bananas and apples, are subjected to elevated temperatures, generally ranging from 338°F to 345°F, resulting in the formation of new compounds with unique flavours, fragrances ,and colours.

This may be accomplished in any oven, not exclusively a microwave oven. This procedure entails elevating food temperatures significantly through the use of an oven, grill, roaster, direct heat source, or microwave oven. Carmelization is not intrinsically carcinogenic. Nonetheless, there are certain potential issues associated with caramelized food as explained below.

1. **Acrylamide Formation:** Caramelization may result in the synthesis of acryl amide, a possible carcinogen.
2. **Polycyclic aromatic hydrocarbons (PAHs):** High-temperature cooking techniques, such as Caramelization, can generate PAHs, which are recognized carcinogens.
3. **Advanced Glycation End-products (AGEs):** The Caramelization process can generate AGEs, which are linked to oxidative stress, inflammation, and a heightened cancer risk.
4. **Oncological Risk:** The International Agency for Research on Cancer (IARC) categorizes:
   - Acrylamide is designated as “probably carcinogenic to humans”
   - PAHs are categorized as “carcinogenic to humans”
5. **Bisphenol A (BPA):** A chemical used to make plastics hard and clear. It may cause cancer. In theory, BPA can get into food when it gets too hot.

Phthalates are chemicals that are added to plastics to make them softer and more bendable. They may cause cancer. They could also get into food if it gets too hot. But the risk is mostly made up, and there isn’t strong evidence of harm this way yet. People, therefore should avoid formation of these compounds while cooking by subjecting to very high temperature while using microwave ovens or normal ovens like grill, roasters etc. Irrespective of the heat source, one can prevent caramelization by implementing certain safeguards and regulating the heating process.

One method is to cook at reduced temperatures (e.g., 180°C/356°F instead of 200°C/392°F), whereas the alternative is to employ shorter cooking durations.

Some meals or the containers they are cooked in may be indirectly at risk for cancer because of the temperature settings used in microwave ovens, even though the radiation itself does not cause cancer. To cook or heat food in the microwave, you should still only use containers products that say “microwave-safe” on the label. The main point is that, though there is no evidence that microwaves from ovens we use to heat food cause cancer.

**Microwave ovens offer enhanced safety**

Some people think that foods that are prepared with traditional heating are healthier and have more nutrients. Food made in a microwave may have more vitamins and minerals than food cooked in other ways because it cooks faster and you don’t have to add water. Vitamin C is a strong antioxidant that can be found in oranges, tomatoes, potatoes, peppers, broccoli, strawberries, Brussels sprouts, and melons. Since vitamin C dissolves in water, heating and steaming lower its amount, but microwaving does not.

When meat is cooked over fire or another very hot source, chemicals such as polycyclic aromatic hydrocarbons

(PAHs) and heterocyclic amines are formed. These chemicals can cause cancer as discussed earlier. If you microwave beef, pork, lamb, game, fish, or fowl for only 60 seconds before grilling, you might be able to lower this risk. It looks like this lowers the amount of PAH and heterocyclic amines in the animal proteins. The loss of nutrients is not a major factor with microwaves. In fact, you may be preserving nutrients in many cases with microwave cooking.

Epidemiological studies have reported that eating cruciferous vegetables such as Broccoli, Kale, Cauliflower, Brussels sprouts may reduce the risk of chronic diseases like atherosclerosis and cancer. These benefits are primarily due to the high content of antioxidant active components and Glucosinolate (GLS) breakdown products in vegetables. These are required to be retained after cooking for best benefits. This is possible with microwave cooking, besides being easier, that requires less heat and uses less water.

### Rules and standards for safety

In the USA, the Centre for Devices and Radiological Health (CDRH) of the FDA is in charge of enforcing performance requirements for electronic devices to make sure radiation emissions don't endanger the general population. Over their lifetime, the quantity of safe leaks in microwave ovens is limited by a federal regulation that applies to all of them. This is far less than anything that could endanger you and same standards are followed by Indian manufacturers also.

- Microwave oven users have to follow strict safety rules that make sure the radiation they give off is well below


the level that could hurt people. While microwave ovens have been known to cause injuries in certain cases, the majority of these cases involve burns from coming into direct contact with hot or steaming food.

- Make sure your oven works well and that the door seals properly. There should also be no damage or signs of wear and tear that you can see.
- Do not use a microwave that is empty. Doing so, it could damage the oven's parts.

**The Indian Council of Medical Research (ICMR)** recommends the following tips regarding microwave cooking, as a healthy way to cook food because it helps retain nutrients.

- Use microwave-safe vessels: Glass or microwave-safe ceramic vessels are preferable to plastic.
- Avoid vacuum-sealed foods: Don't use the microwave to cook or reheat food that's been vacuum-sealed, as it can explode.
- Avoid high-oil or high-sugar foods: Don't use the microwave to cook foods with high oil or sugar content, as it can cause a fire.
- It's crucial to use a food thermometer to check the temperature when cooking raw meats in the microwave.
- Additionally, to guarantee that stews and soups are thoroughly heated, stir them once or more during the cooking procedure.
- To prevent spills when cooking, cover vessels with paper plates or napkins.
- While taking hot dishes out of the oven, let them settle for few minutes to cool.
- Observe the recommended microwave power and cooking time intervals.
- A standard interlock system that activates the microwave oven when the door is opened is included into every oven.

## Other notable uses of Microwave Oven

### Microwave fruit ripening

Certain fruits, such as avocados and bananas, can be microwaved to achieve a riper texture with simple procedure as follows:

For ten to fifteen seconds, microwave the fruit. Confirm the ripeness. Repeat for an extra10 to15 seconds in case not. Beware not to overheat since this will hurt the fruit. According to a few scientific researches, heating oranges in a microwave for 30 to 40 seconds can offer assistance in boosting the sum of juice they create. This does not apply to other natural products, such as apples; it as it were applies to particular citrus fruits.

### Wheat dough that swells in the microwave

Put the dough in a bowl that's safe to utilize within the microwave and cover it with a moist cloth to permit the dough to rise or extend. Utilize low power (30% of the microwave's control) to warm for 20–30 seconds. Verify whether the dough has risen. In case not, proceed for an extra 20 to 30 seconds. Lookout not to heat the yeast too much as this may kill it.

### Cooking Broccoli in microwave oven

Cooking broccoli in a microwave oven is considered a great way that can really protect a high level of nutrients,

counting vitamin C, compared to other cooking methods like boiling. Microwave cooking of broccoli may even slightly increase the level of sulforaphane, a powerful antioxidant particularly, an anticarcinogenic compound found in broccoli and can offer assistance minimize nutrient loss from prolonged cooking. Put florets into microwave safe bowl and add 3 tbsp water to the bowl. Cover bowl freely with cling wrap or cover. Microwave it for 3-4 minutes. Check to see if the broccoli is delicate by piercing the stem. If it's not, microwave in 30-second increments, until it is.

**Take Home**

Microwave ovens are safe, effective and highly convenient cooking method. There is no evidence that they cause cancer or any other harm and some evidence that they are better than other cooking methods at preserving nutrients and preventing the formation of harmful compounds under correct heat.

Food is heated with microwaves by non-ionizing radiation at low energy levels. There is no evidence that microwave radiation exposure increase the risk of cancer. Food cooked in microwave doesn't get radioactive or lose more nutrients than it would with conventional cooking techniques. Given their faster processing times, microwaves can often be a compelling nutritionally superior substitute for traditional food cooking techniques. It is important to keep in mind that there are other cancer risk factors, including genetics, lifestyle, and exposure to known carcinogens which have a bearing rather than doubting microwave radiation whose interaction with human body has been studied extensively.

**The author extensively used the following publications for reference.**


1. World Health Organization (WHO): Moderate consumption of potentially carcinogenic foods.
2. Indian Council of Medical Research, New Delhi
3. National Cancer Institute (NCI-USA): Follow a balanced diet and cooking practices.
4. American Cancer Society (ACS): Limit consumption of charred or burnt foods.
5. International standards on Electro-Technical (IEC) standards for microwave oven.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