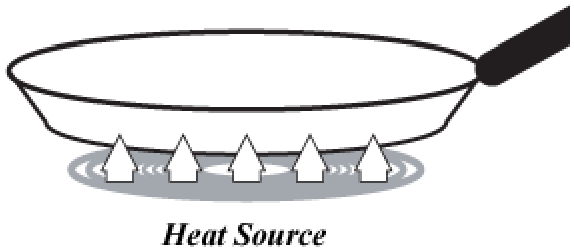
Buyers' Learning Tools

Unit One:
Cooking Methods

Understanding cookware and bakeware starts with an understanding of how foods cook.



COOKING BY CONDUCTION

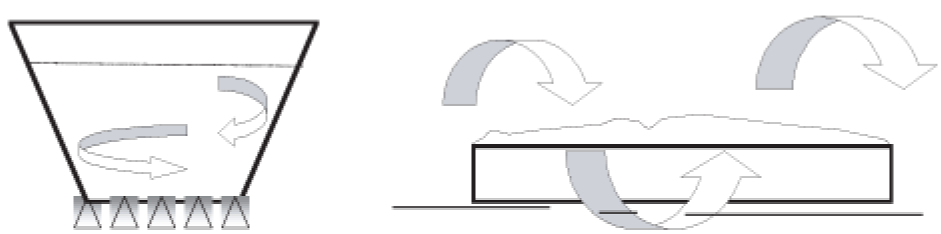
Conduction—*Transfer of heat from the heat source directly to the utensil.* Heat spreads across the bottom and is conducted up the sides of the pan from the heat source. Heat is transferred directly to the food mass as the utensil heats. An example of this would be the sautéing of vegetables or stir-frying. For conduction to take place, there must be direct contact between the heat source and the utensil. Top-of-range cookware cooks many foods by conduction, so it is important to that the cookware be made of a good heat-conducting material. There is limited conduction in oven baking because the baking vessel has little direct contact with the heat source.

As you can see from the table of conductivity, glass top-of-stove cookware would be extremely resistant to conduction since glass is a poor conductor (but at the same time, an excellent insulator). There is a benefit to less conductive cookware, however. The more quickly a pan heats up, or conducts, the more quickly it will cool. This is why for long and slow food preparation such as that used with soups, stews and similar recipes, a less conductive pan may be desired, in that it will hold heat for a longer period of time.

Heat Conductivity of Common Cookware Materials
(ranked from most conductive to least)*

Material	Conductivity
Copper	1.0
Aluminum	0.5
Steels (coupled conductive bases/sides)	~0.25
Iron and steel (single wall)	.16
Porcelained steels	~.10
Porcelained irons	~.10
Glass ceramics	.0025
Glass	less than .0025

*Also note that conductivity of pan is dependent not only on its material but the thickness of the material. The above conductivities assume equal thicknesses of listed materials.

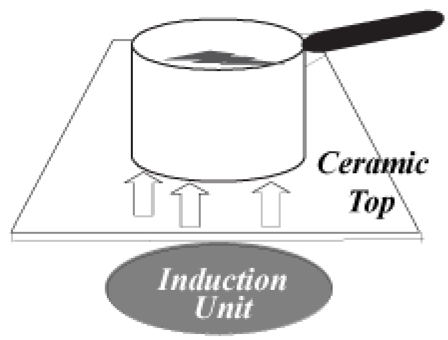


By Liquid Currents *By Air Currents*

COOKING BY CONVECTION

Convection—*Heat transfer by convection requires the movement of air or liquids called convection currents.* In the cooking process where liquids are involved, convection often modifies or controls the rate of heat conduction. Heat transfer is never by convection alone. In a saucepan, the fluid first begins to heat by conduction. The heated portion rises by convection and is replaced by the cooked portions. As the hot and cool food particles intermingle, the food mass uniformly warms.

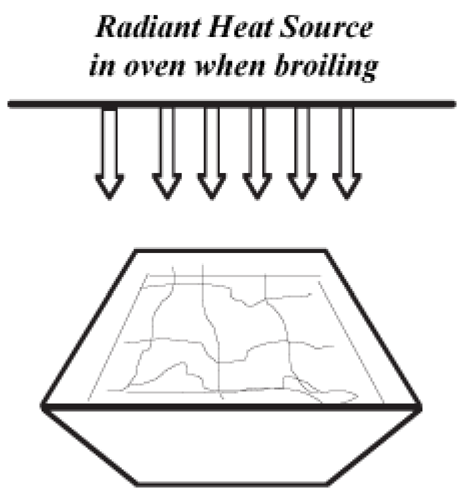
Similar to surface cooking, when oven baking, air near the heat source rises and circulates, only to be replaced by the cooler air. The heated air, moving in convection currents, penetrates the food, assisting in the cooking process. Think of the warmth of bath water warming you as you lie in it; or the warm current of air emitted by a central heating system to understand convection.



COOKING BY INDUCTION

Induction—*Heat is induced into the cookware by an electromagnetic field effect*. An electromagnetic coil beneath the ceramic cooking surface creates a magnetic field. This magnetic field passes through the cooking surface to ferrous (iron or steel) cookware, and by its oscillation, induces heat within the pan and cooks the contents. Cookware must have magnetic properties to work on induction cook tops. Non-magnetic metal such as aluminum cannot be used on induction ranges. The heat generated is in the cooking utensil itself as the cook top remains relatively cool since it is non-conductive. While popular in Europe, induction cook tops still account for only a tiny fraction of cooktops sold in the U.S. and Canada.

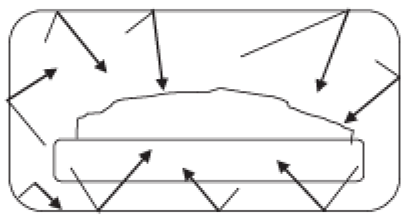
The induction unit is extremely energy efficient since almost no heat or energy is wasted beyond the edge of the pan and because heating stops when the pan is removed.



COOKING WITH RADIATION

Radiation—*The transfer of heat by electromagnetic waves*. Radiation does not require direct contact with a heat source, liquids or air. Like sound and light, radiation is emitted in waves. Radiation is the reason you can feel hot even on a cool day when you are in direct sunlight.

The heat source in a broiler or an oven produces heat waves. These heat waves are radiated to the food mass thus penetrating and heating. In a conventional oven, over half of the heat is radiant energy (the rest is by convection currents with some added conduction). The transfer of radiant heat relies on the ability of a utensil to absorb radiant heat energy. Dark or blackened surfaces soak up radiant heat, while shiny, bright surfaces reflect heat. Many baking recipes reduce cooking time for dark bakeware.



COOKING IN MICROWAVES

Microwave—*Heat transmitted by electromagnetic waves for cooking*. Microwaves are very short in length radio frequency waves and are produced by a special generator in the oven called a magnetron. The waves' frequency is tuned to the vibrating frequency of water. These waves are then distributed throughout a metal cavity and in some ovens, the food rotates on a revolving shelf.

Microwaves are sources of energy, not heat. When the waves are absorbed by the water molecules within food, the energy is transformed into heat and bakes and roasts food. Microwaves penetrate ¾ to 3 inches into food, cooking from the inside to the outside on all surfaces.

Microwaves reflect from all the metallic walls in the oven and penetrate the food from all angles, passing directly through the utensil. For this reason, glass, ceramic, plastic and paper are used as cooking utensils in microwave ovens. Metallic cookware reflects the microwaves away from the food and can cause arcing that may damage the oven's electronics. Some microwave cookware contains a safe combination of plastic and metal to give controlled cooking. In choosing microwave cookware, don't assume that all plastics are microwave safe. Some may melt at low temperatures and, in others, chemicals within the plastic compounds may be liberated when the plastic is heated.