



Principles of Cooking

To cook foods successfully, you must understand the science and principles of cooking.

Now, bear with me, it is neither difficult to understand nor boring. There are just **a few basic facts that we all need to know** to better understand what is happening when we apply heat to food.

Cooking is simply the transfer of energy from a heat source to a food. To cook foods successfully, you must understand the ways in which heat is transferred: conduction, convection and radiation.

Most important, when it comes to cooking, there are many methods used to transfer heat: broiling, grilling, roasting and baking, sautéing, pan-frying, deep-frying, poaching, simmering, boiling, steaming, braising and stewing . . .

What are these methods? Why do some work better than others on certain foods?

Heat Transfer

According to the principles of cooking, heat is a type of energy. When a substance gets hot, the molecules have absorbed energy, which causes the molecules to vibrate rapidly. The molecules start to expand and bounce off one another. As the molecules move, they collide with nearby molecules, causing a transfer of heat energy.

Heat transfer can be transferred to foods through conduction, convection, or radiation. Heat travels *through* foods by conduction.

Conduction

Conduction, one of the most basic principles of cooking, is **the movement of heat from one item to another through direct contact**. For example, when a flame touches the bottom of a pan, heat is conducted to the pan.

Generally, metals are good conductors. Copper and aluminum are the best conductors, while liquids and gases are poor conductors.

Conduction is a slow method of heat transfer because there must be physical contact from one molecule to another.

Convection

Convection is **the transfer of heat through a fluid**. The fluid may be in a liquid or gas state. According to the principles of cooking, there are 2 types of convection: natural and mechanical.

Natural convection causes a natural circulation of heat because warm liquids and gases have a tendency to rise while cooler ones fall.

Mechanical convection causes heat to circulate more evenly and quickly through fans or stirring. True or pure convection ovens, usually found in higher-end-ovens, have an additional element that surrounds the fan and circulates heated air inside the oven. The fan forces heated air horizontally through the oven racks around the food, cooking it evenly. Oven position is relatively unimportant. Any rack in a true convection

Principles of Cooking

oven should yield the same cooking results, with foods on the bottom rack getting no browner than others.

Virtually any food that you'd cook in a regular oven benefits from convection cooking. Actually, your wallet might benefit, too. With convection cooking the oven heats faster and cooks food 25 percent faster - and usually at 25 degrees lower than ordinary ovens. Poultry skins are crispy because they render faster while meat stays juicy, roasted vegetables caramelize more quickly, and baked goods brown evenly.

Radiation

Radiation is **energy transferred by waves of heat or light striking the food**. Two types of radiant heat are infrared and microwave.

Infrared cooking is commonly used with toasters and broilers. These devices use an electric or ceramic element heated to such a high temperature that it gives off waves of radiant heat.

Microwave cooking relies on radiation generated by an oven to heat the food.

The Effects Of Heat

Proteins Coagulate

Coagulation is when proteins transform from a liquid state to a solid state. Examples: the firming of meat fibers and egg whites changing from a clear liquid to a white solid when heated.

Starches Gelatinize

When a mixture of starch and liquid is heated, starch granules swell. The liquid thickens because the starch granules swell to occupy more space. Examples: The thickening of sauces when starch is added.

Sugars Caramelize

As sugars cook, they turn brown and change flavor. Caramelized sugar is used in many sugars, candies, and desserts. In fact, caramelization is used in most flavors we associate with cooking.

Water Evaporates

All foods contain some water. The evaporation of water dries foods during cooking.

Fats Melt

Fats are a greasy, smooth substance that do not dissolve in water. Oils are fats that remain liquid at room temperature. Fats melt when heated and then gradually liquefy. Fats will not evaporate.

There, that wasn't so bad was it? I hope that you agree that some familiarity with the science and principles of cooking makes everything a little less mysterious, and adds to your abilities and enjoyment of cooking.