

## **Yeast Breads Background Info**

Yeast breads have the following basic ingredients: flour, liquid, salt, yeast, fat, and sugar. Eggs are optional. Each ingredient is considered a chemical by food scientists and each serves a specific purpose in a recipe:

### **FLOUR**

Flour contains many different substances, including proteins, starch, lipids, sugars, and enzymes. Protein, when mixed with water, form that remarkable material we call gluten. Without gluten, there would be no such thing as raised bread.

Flour gives structure or body to bread because of the protein called gluten. When flour is thoroughly mixed with a liquid and then kneaded, enough gluten is formed to support the CO<sub>2</sub> produced by the yeast. (Example: gluten is like bubble gum. When you first put it in your mouth it is soft and chewy. It becomes more elastic as you chew so you can blow bubbles. If you chew it for a long time it gets tough and hurts your jaw. Gluten also gets more elastic as flour is manipulated or kneaded.)

Various types of flour contain differing amounts of gluten.

Bread flour produces the strongest, most elastic structure and is used in bread made commercially. The best flour for bread making is a hard-wheat (Durham). It makes the strongest gluten.

All purpose flour does not form as much gluten but it gives satisfactory results.

Cake flour should not be used because it contains the smallest amount of gluten and, therefore, produces a lighter texture desired in cakes. Cake flour forms weak gluten and does not make a good dough.

Rye flour, cornmeal, and oat flour also produce very weak gluten.

Rye flour is obtained by sifting rye meal. It has some gluten-forming properties. Bread made from rye flour, although not necessarily soggy or heavy, is more compact than bread made with wheat flour. Some white flour is often combined with rye flour in making bread to yield a lighter, more porous product than is possible with rye flour alone.

Whole Wheat flour may also be called Graham flour. It is the product prepared from cleaned wheat in such a manner that all three parts of the kernel are still intact. It may be ground to different degrees of fineness. The keeping quality of whole wheat flour is lower than that of white flour because it contains fat from the wheat germ that may become rancid with age.

### **LIQUID**

Water or milk are usually used as the liquid. Their purpose is to moisten, dissolve, and combine the other ingredients. Milk adds nutrients and helps keep the bread fresher longer.

### **FAT**

Fat has the purpose of a tenderizer because it traps air and causes the dough layers to separate.

### **SUGAR**

Sugar provides extra food for the yeast so that the dough rises faster. If too much sugar is added, the yeast works more slowly. Sugar also helps bread to brown and adds flavor and tenderness to the dough.

## EGGS

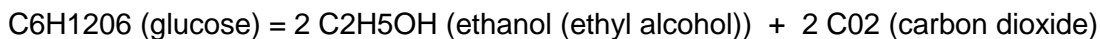
When beaten, eggs incorporate air. They add flavor, color, and strength because of their protein content.

## SALT

Without salt, yeast dough is sticky and hard to handle; if left out of the recipe, the baked bread has small holes on the bottom and outside of the product. Salt regulates yeast-it helps yeast do its job by stopping certain enzymes found in the flour from reacting.

## YEAST

Yeast is a single-celled plant that produces carbon dioxide (a gas) and ethyl alcohol when warm water and sugar are added. A process called fermentation takes place. Although the fermentation of sugar by yeast is a complex chemical process, yeast can change most of the sugars (except lactose) found in batters and doughs to carbon dioxide and alcohol. The alcohol evaporates during baking. The CO<sub>2</sub> causes bread to rise. The chemical formula for this process is summarized as:



## YEAST FACTS

(Source: USU Extension fiber Fact sheet.)

Yeast is a leavening agent. To leaven means to make light and porous. It is a microscopic plant, a microorganism, which can cause fermentation in sugar or flour and form carbon dioxide. The carbon dioxide gas expands the gluten structure and causes the bread to rise. Yeast works best at room temperature (80 F to 85 F) and dies quickly at high temperatures; low temperatures slow down yeast activity. All liquids must be lukewarm when used (a drip of liquid feels neither hot nor cold when tested on the inner arm). After the dough is mixed, it must be allowed to rise in a warm place.

Yeast is purchased in a dry, granular form, as a compressed cake, or in an instant form. Compressed yeast requires refrigeration, but granular yeast keeps well on the shelf. Instant yeast requires no prior handling and may be added directly to the dry ingredients. Some flours are self-rising meaning yeast has already been added and, therefore, no additional leavening agents are necessary.

## WHEAT PROTEINS AND GLUTEN

### WHAT IS GLUTEN?

It is a complex network of intertwined proteins with water molecules filling the interstices.

The proteins of wheat are very important in determining the functional properties of wheat flour doughs. A variety of proteins have been extracted from wheat. About 85% of the proteins of white flour are relatively insoluble. When flour is moistened with water and thoroughly mixed or kneaded, these insoluble proteins form gluten.

Gluten is primarily responsible for the viscous and elastic characteristics and high loaf volume of wheat flour doughs. In yeast breads, gluten is developed to its maximum strength to make possible a high volume and fine texture. In other baked products, such as cakes, gluten development is retarded so that a more tender product will result.

### HOW IS IT FORMED?

Some of the proteins in the endosperm are water soluble. Gliadin and glutenin proteins are insoluble and are the ones that form gluten, the gumlike residue that remains after you have chewed on a piece of raw dough for a few minutes. Gliadin proteins are made up of several thousands of atoms, and the glutenin may range from the thousands up to perhaps a million. By any measure, they are both long, sprawling molecules. Because the molecules are so long, it is possible for them to fold back upon themselves so that side groups of both adjacent and widely separated portions of one chain can end up

next to one another and bond together. A gluten molecule looks something like a fish line that has kinked and tangled with itself.

### QUALITIES OF GLUTEN

Gluten is plastic, elastic, and viscous in nature. That is, it will both change its shape under pressure and tend to reassume its original shape when pressure is removed. This characteristic allows wheat dough to expand to incorporate the carbon dioxide produced by yeast and yet will put up enough resistance that it will not thin out to the breaking point. If the dough were wholly plastic, the gas would simply migrate to the surface and escape; if it were merely elastic, the gas would accumulate in a few increasingly pressurized pockets, and the bread would come out heavy and coarse.

To form gluten, sufficient kneading must take place. However, overkneading can cause a breakdown, or a loss of the elasticity. The proteins have been stretched to the point that the bonds are pulled apart. The bread maker's aim is to develop a highly elastic dough-which will mean maximal gas retention, loaf volume, and fineness of texture-without passing the invisible boundary that marks overdevelopment. It is not easy to overwork bread dough by hand, but it is quite easy to do so in a food processor or a commercial dough developer. When the dough develops a satiny surface, gluten is well-developed.

GLUTEN INHIBITORS: Sugar and fat in relatively large amounts limit gluten quality.

### YEAST BREADS CAN BE MIXED USING ONE OF TWO METHODS

#### CONVENTIONAL METHOD OF MIXING BREAD

1. Dissolve or soften yeast in warm water to start the yeast cell growth action. If the water is too cold, the growth will not take place. If the water is too hot, the growth action will be killed. (Let it stand for 8 to 10 minutes without stirring.)

Compressed yeast requires warm water of a temperature of about 85 F.

Active dry yeast requires a slightly warmer temperature of about 105 F to 110 F.

If there is a chance that the yeast is too old, test it by adding 1/2 tsp. sugar to the water and yeast. If the yeast is alive, it will foam within 10 minutes.

2. Add the fat, sugar, and salt to scalded milk. Cool the liquid to about 86 F. While still warm, add the dissolved yeast.

3. Add the flour and mix according to the recipe.

#### MIXER METHOD OF MIXING BREAD

1. Use only active dry yeast. Combine undissolved yeast with part of the flour, sugar, and salt.

2. Heat fat and liquid to between 120 F and 130 F. The higher temperature is needed because there are more ingredients to be warmed so that yeast growth can be activated.

3. Add the liquid to the dry ingredients and mix with an electric mixer. Add the remaining flour and continue mixing according to the recipe.

**SUCCESSFUL YEAST BREAD PREPARATION INVOLVES CAREFUL MEASURING, SUFFICIENT KNEADING, CONTROLLED FERMENTATION TEMPERATURES, CORRECT PAN SIZE, AND CORRECT BAKING TEMPERATURE**

## MEASURING

Recipes give a range of flour; i.e., 3 - 3 1/2 cups because flours vary in how much liquid they can absorb. Begin by adding flour at the lower end of the range (3 cups). When the dough clings together and leaves the side of the bowl, enough flour has been added.

## KNEADING

After mixing, it is necessary to knead the dough to develop the gluten. Add just enough additional flour to prevent the dough from being sticky on the work surface. Develop a rhythm to kneading. Fold the dough in half toward the body, push against the dough with the heel of the hands. Continue in this fashion of folding, pushing, and turning until the dough becomes smooth and elastic. Usually kneading for 8-10 minutes is enough for the gluten to develop and for the dough to be a silky and smooth ball.

## FERMENTATION (Letting the dough rise.)

Most of the carbon dioxide (CO<sub>2</sub>) is produced during the rising process at a temperature between 80 F - 85 F.

If the room is cool, fill a large bowl 2/3 full of hot water, place a wire rack on top and put the dough bowl on the rack or set the bowl in a warm water bath.

The dough must rise until it is double in volume. Lightly grease a large bowl. Place dough into the bowl, turning so that all the surface has a slight layer of grease. Cover with a clean towel and let rise.

## PUNCHING DOWN AND SHAPING DOUGH

When the volume has doubled, test by pressing with a finger. If a dent remains the dough is ready to punch. To let the excess gas escape and make the dough easier to shape, push the fist into the center. Pull dough away from the sides of the bowl and reform the ball. Turn dough out onto a slightly floured surface or pastry cloth. Shape dough into loaves, rolls, or desired shapes. After dough is shaped, allow it to rise again to double volume.

## BAKING AND COOLING BREAD

Bake in a preheated oven according to recipe instructions. When the product is done, it will sound hollow when tapped. Remove from pan immediately onto a cooling rack; otherwise, the bottom will become soggy. Cooling too quickly or in a draft will cause the crust to crack.