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Cooked by Michael Pollan
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Coming this Fall

Comfort Food | Tuesday, October 1st, 6 p.m.

During the summer it is hard to imagine the cold winter days, but they come every year. In October the Project Foodie team will explore why some foods are considered comfort food as well as some of our favorite recipes that add a bit of warmth to the grey days of winter.

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Food Science

PROJECT FOODIE

mixing things up in the kitchen with GPL

"The discovery of a new dish confers more happiness on humanity, than the discovery of a new star."
Jean-Anthelme Brillat

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The Science of Baking

When baking there are up to five basic ingredients that work together to produce the perfect cookie, cake or bread: flour, sugar, fat, leavening agent and eggs. While seemingly simple there are a lot of variables within each group that can contribute significantly to the end product. By knowing the science behind each ingredient you can tweak your recipes to get your ideal baked good.

Flour

Flour is made up of carbohydrates, proteins and sometimes a bit of fat. By changing the flour you can change the density and texture of your baked goods. By choosing flour that has a high percentage of protein, a perfectly chewy on the inside and crusty on the outside loaf of bread can be achieved. Conversely, by choosing flour with less protein the other types of baked goods such as cookies, cakes, and biscuits can come out tender and delicious.

All-purpose flour has an average protein content, but even within brands the percentage can vary enough to effect the outcome. Cake flour undergoes a special bleaching process that increases the flours ability to hold water and sugar. When making recipes that have a high sugar to flour ratio the cake flour will help hold the rise and will make a collapse less likely. Self-rising flour is a soft all-purpose flour with leavening agents already added. When cooking with self-rising flour it is suggested that you cut back or eliminate the other leavening agents in the recipe.

for 30 seconds, then use the spoon to stop the motion so the milk will be still.

6. Cover the pot and let it sit for five minutes.
7. After five minutes, the mixture should resemble a very soft custard.
8. Using a knife or a cake spatula, cut the curd into a 1-inch checkerboard pattern, making lines across, then lines in the other direction.
9. Return the pot to the burner over medium heat and stir gently until the temperature of the whey (the liquid that separates from the curd) reaches 105 degrees.
10. Use a slotted spoon to transfer the curd to a colander set over a bowl.
11. Slowly spin around the colander to allow the whey to drain from the curd. Remove the cheese and gently squeeze it a few times to drain off more excess whey.
12. Transfer the cheese to a microwave-safe bowl and microwave the curd on high for 1 minute.
13. Remove the bowl from the microwave and pour off as much whey as you can. Use your hands again to try to squeeze out more of the whey.
14. Microwave it again for 35 seconds, then press the curd together again to drain the whey. Knead and stretch the curd to drain as much whey as possible. Microwave at least once more for 35 seconds.
15. Add salt if desired, then set the ball of cheese in an ice bath until totally cooled.

Fresh Mozzarella

from thepioneerwoman.com

Valerie's Comments: This has taken me a few tries to get it right, but the end result is totally worth the effort.

What you'll need:

1 gallon of whole milk (the fresher the better)

1.5 teaspoon of citric acid powder

1/4 teaspoon liquid vegetable rennet or 1/4 vegetable rennet tablet (dissolved in 1 cup of water)

1-2 tablespoons of salt (optional)

Food thermometer

What you'll do:

1. Sprinkle the citric acid powder in a cool, empty, large non-reactive stockpot. Pour 1/4 cup water over it and stir to dissolve.
2. Pour milk into the citric acid solution and stir to combine.
3. Put the pot over medium-low heat and heat it to 90 degrees.
4. When the milk reaches 90 degrees, remove the pan from heat and add in the rennet mixed with water.
5. Stir the mixture with a gentle, circular up and down motion

How much protein is in your flour?

flour type	% protein	recommended uses
high-gluten	14 to 15	bagels, pizza crusts, blending with other flours
whole-wheat	14	hearth breads, blending with other flours
bread	12 to 13	traditional breads, bread machine breads, pizza crusts
all-purpose	9 to 12	everyday cooking, quick breads, pastries
self-rising	9 to 11	biscuits, quick breads, cookies
pastry	8 to 9	pie crusts, pastries, cookies, biscuits
cake	5 to 8	cakes, especially those with a high ratio of sugar to flour

Sugar

Sugar is more than just the granulated white stuff that is so common in most pantries. Granulated sugar can be made from sugar cane or from beets. It can be ground down to create a superfine sugar or pulverized to create powdered sugar. The type of sugar used can play a big role in the final outcome of your recipe.

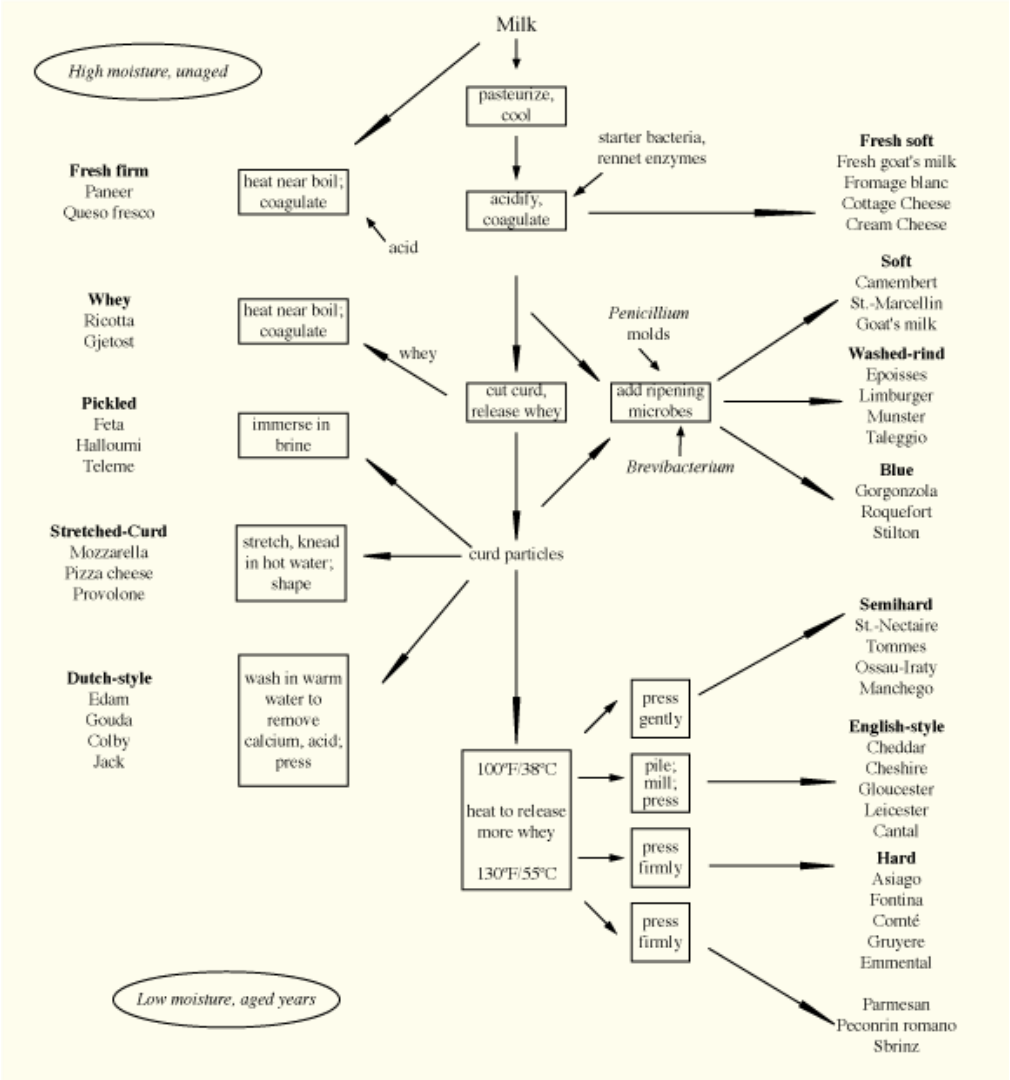
White sugar or granulated sugar helps keep baked goods soft and moist. It also helps get the desired crispy outside effect with cookies and brownies. Some bakers will tell you that cane sugar is superior to beet sugar. This may be attributed to differing protein contents. Brown sugar was originally semi-refined sugar with a bit of natural molasses left but most commonly now it is white sugar with molasses added back in. Brown sugar will give a warm spiciness with a hint of caramel to recipes using it. Superfine sugar, or caster sugar, dissolves well in cold and room temperature liquids because the grain is finer. This sugar can also improve the texture of cakes because the crystals cut into the batter helping form air pockets creating a delicate crumb. Powdered sugar, or confectioners' sugar, is pulverized granulated sugar with a bit of corn starch added. It dissolves readily in any liquid or fat. When making merengue, whipped cream or frosting powdered sugar is commonly used so that all the crystals are dissolved.

Fats

There are three basic fats to choose from when baking: butter, margarine and shortening. What you use and the temperature of the fat makes a difference.

Butter is 80% fat and 20% water. When used in baking the butter gives off steam which causes more gluten formation. Butter has a lower melting point so the butter will give off steam at the beginning of the baking process. Butter also has a better taste that the other more common fat options. Margarine is designed to have the same fat/water ratio as butter but this can vary. Some margarine is table margarine and has a higher water content making it easier to spread. When using margarine in your recipes look for margarine designed for baking. Different margarines all have a unique taste which will translate into your end product. Shortening has a higher melting temperature than butter making steam later in the baking process. It can be used in place of butter, but all the flavor butter provides will be absent. It is common to mix fats to get a balance of taste and performance.

Process of Creating Some Common Cheeses



From *On Food and Cooking* by Harold McGee and science.howstuffworks.com

The Science of Cheese

Cheese-making is a long and involved process that makes use of bacteria, enzymes and naturally formed acids to solidify milk proteins and fat and preserve them. Once turned into cheese, milk can be stored for months or years.

The main preservatives that give cheese its longevity are salt and acids. The basic steps in cheese making go something like this (for most common cheeses):

- First, milk is inoculated with lactic acid bacteria and rennet. The lactic acid bacteria convert the sugar in milk (lactose) to lactic acid. The rennet contains enzymes that modify proteins in milk. Specifically, rennet contains rennin, an enzyme that converts a common protein in milk called caseinogen into casein, which does not dissolve in water. The casein precipitates out as a gel-like substance that we see it as curd. The casein gel also captures most of the fat and calcium from the milk. So the lactic acid and the rennet cause the milk to curdle, separating into curds (the milk solids, fats, proteins, etc.) and whey (mostly water).
- The curds and whey are allowed to soak until the lactic acid bacteria create a lactic acid concentration that is just right. At that point, the whey is drained off and salt is added.
- Now the curds are pressed in a cheese press -- lightly at first to allow the escape of the remaining whey, then severely (up to a ton of pressure) to solidify the cheese.
- Finally, the cheese is allowed to age (ripen) in a cool place to improve its taste and consistency.

Leavening agents

The two most common leavening agents used are baking powder and baking soda. Baking powder has an acid mixed in so that it can be used in a recipe that has no other type of acid in it. Adding baking powder to any type of liquid will create a reaction forming carbon dioxide, one acts later than the other prolonging the reaction. Baking soda creates a reaction forming carbon dioxide as soon as it is mixed with an acid—vinegar, yogurt, buttermilk, cream of tartar. The reaction happens quickly so it is important to use the batter right away to keep the air bubbles. If your recipe does not have enough acid to support the reaction you can be left with a product that has an unpleasant soapy taste.

Eggs

Eggs give structure to baked goods. They can do triple duty and work as a leavener, thickener and a binder. When making substitutions in a recipe it is important to know how the egg is being used. When recipes call for a lot of eggs the size does matter. Egg yolks contain the nutrients, fat and cholesterol. Egg yolks are prized for their emulsifying ability. The whites are made up of protein and water. Egg whites help dry out and crisp baked goods.

Homebaking.org
Finecooking.com

Using Science with Cookies

USING SCIENCE TO GO BEYOND SIMPLE COOKIE DOUGH http://www.simplifried.com

adapted from Good Eats: Chips for Sister Marsha

the thin

YIELD: 2 1/2 dozen

fats	sugars	binders + liquids	flour	leavening
2 sticks butter With a lower melting point than shortening, butter will help the cookies spread before setting.	**1 cup white, 1/2 brown** Using more white sugar than brown will make the cookie crispier.	**1 egg, 2 oz milk** Replacing egg with milk will help the cookie spread rather than puff up.	**2 1/4 cups AP flour**	**1 teaspoon plus a pinch more baking soda** Baking soda reduces acidity which raises the temperature at which the cookie sets, giving it more time to spread.

1 1/2 tsp vanilla **1 tsp salt** ***BAKE AT 375°***

Do not chill batter before baking. Give each cookie a lot of room on the cookie sheet so they can spread as they cook.

the puffy

YIELD: 2 1/2 dozen

fats	sugars	binders + liquids	flour	leavening
1 cup butter flavored shortening Shortening has a higher melting point than butter so the cookies rise and set before they spread.	**3/4 cup white, 1 cup brown** Using more brown sugar than white will create a more tender chewy cookie.	**2 eggs**	**2 1/4 cups cake flour** Less moisture is absorbed using lower protein cake flour, creating steam to help the cookies rise.	**1 1/2 tsp baking powder** Powder rather than soda will keep the batter acidic so it sets quicker and spreads less.

1 1/2 tsp vanilla **1 tsp salt** ***BAKE AT 375°***

For best results, chill batter before scooping so it spreads slower and has time to set. Using a smaller scoop will keep the cookies puffy as well.

the chewy

YIELD: 2 1/2 dozen

fats	sugars	binders + liquids	flour	leavening
2 sticks butter, melted The water in melted butter will mix with higher protein flour, developing chewy gluten.	**1/4 cup white, 1 1/4 cups brown** The molasses in the brown sugar will attract moisture and help keep the cookies chewy.	**1 egg plus, 1 egg yolk, 2 Tbs milk** Replacing egg white with milk will keep the cookies moist which helps chewiness.	**2 1/4 cups bread flour** Bread flour has more protein, which will mix with the liquids and create chewy gluten.	**1 tsp baking soda**

1 1/2 tsp vanilla **1 tsp salt** ***BAKE AT 375°***

For best results, chill batter before scooping.

http://assets.simplifried.com/wp-content/uploads/cookie-science.pdf

Miracle Fruit

A Berry That Can Trick Your Tongue

There is a berry that is native to West Africa and first discovered by westerners in 1725 that has the ability to temporarily change the way you taste. The miracle berry looks a bit like a cranberry and is said to have a mild, sweet tang. The "miracle" is in the protein miraculin. Miraculin has the power to make sour foods taste sweet-a lemon can taste like lemonade.

Miracle berries are used for two main purposes today. Today they are used like the West Africans used them; a berry is eaten before a meal to get the taste of sweetness from otherwise sour food. Sweetness without the sugar has a great appeal for diabetics and dieters alike. Another popular use for this little berry or its dried counterpart is for flavor-tripping parties. Party goers can chew a berry and for a half an hour the taste of food is changed-sour becomes sweet.

So how does this little miracle work? When you chew on a berry the miraculin latches on to your sweet receptors. For the most part the protein just sits on the receptors until you add a bit of acid into the mix. By adding acid a few extra protons are picked up by the miraculin and it changes shape. When the shape of the protein is changed it also changes the shape of the sweet receptors distorting them so that acidic food tastes sweet.