

The Pressure Canner - How it works

Low acid foods (pH of 4.6 or higher), such as vegetables, meat, and fish, require a temperature higher than boiling water (212°F) to destroy harmful microorganisms such as *Clostridium botulinum*. Low acid foods must be processed at 240°F, which can be achieved only under pressure in a pressure canner at 10 pounds per square inch (psi) at sea level.

A pressure canner is safe to use, if handled correctly. The mechanisms by which food is preserved in a pressure canner include:

Heat is applied to the canner. Water boils at 212°F, forming steam. Steam drives out air through the open vent. Heat begins to penetrate the jar.

As heating continues, air is finally exhausted. Air must be excluded because it interferes with passage of heat. Heat passes through steam more readily than through air. Heat continues to penetrate the jar.

The vent is closed after steam has escaped for 10 minutes. Steam now cannot escape, so pressure rises. Water under pressure boils at temperatures above 212°F. At 5 pounds gauge pressure, water boils at 228°F. At 10 pounds pressure, water boils at 240°F.

Heat Distribution - by Conduction. Conduction is the means by which heat penetrates the jar. That is, heat passes from one molecule to another. In thick mixtures, heat movement is largely by conduction.

Heat Distribution - by Convection. In convection heating, fluids expand, rise and are replaced by cooler fluids. Convection currents are slow in thick mixtures. They are retarded by fat, tightly-packed food and solid materials. Heat penetrates by both convection and conduction at the same time.

Food, steam and air tend to expand as heat enters, thus increasing the pressure in the jar. The 1/2-inch "headspace" in the jar acts as a cushion. Since this increasing pressure is still below canner pressure, jar contents cannot boil out against the higher canner pressure when it is held steady. Pressure and temperature in the jar are finally equal to the pressure and temperature in the canner.

At the end of the processing time, the source of heat is removed and active boiling stops. Temperatures and pressure in the canner start to fall as the cooling-off period begins. Temperature and pressure in the jar slowly follow that of the canner.

If the vent is opened before the pressure reaches zero or too soon after pressure falls to zero, there is danger of jars exploding. This sudden release of outside pressure permits steam to form explosively in the jar and the liquid boils out.

When the canner is removed from heat and the petcock is left closed, cooling continues slowly. The gauge needle returns to zero. The vent is opened slowly. Air enters from the outside. Too long a delay in opening the vent causes increasing vacuum. This

makes the canner lid difficult to remove; jars may spurt liquid; and the gauge be damaged.

After jars are removed from the canner, the contents may continue to boil as the jar pressure is reduced by condensation of steam. Continued boiling is a good indication that jars are tightly sealed.

The same principles apply to canners with weighted selective pressure controls and vent tube. However, the control which is made for 5, 10, and 15 pounds pressure is set on the tube that also serves as the vent. The periodic jiggle of the control indicates that the air is exhausted from the canner and that it has reached the desired pressure.

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