About Baking:

Ingredients and How They Work

The Prepared Pantry

*Go to **www.preparedpantry.com** for more baking guides!*

Contents

"Baking is both an art and a science but if you understand the science, the art comes easier."

Dennis Weaver

Dear Baker,

We think you love to bake as much as we do . . . the smell of fresh bread wafting through the kitchen, the squeal of grandkids as they discover your newly-baked cookies, the look of satisfaction as your spouse reaches for his or her third slice of bread. There's something satisfying about creating something with your own hands, something that is almost a work of art, and then watching others enjoy your creation.

Baking is an avocation that is never perfected; there is always something that you can learn that will make your baking a little better. Sometimes it's a new technique or an innovative recipe. Often, it's insight into how things work.

This guide is dedicated to helping you understand the ingredients that you use everyday, how they work, and how to use them to your advantage. . We start out with flour, the basis of nearly all baking, and tell how to choose and use the flour to suit your purpose. We talk about yeast and other leaveners. We explore the world of eggs, what they are used for, and how to use them properly and safely. We talk about the complex world of fats and discuss an array of sweeteners to brighten your products. You'll learn how best to use these ingredients, how to make substitutions, and why things work. Finally, we'll talk about how ingredients work in a bread machine where they have to come together automatically and on time and we'll offer tips to make that bread come out just right.

We think you will want to read this, share it with your friends, and refer to it often. We think you will enjoy it; we guarantee that it will help you be a better baker.

Good luck and happy baking.

Dennis and Merri Ann Weaver and Company

Your friends at . . .

The Prepared Pantry

Flour Types and Their Uses

There is a dizzying array of flours available—each with an intended use. Matching the flour to the product that you are baking is one of the keys to successful baking. While the commercial baker has access to dozens of specialized flours, we can do quite well with just a few in our kitchens. In this section, we will explore the white flours typically found in our kitchens along with whole wheat flours . . . and add just a word about other flours.

The White Flours

By far, the western world consumes more white flour than any other. We can buy bleached or unbleached, bread, all-purpose, self-rising, cake, and pastry. We can buy flour made with soft Southern wheat or hard winter wheat. They are all different with an intended purpose. The choice of flour will make a profound difference to most baked goods.

Do you buy bleached or unbleached flour? The natural color of wheat flour is somewhat yellowish. Many store breads use bleached flour to obtain the whiteness that we associate with commercial white bread. Chlorine is the common bleaching agent used to whiten flour. While the FDA has approved the use of chorine in flour, you may prefer to avoid this additive and use flour in its more natural state. When you don't mind the ivory or cream color of products made with unbleached flour, by all means use that. The only bleached flour that we use is bleached cake flour when we want to obtain the pure white texture we prefer in white cakes. In yellow cakes or cakes of other colors, we use unbleached pastry flour. If you switch from bleached to unbleached flour in your bread recipes, be aware that the two flours may exhibit different performance characteristics.

In your grocery store, you may find either bromated flour or flour that has not been bromated. Bread flours have to age or oxidize before they perform well. The time and expense of natural oxidation is not practical in commercial operations and the results are not often uniform. So the industry has explored means of speeding the process along—bromates being one of them. The FDA has ruled bromates to be safe and legal (though California outlawed bromates in 1991 as a possible carcinogen and most of Europe will not allow bromates). If you are not comfortable with bromates even though the FDA has approved their use, look for flour that has been treated with ascorbic acid (Vitamin C) or other chemicals that you might recognize.

Predominantly on grocery shelves are bread flours, all-purpose flours, and cake and pastry flours. Bread flours have a high protein content--10% to 14%--necessary to give bread the chewy texture and open appearance—the "crumb:--that we cherish in our breads. (We'll talk about how protein works in just a moment.) Cake and pastry flours have a low protein content to create the soft, crumbly, melt-in-your-mouth texture that we prefer in our desserts. All-purpose flour is a compromise between the protein content in bread flours and the protein in pastry flours. All-purpose flours make passable bread and passable pastry but more specialized products are more reliable performers. That's why you will rarely see all-purpose flour in a commercial bakery. Self-

rising flours have salt and leaveners added. Cake flour is almost always bleached. Pastry flour is usually unbleached but can be found bleached.

Gluten, formed from the proteins in flour, is what gives baked goods their structure. A high protein content is necessary for great bread and a low protein content is required for proper cakes. When water is mixed with flour, the protein in the flour absorbs this moisture. When the combination is worked by mixing or kneading, two types of protein come together into strands—tiny ropes of gluten. During baking, this protein coagulates just as the proteins in an egg coagulate in the heat of a frying pan. It's this coagulated protein that gives bread its chewiness. In a cake, we don't want chewiness so we use a low protein content flour. Furthermore, we use a shortening (commercial shortening, butter, margarine, or oil) to lubricate and shorten the gluten strands. (Hence the descriptive name "shortening".)

There are other factors in flour that determine performance. Acidity and the presence of conditioners affect how yeast performs. Ash and moisture contents may affect your baking.

So what flour should you buy? Buy flours for their intended uses—bread flour for breads and pastry flours for pastries plus all-purpose flours for those new recipes—except breads--that were probably developed with all-purpose flour since that is what is common in nearly all kitchens. You can switch to a specialty flour after you become familiar with the recipe. Keep you flour tightly covered so that it does not dry out and store it in a cool location. We recommend that you try different brands—there is a surprising difference in performance between brands--and then stick with what works for you. In our experience, name brands tend to consistently hold to a specification where less expensive brands tend to vary from season to season and sometimes, even lot to lot. If you really want to broaden your selection, make friends with a baker. He or she has available a vast array of flours each with its own specification. Buy a bag or two of flour from your baker and try it. Flour is inexpensive and your baker will be able to supply you with a detailed specification so that you can see what you are getting.

Comparison of Whole Wheat and White Breads
(Based on a one ounce slice of each)

	100% whole wheat	100% white
Calories	70	76
Fat	1.2	1.1
Sodium	181	146
Carbohydrates	12.9	13.9
Protein	2.7	2.4
Dietary Fiber	1.5	0.5
% of US Recommended Daily Allowance		
Protein	4.2	3.7
Vitamin A	trace	trace
Vitamin C	trace	trace
Thiamin	6.7	8.7
Riboflavin	3.5	5.3
Niacin	5.4	6.4
Calcium	2	3.6
Iron	5.5	4.5
Vitamin B-6	2.5	0.5
Pantothenic Acid	2.3	1
Folacin	4	2.5
Phosphorous	7.4	3.1
Magnesium	6.5	1.5
Zinc	3.2	1.2
Copper	5	2

Whole Wheat Flour

The wheat kernel is composed of three parts: the bran which forms the hard outer coating of the kernel, the smaller germ which is the embryonic portion of the kernel as the yolk is to an egg, only of smaller proportion, and the starchy endosperm. In the milling of white flour, the bran is cracked from the kernel and discarded and most of the germ is removed leaving the endosperm. In whole wheat flour, both the bran and the germ are left with the flour. Since the germ has a high fat content and fat can go rancid, whole wheat flours are much more likely to spoil. Also, since the flour is composed of the

entire wheat kernel, whole wheat flour is not enriched with vitamin additive as white flour is. (The federal government specifies the addition of vitamins to white flour. See the nutritional comparison of enriched white flour to whole wheat flour.) Whole wheat flour can be purchased in either a fine ground or course ground texture.

Other Flours

Like wheat flour, **cornmeal** can be purchased with or without the germ and in a fine or a course ground form. For cornmeal with the germ removed, look for the term "degerminated" on the label. Degerminated cornmeal keeps longer since the higher fat content germ is removed but is not as nutritionally complete as cornmeal with the germ. The word "meal" refers to products that are not as finely ground as flour. Both cornmeal and corn flour are available.

Rye flour is used extensively in pumpernickel and rye breads. It can be purchased in light rye to dark rye blends. Because its proteins do not form gluten, bread made with rye flour alone is heavy and dense. Accordingly, when making breads with rye flour, add two to three times as much high protein content bread flour as you have rye flour.

Oats are used in baking in various forms: rolled, quick, steel cut, and flour. (Steel cut oats are quick oats that are not flattened.) Oat products are most generally used with chemically leavened products like scones and muffins. Rolled oats added to bread make for a wonderful chewy texture and moistness.

Buckwheat flour is often used in pancakes and sometimes in breads. Buckwheat is not really a grain but a seed. Because there are no proteins for gluten, buckwheat adds no structure to the baked product. Buckwheat flour is most commonly used in pancakes.

Potato flour is an important component in the baker's arsenal. Unlike wheat flour, it is hygroscopic—that is, it attracts water instead of dries out. So the staling process in breads is retarded or slowed. One tablespoon of potato flour to two cups of wheat flour will extend the life of your bread and keep it moist. We use potato flours extensively in our breads.

Yeast

Yeast is the magic ingredient of the baking world. It's alive and master bakers have learned to cultivate yeast as a living thing in their bread and pastry doughs. In this section we will explore the different types of yeast and learn how to cultivate yeast in our products to make the best breads.

Our grandparents used--and many commercial bakers still use—fresh yeast rather than the dry yeast that we buy in the store. Fresh yeast performs marvelously well but is fragile, must be kept refrigerated, and used right away—hardly the conditions of today's carefree baking.

Instead of fresh yeast, most of us use dry yeast, either instant active dry yeast or active dry yeast. The difference in the two is how the yeast cells hydrate or absorb water. Instant active dry yeast does not have to be hydrated in water for five to ten minutes prior to mixing as active dry yeast does. Active yeast is mixed in water, the particles are dissolved, and the yeast is allowed to grow until the mixture becomes foamy. Then it is added to the flour. The cells of instant dry yeast are porous to absorb water and can be put directly in the flour without waiting for the yeast to hydrate. However, so that the yeast does not have to compete with the sugar or other ingredients for moisture, it is best to mix the yeast in only a portion of the flour. A method that works well is to mix the yeast with about one-third of the flour to create a very wet batter where the yeast cells will hydrate easily and then, add the remaining flour.

And yes, yeast is alive. It is neither plant nor animal but a fungus. We add it to the flour in its dormant state and expect it to thrive in our dough with moisture and the proper temperature. Under the right conditions, the yeast cells feed on sugar and multiply. A loaf of bread, ready to go into the oven, may contain millions of yeast cells. (The little particles found in a yeast packet are not yeast cells. They are an agglomeration of yeast cells mixed with dextrose or starch into larger balls containing many yeast cells.) As the yeast cells feed, they expel carbon dioxide and alcohol. The carbon dioxide gas rises through the bread dough and is captured by the gluten structure in the dough to form air cells. The alcohol and other excretions impart a "yeasty" flavor to the dough. Master bread bakers manipulate the ratio of carbon dioxide to alcohol—usually with temperature and acidity--to control the rise time and the flavors in the breads.

So how do we nurture these little creatures? Like most other living creatures they require moisture, food, and a hospitable environment. In a moist environment, yeast will grow rapidly. Most of the time, you will want your bread dough as moist as you can handle without being sticky. A bread dough that is too dry will take a long time to rise because the yeast will not multiply as rapidly and because the dry dough is stronger and more difficult to lift.

Yeast feeds on sugar or converts the starch in the flour to sugar for food. Without the capability to convert starch to sugar for food, yeast would not thrive in sugar free breads such as French bread. Salt impedes the growth of yeast so you can slow down the rise with salt. Conversely, you speed up yeast growth with sugar. An extra half teaspoon of salt will significantly slow the rise of the dough.

Moist dough between 78 degrees and 80 degrees is an ideal environment for yeast growth. Since yeast is very sensitive to temperature, temperature is a major factor in how fast yeast multiples. Yeast is dormant and will not grow at 40 degrees and grows only slowly at 55 degrees. Yeast dies instantly at 140 degrees. We recommend not using water warmer than 120 degrees to avoid accidentally killing the yeast.

A thermometer has been called the baker's secret weapon. In all breads, it is very useful to be able to measure the temperature of the water, the dough during mixing, and the bread as it comes from the oven. In using a bread machine, the exact water temperature is critical to a uniform outcome. Bread is baked when the internal temperature is between 190 degrees and 210 degrees. As mentioned, the ideal dough temperature for the proper growth of yeast is 78 to 80 degrees. At higher temperatures, the dough may rise too quickly creating a crumbly texture to the bread. At less, the bread will rise more slowly and will have a higher alcohol content—though some marvelous, complex flavors can be created at lower temperatures.

Understanding yeast and how it works is an essential lesson for the bread baker.

Sugars and Other Sweeteners

What would baking be without sugar? Sugar provides sweetness, flavor, and often changes the physical characteristics of our baked goods. In this section, we will explore the more popular sweeteners and their roles in baking.

Sugars are carbohydrates. There are two types of sugars: simple sugars or monosaccharides and complex sugars or disaccharides. Different sugars have different degrees of sweetness. Lactose, found in milk, is less sweet. Fructose, found in honey, is sweeter.

Granulated sugar:

Granulated sugar is the table sugar that we are all familiar with. It is 99% sucrose and is a disaccharide refined from either sugar cane or sugar beets.

Superfine sugar:

Superfine sugar is simply granulated sugar ground to a finer texture.

Molasses:

Molasses is a by-product of the sugar refining process and can be light or dark depending on the process. Molasses is typically added to baked goods for its strong, distinctive flavor but because it contains an invert sugar and is not 99% sucrose as granulated sugar is, it attracts moisture and keeps baked goods from drying out.

Brown sugar:

Brown sugar is refined sugar with some molasses either left in the sugar from the refining process or added as a syrup. The combination results in a caramel flavor and enough invert sugar to help keep baked goods fresh. Substituting brown sugar for a portion of the granulated sugar in a cookie recipe, adds caramel flavor, increases spread, and creates a cookie that will stay moist longer. Products baked with brown sugar will brown quicker than those baked with granulated sugar.

Confectioners' sugar or powdered sugar:

Confectioners' sugar is pulverized granulated sugar with 3 to 5 percent cornstarch added. If you substitute part of the confectioners' sugar for granulated sugar in a sugar cookie recipe, the added cornstarch will make for a stiffer dough and a cookie that will hold its shape a little better. Confectioners' sugar added to baked meringues will reduce its proclivity to weep. Because it is so fine, it does not cream with butter or shortening to create tiny air pockets as granulated or brown sugar does.

Turbinado sugar:

Turbinado sugar is an amber-colored sugar manufactured into course crystals. It has a little of the caramel flavor of brown sugar. Turbinado sugar makes a wonderful decorative sugar for cookies, cakes, muffins, and pie tops.

Corn syrup:

While sugar beets and sugar cane have a high sugar content, corn consists primarily of starch and yet corn syrup rivals the sweetness of table sugar. To process corn into something as sweet as sugar, an enzyme is used to convert the starch to sugar. The more complete this conversion is, the sweeter and more viscous is the syrup. Corn syrup is often used in candies and frostings because it won't turn grainy as sugar can.

Honey:

Honey is a derived from the nectar of flowers and, when commercially produced, heated to kill any yeasts or bacteria, and filtered to remove foreign substances. Each flower type adds its own distinctive flavor and the composition of the honey varies slightly depending on these flower types. When substituting honey for sugar, consider three factors: honey has a distinctive flavor that is imparted to baked goods, honey is 1 1/4 times sweeter than sugar—adjust your recipe accordingly, and because it contains fructose and glucose, it is hygroscopic and will retard staling.

The Role of Sweeteners in Baking

Sugar can affect baking in more ways than sweetness alone. Sweeteners change the characteristics of our baked goods. We've identified seven different ways that sweeteners affect our baked goods:

Moisture retention:

We've already discussed the moisture retaining qualities of brown sugar and molasses. Both honey and corn syrup also have those qualities. Because they are hygroscopic, not only do they help retain moisture in the baked product but they also draw additional moisture from the air. Candies made with hygroscopic sweeteners will draw moisture from the air and may become sticky.

Browning:

Even a little sugar will help brown cookies as the sugar melts and caramelizes. Because milk contains lactose, a sugar, a little milk in a bread dough improves the crust color. Sweeteners high in fructose or glucose, like honey or corn syrup, brown at a lower temperatures and produces a deeper brown.

Tenderness:

Sugar in a bread dough makes for a more tender product. It competes with the proteins for moisture and therefore acts as a shortening. It also interferes with the gelatinization of the starches in the flour. It is one of the reasons that a rich pastry dough is more tender and less chewy than a lean French bread.

Aeration (Leavening):

When sharp sugar crystals are beaten into shortening, butter, or margarine, air is entrained in the mixture. These tiny air pockets give the batter loft and structure during the baking process. Confectioners' sugar lacks the cutting edges of granulated sugar and does not cream well with butter.

Structure:

We will talk about spread in a moment which is a structural issue. Sugar raises the temperature at which eggs coagulate and therefore delays the setting of batters giving them more time to rise and allowing cookie doughs to spread more.

Spread:

Spread is most often an issue with cookies. As sugars melt they act as liquids and allow the cookie dough to spread. Since brown sugar contains moisture, cookies made with brown sugar tend to spread more than those made with white. Honey, molasses, and corn syrup contribute to spread. Substituting confectioners' sugar for a portion of the granulated sugar in a recipe will decrease spread. (If you do substitute confectioners' sugar for a portion of the sugar, cream the butter with the granulated sugar to create aeration and add the confectioners' sugar with the dry ingredients.)

Fermentation:

Since yeast feeds on sugar more easily than starch, a little sugar speeds up fermentation in a bread dough and makes the dough rise faster. Conversely, too much sugar makes the dough sluggish.

The Chemical Leaveners

Yeast is an organic leavener; tiny organisms create carbon dioxide to lift the dough. In this section, we will explore the chemical leaveners and how they work: baking powder, baking soda, and cream of tartar. You will understand how these chemical reactions occur and how they leaven our baked goods.

Baking Soda

Baking soda is a powerful alkaline used primarily to leaven cookies, muffins, and cakes. Because it is alkaline, it reacts with acids in a batter as soon as it is mixed causing bubbling and a thickening of the batter. It does not require the heat of the oven to begin leavening.

Generally, only acidic recipes call for baking soda. Buttermilk, juices, unalkalized cocoa, and molasses are common acids used in baking. The reaction of the alkaline baking soda with an acidic batter has two effects: it creates the carbon dioxide bubbles that leaven the batter and it neutralizes the acid in the batter. Neutralizing the acid changes the taste—buttermilk, for example, no longer has its characteristic acid tang.

Typically, recipes use 1/4 teaspoon baking soda for each cup of flour. Very heavy batters or very acidic ones may use more. Occasionally drop cookies call for more baking soda but that is to allow the cookie to brown more easily. A batter with a lower pH will brown more easily.

Baking Powder

While baking soda is alkaline, baking powder is a mixture of an alkaline baking soda and two acids designed to create a neutral compound. It therefore reacts with itself using the moisture of the batter as a catalyst. Like baking soda, this reaction creates carbon dioxide bubbles.

The baking powder generally used in the kitchen is double-acting: it reacts at room temperature in the presence of moisture and again in the oven in the presence of heat. The result is the extra lifting power necessary to make a cake light and airy. Because the baking powder reacts with itself, it does not alter the pH of the batter.

Often a weakly acidic recipe will call for both baking soda and baking powder. The baking soda will react with the acid in the batter but the reaction will not be strong enough and is bolstered with the extra baking powder.

Cream of Tartar

Cream of tartar is a by-product of the wine-making industry and is derived from tartaric acid. As an acid, it is the counterpart to baking soda and when the two are combined they create a chemical reaction which produces carbon dioxide. Most recipes that call for cream of tartar also call for baking soda. In some recipes, cream of tartar is used to increase the acidity in the batter to preserve the tang of buttermilk or an acidic juice used in conjunction with baking soda.

Other Leaveners

There are other chemical leaveners, though they are rarely used in today's kitchens. In addition, mechanical means are used for leavening. Creaming butter and sugar together entrains air in the

batter. Steam is used to lift products. Egg whites are whipped to capture tiny air pockets and thereby lighten products.

A Word about Salt

When we think of salt, we think of taste. Indeed, if bread or pastries lack salt, they taste flat. But salt has other profound effects on our baking. Here we will explore two of the most common.

Gluten structure

Salt strengthens the gluten structure in the bread and makes it more extensible. So bread will have a chewier, more elastic texture with more salt. Often a slack dough can be made more workable with the addition of a half-teaspoon of salt. A dough made tighter with salt, will be stronger and take longer to rise.

Fermentation

Not only will salt will slow the rise of bread dough because it makes for a tighter, stronger gluten structure, but salt is a powerful inhibitor of yeast growth. As little as one-half teaspoon of additional salt in the bread recipe will increase the rise time of the dough significantly. So, if your favorite recipe is slow in rising, reduce the salt—but remember that it will also change the texture of the bread noticeably.

Salt grains damage yeast. Adding the salt to the dough after the yeast has been hydrated will lesson the effect of the salt on yeast. Table salt dissolves easily in a moist dough and may be added after the dough is mixed and is ready for kneading. Or, to assure complete dispersion of the salt, dissolve the salt in a spoon of lukewarm water before adding it to the dough.

Butter, Shortening, and Oils

Butter, shortening, margarine, and oil all have similar functions in baking:

- They tenderize baked goods and soften the texture
- They assist in leavening when sugar is creamed with fats
- They add moistness and richness
- They add flavor
- They add keeping quality and retard staling
- They add flakiness in certain pastries

It is the butter or oil in baked goods that provides a pleasant “mouth feel” and a soft moistness. In this section, we will explore the most common fats and oils, how they work, and certain health considerations--hydrogenation, saturation, and metabolism . . . in kitchen-friendly terms.

Fats and oils—triglycerides—are strings of carbon atoms with hydrogen atoms attached. (Fats are triglycerides that are solid at room temperature. Oils are liquid at room temperature.) When these triglycerides enter the body, the hydrogen atoms are separated from the carbon atoms by enzymes—the process of metabolism. In the separation of atoms, energy is released that fuels the body. Fats have a higher caloric intensity than sugars; gram for gram, they are potentially more fattening.

When the maximum number of hydrogen atoms is attached, the string of carbon atoms is saturated with hydrogen atoms and it is a saturated fat. Typically, saturated fats are solids at room temperature—animal fats, butter and shortening. The body treats saturated fats differently than those with less hydrogen atoms attached and doctors warn us that too much saturated fat in our diet may lead to heart disease.

Hydrogenation is a process that adds more hydrogen atoms to a carbon string. If we take canola oil, which is low in saturated fats, and hydrogenate it, we can make margarine or shortening. Food scientists are concerned about the health aspects of hydrogenated fats. Hydrogenation is an artificial process that results in a different positioning of hydrogen to carbon atoms. (The hydrogen atoms are positioned on opposite sides of the carbon atoms rather than on the same side and hence are called trans-fatty acids.) It seems that the body has difficulty recognizing and metabolizing these differently configured molecules. The consequence is that hydrogenated fats increase cholesterol levels in the arteries. (For a complete discussion of the affects of fat in the diet—both positive and negative—the authors recommend *Eating Well for Optimal Health* by Andrew Weil.)

The baker’s challenge is to bake wonderful goods and at, the same time, limit the deleterious affects of fats. We only occasionally bake with hydrogenated fats—shortening and never margarine. In some products, we reduce the amount of fat. In others, we encourage smaller servings. We believe that baked products with fat—and nearly all baked products require fat—are acceptable in moderation for most people and many baked products deliver valuable fiber, vitamins, and minerals.

Shortening

As discussed elsewhere in this guide, a fat acts as a shortening in a flour dough by shortening the gluten strands. (See the section on flours and how they work.) The shortening that we buy in the grocery store is a white, tasteless fat made by hydrogenating either animal or vegetable fats. (The label on the product will tell you which fats are used.)

Shortening, with its hard, tough texture, is excellent for creaming, the beating of sugar and a fat together to capture tiny air packets and help leaven the batter. It has a high melting point and will not liquefy in most dough until baked, making it easier to work with than butter. (Though it is easier to work with, we prefer butter for most of our baking both for flavor and because butter is not hydrogenated.) Either butter or shortening can be cut into flour for the baking of pie crusts and biscuits.

Butter

We love to bake with butter. Nothing adds the wonderful flavor and rich texture that butter does.

Butter consists of 80% fat, 15% water, and 5% milk solids. (When substituting water for shortening, consider the water content of butter compared with shortening which is nearly 100% fat.)

Butter has a very different consistency than shortening. While shortening is pliable at working temperatures, butter is hard when cold and melts easily when worked making butter-based dough's harder to handle. Consequently, some bakers use 50% butter and 50% shortening in their dough's to improve handling characteristics but retain the flavor of butter. Butter-based products have a different mouth-feel than shortened products; butter melts in the mouth while shortening does not.

Butter can be purchased both in a salted and unsalted version. Salted butter will not perish as easily. Unsalted butter has a sweeter, fresher taste in baked goods. They can be used interchangeably in most recipes though you may need to adjust the salt in the recipe slightly.

Margarine

Margarine, like shortening, is manufactured from hydrogenated animal or vegetable fats. Salt, flavors, and colors are added to mimic butter. Margarine has a wider range of water contents than does butter and may affect the recipe when margarine is substituted for butter.

Oils

Oils are liquid fats. They are used in some quick bread and cake recipes. Because they mix so thoroughly in a dough, they tend to shorten too much and are used less frequently in bread recipes. Oils are also used to grease baking pans.

The Wonderful World of Eggs

Eggs are wonderful. They are used in so many products and so many ways. Many of our cakes would not be possible without eggs and cookies are very difficult without eggs. We know of nine different functions of eggs in baking:

- As eggs cook, the protein coagulates and provides structure to the product.
- Eggs help leaven certain products by trapping air cells in whipped eggs or egg whites. Angel food and chiffon cakes are often entirely leavened with eggs.
- The fat in the egg yolk shortens batters and dough to tenderize the product.
- Since eggs are mostly water, they moisten the products to which they are added.
- Eggs, egg whites, and yolks, are used as washes on bread loaves to give them a glossy finish and hold sesame seeds and other accoutrements in place.
- The natural emulsifiers in eggs help make our batters smooth.
- They add flavor.
- They add color. Most lemon meringue pie recipes rely entirely on egg yolks for color.
- They add nutritional value.

The Three Parts of the Egg

The egg is composed of three main parts plus membranes and two white strands called chalazae.

The shell contains the egg. It is fragile and porous. It is important to remember that eggs will absorb flavors and odors through the shell and therefore must be protected from strong smelling substances. When baking, make sure that your eggs are odor free. A tainted egg will spoil your product.

The yolk is high in both fat and protein and is a natural emulsifier. It is rich in vitamins and minerals and contains cholesterol. The color of the yolk varies on the diet of the chicken but color is not an indicator of food value or quality.

The white is primarily albumin protein. It is clear and soluble before it is cooked. It contains sulfur and may become odorous.

When you add eggs to a batter you add a great deal of water to the product. About 3/4's of the egg by weight is water. Eggs are about 12% fat and 13% protein. A large egg weighs 1 2/3 ounce out of the shell with the yolk weighing 2/3's ounce and the white, an ounce.

Fresh, Safe Eggs

The egg industry is conscientious and regulated and it is very rare to find an inferior or rotten egg in a carton from commercial sources. It is not rare to find broken or cracked shells. When you open a carton and find a cracked egg, discard it since a crack creates an easy avenue for bacteria to enter.

Eggs are a potential source of salmonella contamination. The American Egg Board estimates that only one in 20,000 eggs is contaminated. Still, it is recommended that you do not use raw

eggs in your food and that egg products be cooked to 160 degrees. Always wash your hands after handling eggs and sanitize any work surfaces where raw eggs may have been used.

Always buy eggs that are graded A or AA. You can determine the quality of the eggs in your refrigerator just as an inspector does. Open an egg onto a flat surface. If the egg is compact with a plump yolk, it is fresh. If the chalazae are prominent, the egg is fresh. (Chalazae secure the yolk in the center of the white.) Fresh eggs make for more stable egg white foams. Eggs become more alkaline as they age and may have a minor affect on the function of chemical leaveners.

Eggs kept in the coldest part of the regenerator keep up to five weeks though we plan on using our eggs within two weeks. An egg left out overnight will reduce the shelf life by a week.

Brown eggs are not more nutritious than white eggs. Blood spots are not a cause for alarm. You do not need to remove them but you may.

Because the shells are porous, eggs will lose moisture over time. Eggs packaged for consumers are given a mineral oil bath to help seal the shells, reduce the moisture loss, and protect the egg from odors. Do not wash your eggs since doing so will remove the protective mineral oil covering.

Many recipes call for eggs at room temperature. Rather than leaving your eggs on the counter to warm, simply place them in a bowl of warm water for a few minutes.

How Ingredients Work in a Bread Machine

Timing is the key to successful bread from a bread machine. In traditional methods, the dough is allowed to rise until it is ready for the oven. In the bread machine, the baking begins after a given amount of time whether the dough has risen sufficiently or not. If the dough does not rise quickly enough, the result will be a dense loaf. If it rises too quickly, the dough will fall before the baking sets the loaf. The window of time in which bread will turn out perfectly shaped is relatively small.

There are a number of factors that effect rise times. They are:

- **The amount and type of yeast.** Adding more yeast will speed the rise. Adding too much yeast will make the bread crumbly. In most cases, there are better ways to affect the rising of the dough than changing the yeast.
- **Dough temperature.** Yeast grows ideally at temperatures of 78 or 80 degrees. Changing the water temperature by ten degrees will affect the shape of the loaf. For most of us, that means that a thermometer is a necessary tool for consistently shaped bread.
- **Dough hydration.** An extra tablespoon of water makes a difference so measure water carefully.
- **Salt.** The shape of the loaf will change with the amount of salt in the recipe. If you don't think your loaf is rising enough, reduce the slat by one-half teaspoon.
- **Sweeteners.** Sugar, honey, or molasses feeds the yeast and accelerates the rise. While sugar will affect your bread, salt has a more dramatic affect.
- **Kitchen environment**. A warm or cool kitchen or warm or cool ingredients will affect the rising of the bread.

Every bread machine and every kitchen is different and the results from your bread machine may not always be perfect. You can tinker with the first five of these factors to fine tune a recipe. If you are using bread machine mixes instead of a recipe, you cannot change the ingredients in the mix but still, you can still fine tune the mix to fit your machine and your conditions. What follows is a guide for doing so.

Tips for Improving the Odds with Your Bread Machine

Bread machines are wonderful inventions but they can be a little bit tricky. The margin for error in most recipes is really quite narrow--even for those recipes supplied by the manufacturer—much narrower than breads made in your stand-type mixer or by hand.

Here are some hints that will move the odds more to your favor:

• Always measure the ingredients accurately. Measure liquids in a clear measuring cup at eye level.
• If the water temperature is specified, use a

kitchen or candy thermometer to measure the temperature.
• Always use fresh flour kept in a closed container. Flour absorbs moisture from the air and will affect the moisture amount in the recipe. (We receive our flour within 60 days of milling and once opened, store it in sealed containers.)
• Always start with both the machine and the ingredients at room temperature.

If you have trouble baking bread with your machine, do what many experienced bread machine users do: use the machine for mixing and rising but not baking. Many machines have a "dough/manual" setting. Use it and then form the loaf and transfer it to a baking pan or sheet.

To use your bread machine in this way, begin the mix or recipe as instructed. Check on the dough as the machine mixes and kneads. If the dough is too sticky add another tablespoon of flour or if too dry, dribble a little water into the machine. Let the machine continue through the rise cycle. When the machine beeps to signal that baking is to begin, gently remove the dough by inverting the pan over the counter. Gently knead the dough to release the trapped gas and then form the loaf. Bake as a conventional loaf, usually at 350 degrees. You will have tilted the odds back in your favor, you will have the option of forming loaves the size and shape you wish (or even dinner rolls), and you won't have a thick crust and a hole in the loaf