Cooking

The temperature at which water boils declines as elevation rises (Table 1). Because of this, foods prepared by boiling or simmering cook at a lower temperature at high altitude than at sea level, and thus, require a longer cooking time. Meats cooked by simmering or braising may require one-fourth more time at 5,000 feet than at sea level. Oven temperatures, however, are not affected by altitude, so sea-level instructions work for oven-roasted meats. Hard-cooked eggs will also take longer to cook to a “three-minute” egg may take five minutes to cook at 5,000 feet. High altitude areas are also prone to low humidity, which causes the moisture in foods to evaporate more quickly during cooking. Covering foods during cooking will help hold in moisture.

Canning

Fruits, tomatoes and pickled vegetables can be safely canned in a boiling water bath. However, because the temperature of boiling water is lower at higher elevations, you need to increase the processing time by one minute for each 1,000 feet above sea level if the sea level time is 20 minutes or less. If the processing time is more than 20 minutes, increase by two minutes per 1,000 feet.

Other vegetables, meats and poultry (low-acid foods) must be canned in a steam pressure canner at 240 degrees F for the appropriate time to destroy heat-resistant bacteria. At sea level to 2000 feet, 11 pounds of steam pressure will produce this temperature. Above 2,000 feet, steam pressure must be increased to reach 240 degrees F as illustrated in Table 2.

Deep-fat Frying

Both humidity and altitude affect candy making. To prevent excessive water evaporation during the cooking of sugar mixtures at altitude, cook to a “finish” temperature that is lower than that given in sea-level recipes. If you use a candy thermometer, first test the temperature at which your water boils, then reduce the finish temperature by the difference between the temperature of your boiling water and 212 degrees. This is an approximate decrease of two degrees F for every increase of 1,000 feet in elevation. You may also use the cold-water test, which is reliable at any altitude. Cook jellies to a finish temperature that is eight degrees F above the boiling point of your water.

Sweeteners

Sugars, particularly brown and granulated, dissolve more readily at high altitudes. Water-sweetened drinks may need more sugar for taste because the sugar granules are smaller, and the water has a lower boiling point. However, for most foods, no adjustments are necessary as long as you start cooking at the sea-level boiling point. If you are cooking at a lower temperature, you must cook for a longer time because the sugar takes longer to reach the gelatinization temperature. You may need to reduce the sugar by 10% and add a little more water to foods that are being cooked at a lower temperature.

Freezing

An important step in preparing vegetables for freezing is heating or “blanching” before packing. At 5,000 feet elevation or higher, heat 1 minute longer than the blanching time given for sea level.

Candy, Syrup and Jelly Making

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Freezing

An important step in preparing vegetables for freezing is heating or “blanching” before packing. At 5,000 feet elevation or higher, heat 1 minute longer than the blanching time given for sea level.
Preparation Guide

High Altitude

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Cookies
Although many sea-level cookie recipes yield acceptable results at high altitudes, they often can be improved by a slight increase in baking temperature, a slight decrease in baking powder or soda, a slight decrease in fat or sugar, and/or a slight increase in liquid ingredients. Many cookie recipes contain a higher proportion of sugar and fat than necessary, even at low altitudes.

Biscuits, Muffins and Quick Breads
Quick breads vary from muffin-like to cake-like in cell structure. Although the cell structure of biscuits and muffin-type quick breads is firm enough to withstand the increased internal pressure at high altitudes without adjustment, a bitter or alkaline flavor may result from inadequate neutralization of baking soda or powder. When this occurs, reducing the baking soda or powder slightly will usually improve results.

Quick breads with a cake-like texture are more delicately balanced and usually can be improved at high altitudes by following the adjustment recommendations given for cakes.

Pie Crusts
Although not generally affected by altitude, slightly more liquid may improve results.

Practical Baking Notes
Use any brand of enriched all-purpose or cake flour.
Do not assume that your sea level recipe will fail. Try it first. It may need little or no modification.

Angel Food and Sponge Cakes
The leavening gas for these is largely air. Do not beat too much air into the eggs. Beat egg whites only until they form peaks that fall over - not stiff and dry, which will cause collapse of cells. Strengthen cell structure by using less sugar and more flour, and a higher baking temperature.

Cake Mixes
Adjustments usually take the form of strengthening the cell walls of the cake by adding all-purpose flour and liquid. Suggestions for high-altitude adjustments are provided on most cake mix boxes.

Table 3: Cake-recipe adjustment guide for high altitude.

<table>
<thead>
<tr>
<th>Adjustment</th>
<th>3000 ft.</th>
<th>5000 ft.</th>
<th>7000 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce baking powder:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For each tsp., decrease</td>
<td>$1/8 tsp.</td>
<td>$1/8-$1/4 tsp.</td>
<td>$1/4 tsp.</td>
</tr>
<tr>
<td>Reduce sugar:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For each cup, decrease</td>
<td>0-1 Tbsp.</td>
<td>0-2 Tbsp.</td>
<td>1-3 Tbsp.</td>
</tr>
<tr>
<td>Increase liquid:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For each cup, add</td>
<td>1-2 Tbsp.</td>
<td>2-4 Tbsp.</td>
<td>3-4 Tbsp.</td>
</tr>
</tbody>
</table>

Table prepared by Patricia Kendall, Colorado State University Extension, food science and human nutrition specialist and professor.

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