High-Altitude Baking

It's a scientific fact: The higher the altitude, the lower the air pressure. While this is an excellent environment for training athletes, it's a difficult one for baking. Baking depends on the specific interactions of several kinds of ingredients, including flour, leavening, fats, and liquid; throw in the wild card of atmospheric pressure, and all bets are off, if you've been used to baking at sea level. To complicate things further, individual microclimates vary greatly in the mountains, so the adjustment that works for you may not work for your neighbor down (or up) the road.

If you're baking at an elevation of 3,000 feet or greater, this chart is meant as a starting point, to help you convert recipes. Different types of baked goods need different adjustments, some suggestions follow. It may take a few tries to get results you're happy with; if possible, try to adjust only one ingredient at a time, so you can isolate the effect it has. Be sure to keep notes on what you've done, and try the smaller adjustments first when a range is given.

Leavening

When using baking powder and baking soda, the chart on page xx can help you adjust amounts. When making a recipe that calls for both baking powder and baking soda plus an acidic ingredient, like buttermilk or sour cream, try switching to all baking powder, and using regular milk in place of the acidic ingredient.

WHAT TO CHANGE	HOW TO CHANGE IT	WHY
OVEN TEMPERATURE	Increase 15 degrees F to 25 degrees F; use the smaller increase when making chocolate or delicate cakes.	Since leavening and evaporation proceed more quickly, the idea is to use a higher temperature to "set" the structure of baked goods before they overexpand and dry out, or rise too quickly and then collapse.
BAKING TIME	Decrease by 5 to 8 minutes per 30 minutes of baking time.	Baking at higher temperatures means products are done sooner.
SUGAR	Decrease by 1 tablespoon per cup.	Increased evaporation also increases concentration of sugar, which can weaken the structure of what you're baking.
LIQUID	Increase by 1 to 2 tablespoons at 3,000 feet. Increase by 1½ teaspoons for each additional 1,000 feet over 3,000. You can also use extra eggs as part of this liquid in recipes with a tender crumb, like muffins and cakes.	Extra liquid keeps products from drying out at higher baking temperatures and accelerated evaporation rates.
FLOUR	At 3,500 feet, add 1 tablespoon per recipe. For each additional 1,500 feet, add 1 more tablespoon. In quick bread and muffin recipes, flour with a higher protein content may yield better results.	Additional flour helps to strengthen the structure of baked goods.

CAKES: To increase liquids, use extra eggs; if only part of an egg is needed, use the white.

COOKIES, CRACKERS AND PIECRUSTS: Won't be dramatically affected; will usually need extra water to help the dough come together.

FRIED DOUGHS: Lower the frying temperature by 3 degrees F for every 1,000 feet above 3,000, and increase cooking times.

High-Altitude Changes

BAKING POWDER OR BAKING SODA IN ORIGINAL RECIPE	3,000–5,000 FT.	3,500–5,000 FT	5,000–6,500 FT	ABOVE 6,500 FT
1 teaspoon	⅞	¾	½	¼
1½ teaspoons	1¼	1	¾	½
2 teaspoons	1½	1¼	1	¾
2½ teaspoons	1¾	1½	1¼	1
3 teaspoons	2	1½	1¼	1
3½ teaspoons	2½	2	1½	1
4 teaspoons	2½	2	1½	1

QUICK BREADS: No additional adjustments necessary other than those suggested in the tables.

YEAST BREADS: Decrease the amount of yeast in the recipe by 25 percent, and make water/flour adjustments as necessary to get a dough with the correct texture. Make sure your bowl has plenty of room for the dough to rise.

Since rising times are much shorter at higher altitudes, and the dough won't have sufficient time to develop its optimum flavor with one rise, you have a number of options to improve flavor:

- Give the dough one extra rise by deflating it and letting it rise an additional time before forming it.
- Try covering the dough and placing it in the refrigerator for its first rise, to slow the action of the yeast and give the dough more time to develop.
- If you have sourdough starter, use some of it for some of the liquid in the recipe.
- Make a sponge by mixing the yeast and liquid in the recipe with 1 to 2 cups of the flour. Cover and let the sponge work for a few hours in the refrigerator, until it becomes bubbly and rises, then continue with the recipe.

For More Information

Because high-altitude baking is a complex subject, we recommend that you acquire a set of booklets that covers all aspects of baking at 3,500 feet and up from the Colorado State University Cooperative Extension Resource Center, 115 General Services Building, Fort Collins, CO 80523-4061. For questions, call toll-free 1-877-692-9358, or e-mail them at cerc1@ur.colostate.edu.