

Microwave Cooking

How microwaves cook food

Microwaves generated from the magnetron bombard the food, causing the polar molecules to rotate at the same frequency millions of times a second. The oxygen of water molecules reacts most sensitively. All this agitation creates molecular friction, which heats up the food. The friction also causes substantial damage to the surrounding molecules, often tearing them apart or forcefully deforming them. The scientific name for this deformation is "structural isomerism". This is contrary to conventional heating of food where heat transfers convectionally from without to within. Cooking by microwaves begins within the cells and molecules where water is present and where the energy is transformed into frictional heat.

In addition to the violent frictional heat effects, called thermic effects, there are also athermic effects which have hardly ever been taken into account. These athermic effects are not presently measurable, but they can also deform the structures of molecules and have qualitative consequences.

For example the weakening of cell membranes by microwaves is used in the field of gene altering technology. Because of the force involved, the cells are actually broken, thereby neutralizing the electrical potentials, the very life of the cells, between the outer and inner side of the cell membranes. Impaired cells become easy prey for viruses, fungi and other microorganisms. The natural repair mechanisms are suppressed and cells are forced to adapt to a state of energy emergency -- they switch from aerobic to anaerobic respiration. Instead of water and carbon dioxide, the cell poisons hydrogen peroxide and carbon monoxide are produced."

The same violent deformations that occur in our bodies, when we are directly exposed to radar or microwaves, also occur in the molecules of foods cooked in a microwave oven. This radiation results in the destruction and deformation of food molecules. Microwaving also creates new compounds, called radiolytic compounds, which are unknown fusions not found in nature. Radiolytic compounds are created by molecular decomposition - decay - as a direct result of radiation.

After some 20 years of research into their use, Soviet Russia banned the use of microwave ovens for heating food in 1976 as they decided that the dangers outweighed the benefit of speed. They were allowed again from 1987 when, under Perestroika, Gorbachev allowed many business pressures to change problematic Russian regulations that did not fit in with "Western Free-Trade" practice.

Some Russian researchers have reported a marked acceleration of structural degradation leading to a decreased food value of 60 to 90% in all microwaved foods tested. They found significant decreases in the bio-availability of B complex vitamins, vitamin C, vitamin E, essential minerals and lipotropics (substances that prevent abnormal accumulation of fat). This was confirmed in a Japanese study when they found that approximately 30-40% of vitamin B12 was lost in foods cooked by microwaves (Watanabe). B12 deficiency is one of several factors that can cause dementia.

Dr C Garcia-Viguera (2003, [2007](#) (lead author Lopez-Berenguer)) found that broccoli lost 97% of its antioxidants (vitamin C) when microwaved. There were also reductions in phenolic compounds and glucosinolates. Mineral levels remained stable. In general, the authors concluded, "*the longest microwave cooking time and the higher volume of cooking water should be*

avoided to minimise losses of nutrients." She suggested that this may apply to other vegetables, but they were not tested. It was felt that the results could have implications for public health.

Scientists at China Agricultural University's College of Food Science & Nutritional Engineering in Beijing looked at different forms of cooking and their production of acrylamide, a cancer-causing chemical. They found that microwaving food produced more acrylamide than boiling or frying (at 180°C), and that 750 Watt ovens produced more acrylamide than 500 Watt ovens (Yuan [2007](#)). However, scientists at the University of Mersin's Department of Food Engineering (Turkey) used a microwave oven to pre-cook french fries to reduce the cooking time needed, as the volume of acrylamide produced is related to length of frying time. The reduction in acrylamide was 36% @ 150°C; 41% @ 170°C; and 60% @ 190°C.

There seems to be a growing body of evidence that suggests that human breastmilk or baby formula is changed if heated in a microwave. The vitamin content is depleted and certain amino acids are converted into related substances that are biologically inactive. Some of the altered amino acids are poisons to both the nervous system and the kidneys. Paediatrician John Kerner and colleagues at Stanford University found that milk lost lysozyme activity, antibodies, and fostered the growth of more potentially pathogenic bacteria. Others found that microwaving human breast milk destroyed 98% of its immunoglobulin-A antibodies and 96% of its liposome activity (which inhibits bacterial infections). This breast milk was heated from frozen, which does not happen usually, we would imagine, except under special circumstances, such as in hospitals. It is unclear whether the breast milk in question may have been affected by other factors, such as maternal stress, under these circumstances.

In the early 1990s a hospital in Minneapolis, Minnesota, distributed pamphlets warning people against using microwave ovens to heat infant formulas because they altered the food.

"Although microwaves heat food quickly, they are not recommended for heating a baby's bottle. The bottle may seem cool to the touch, but the liquid inside may become extremely hot and could burn the baby's mouth and throat. Also, the buildup of steam in a closed container, such as a baby bottle, could cause it to explode. Heating the bottle in a microwave can cause slight changes in the milk. In infant formulas, there may be a loss of some vitamins. In expressed breast milk, some protective properties may be destroyed. Warming a bottle by holding it under tap water, or by setting it in a bowl of warm water, then testing it on your wrist before feeding may take a few minutes longer, but it is much safer."

A Bohmert, the anthroposophist reported the following:- water samples were heated, some in a microwave oven and others conventionally, and then left to cool before use. These water samples were used to bring grain to germination. The grain in contact with microwaved water was the only one that did not germinate.

Microwave cooking has been shown to heat food unevenly, which means that some of the food is not heated sufficiently to kill all the bacteria or parasites that might be present. This uneven heating also creates hotspots in foods that release synthetic oestrogens found in certain plastics (Gittleman). Frozen hamburgers, fish and warmed-up dishes all may have cool areas in them that could promote the growth of pathogens. Live unkilld microbes may remain to grow in an unrefrigerated dish.

Microwave ovens from various suppliers were used to cook naturally contaminated whole chickens according to the manufacturers' instructions. Many yielded visible *Listeria* bacteria after microwave cooking (FAC).

Russian investigations were published by the Atlantis Raising Educational Center in Portland, Oregon. Carcinogens were formed in virtually all foods tested. No test food was subjected to more microwaving than necessary to accomplish the purpose, i.e., cooking, thawing, or heating to insure sanitary ingestion. Here's a summary of some of the results:

- Microwaving prepared meats sufficiently to insure sanitary ingestion caused formation of d-Nitrosodienthanolamine, a well-known carcinogen.

- Microwaving milk and cereal grains converted some of their amino acids into carcinogens.
- Thawing frozen fruits converted their glucoside and galactoside containing fractions into carcinogenic substances.
- Extremely short exposure of raw, cooked or frozen vegetables converted their plant alkaloids into carcinogens.
- Carcinogenic free radicals were formed in microwaved plants, especially root vegetables.

Biological changes

Microwave exposure caused a higher degree of protein unfolding than usual thermal stress at the same temperature (George [2008](#)).

Chemical leakage of packaging

Heat susceptors are visible thin, gray strips or disks of metallized plastic that absorb microwave energy and turn the surface of the package into a very hot little frying pan (reaching temperatures of 300-500 degrees F), that can make microwaved foods brown and crisp or crunchy.

The grease-repelling papers used for some microwavable packaged foods, in particular microwavable popcorn, may be responsible for the levels of PFOA, a suspected carcinogen, in the blood of most Americans.

The January/February, 1990, Nutrition Action Newsletter reported on the leakage of numerous toxic chemicals from the "heat-susceptor" packaging of common microwavable foods, including pizzas, chips and popcorn. At the high temperatures achieved in this process, the chemicals in the plastic migrate from the susceptors into your food. The chemicals include polyethylene terephthalate (PET), a petroleum derived product, and other known or suspected carcinogens, such as benzene, toluene and xylene. Haldimann ([2007](#)) also found increased concentration of antimony (which in small doses can cause headaches, dizziness and depression), as a result of cooking with polyethylene terephthalate (PET) oven-proof trays (used to package ready-to-eat meals).

It is not recommended that food containing fat in a plastic container should be heated in a microwave oven. The combination of fat, high heat and plastics releases dioxins (a known carcinogen) and other toxins into the food.

Susan Brewster, Associate Professor of Food Chemistry at the University of Illinois, worries about the possibility that certain plasticizers could act as endocrine disruptors, which means they can potentially mimic or compete with human hormones. If they do, then that could affect such things as fertility or someone's risk of getting cancer.

Park ([2006](#)) found that not all microorganisms were destroyed by microwave radiation and could have implications for the design of containers to be used for cooking in the home microwave oven.

Changes in the people eating microwaved foods

Research on changes in the consumers of food cooked using microwaves have been sparse. A piece of work carried out by Hertel and Blanc has been quoted extensively and needs following up. Although they found many and serious changes, including decreased haemoglobin levels and increased cholesterol and leukocyte levels, their research was based on just 18 people, all who ate a macrobiotic diet only, including Hertel himself. It may be that their findings are equally valid for the general public, but without further evidence, we cannot make that assumption. Tom Valentine, an independent US journalist, published the results of this study in Search for Health in the Spring of 1992.

Microwave and powerfrequency radiation from a microwave oven

The oven equipment gives off high (over one microtesla) powerfrequency EMFs from the cables and the motor. These extend for about a metre.

Microwave radiation leaks from the seal around the door and through the glass of microwave ovens. The water molecules in the body of someone standing close by will be agitated to some degree by the microwave radiation. Eyes are particularly vulnerable, as they contain large amounts of fluid and a lower blood supply to take away any heat. This is important to bear in mind with regard to children whose height and curiosity could lead to them watching the changes induced in microwave cooking from too close a distance.

Current regulations require that a microwave oven leak no more than 1 milliwatt per square centimetre when it leaves the factory, and 5 mW/cm² after a period of use. We do not know if these levels are really safe and believe microwave ovens should be used with caution. Since microwave emissions can change with normal use, ovens should be checked regularly, preferably annually, to pick up any microwave leakage from the seals.

Even when the microwave oven is working correctly, the microwave levels within the kitchen are likely to be significantly higher than those from any nearby cellular phone base-stations. Remember also that microwaves will travel through walls if the microwave oven is against an inside wall.

One study (Liu [2007](#)) found that women using a microwave oven were at increased risk of early spontaneous abortion.

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