

# Baking Science... Ingredient Functions



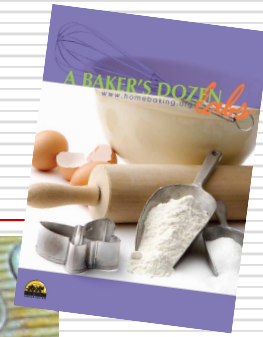
Farm to Oven



**Sharon Davis,  
Family & Consumer Sciences  
Education**

# Apply Test Kitchen R&D Baking Methods

Equip FCS Labs...scales, thermometers, scoops



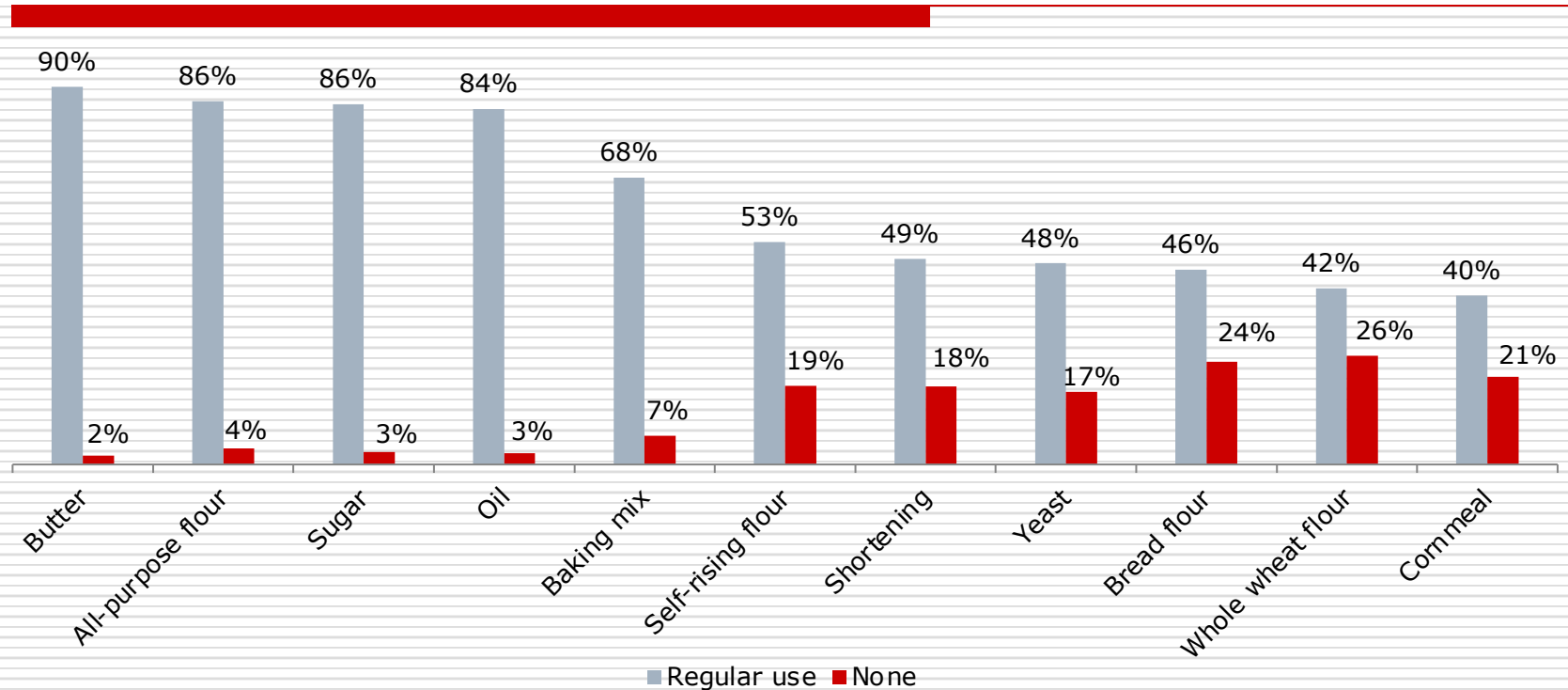
Bridge from home tools and methods to professional



Thermometers at [www.Thermoworks.com](http://www.Thermoworks.com)

# Baking Ingredients Used

Consumers on average regularly use 7 of these 11 baking ingredients



Mintel Consulting: September 2019

Q7: When you are baking, how often do you typically use each of the following ingredients? N=1,830

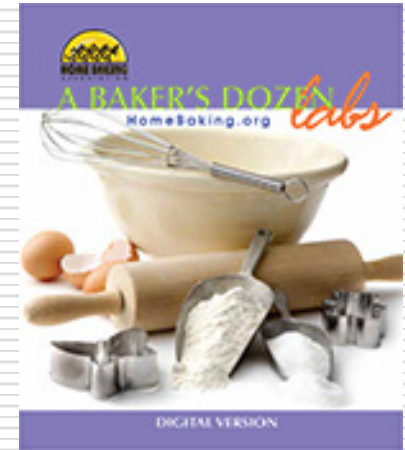




# Basic Ingredient Categories

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- Flour
- Liquid
- Leavening Agent
- Fat
- Sugar
- Eggs
- Spices or Flavorings



EXTRA! Lesson, *Ingredient Super Heroes*.

<https://www.homebaking.org/wp-content/uploads/2020/06/HBA-Ingredient-Super-Hero-Lesson-Plan-1.pdf>



# INGREDIENT CHART



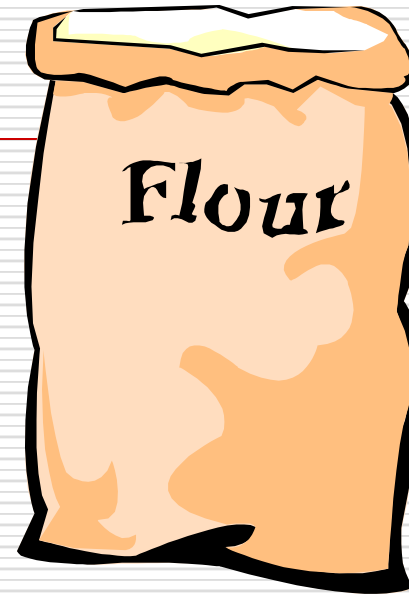
After reviewing this power point, assign students to Name and chart the functions for ingredients they're using in the next baking recipe.

Ingredient	Functions	Examples
Flour		Hard wheat – Soft wheat –
	Contributes tenderness, moistness and enhances flavor	
Sugar		1. 2. 3. 4.
Eggs		
Liquids		Water, milk, cream, buttermilk, sour cream, juice, etc
	Strengthens gluten and enhances flavors	
Flavorings and Spices		
Chocolate		Unsweetened chocolate Semi-sweet chocolate White chocolate Cocoa powder
Leavening Agents		

# FLOUR

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Provides gluten  
and starch...



the framework of bread.

Grain flour sources of gluten:

Primary: Wheat

Lesser amounts: rye, triticale, barley, spelt, emmer, einkorn

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# A look at the six classes of wheat grown in the U.S. and the food products made from them.



Hard Red Winter



Versatile, with excellent milling and baking characteristics for pan bread, HRW is also a choice wheat for Asian noodles, hard rolls, flat breads, general purpose flour and cereal.



Hard Red Spring



The aristocrat of wheat when it comes to “designer” wheat foods like hearth breads, rolls, croissants, bagels and pizza crust, HRS is also a valued improver in flour blends.



Soft Red Winter



Versatile weak-gluten wheat with excellent milling and baking characteristics for cookies, crackers, pretzels, pastries and flat breads.



Soft White



A low moisture wheat with high extraction rates, providing a whiter product for exquisite cakes, pastries and Asian-style noodles, SW is also ideally suited to Middle Eastern flat breads.



Hard White



The newest class of U.S. wheat, HW receives enthusiastic reviews when used for Asian noodles, whole wheat or high extraction applications, pan breads and flat breads.



Durum



The hardest of all wheats, durum has a rich amber color and high gluten content, ideal for pasta, couscous and some Mediterranean breads.



[www.wheatworld.org](http://www.wheatworld.org)



[www.uswheat.org](http://www.uswheat.org)



[www.wheatfoods.org](http://www.wheatfoods.org)



# Protein Content of Flours

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Cake Flour	7% to 8.5%
Pastry Flour	8% to 9.5%
All-purpose flour	9% to 11%
Bread Flour	11.3 to 13%



- Protein level is an indicator of gluten strength in wheat flours.
- Lower protein percentages are likely to be used for cakes, cookies, crackers, biscuits, pastries for a tender product.

Source: A Bakers Dozen Labs, Wheat Flour & Cornmeal, Lab 3, HomeBaking.org

# Types of Flour

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- **Hard wheat** (Bread flour)
  - High protein content
  - The higher the protein content the more potential it has to form gluten
  - Ideal for bread making
  - Includes all-purpose and whole wheat flours
- **Soft wheat** (Pastry and Cake Flour)
  - Low protein content
  - Ideal for tender baked products
  - May be used in pastry flour and all-purpose

## Wheat Growers Corner

# Flour 101

If you want to flex your baking muscles, think flour -- there's a lot more than "all-purpose" out there. Many of the flours listed below can be found in the baking aisle of your favorite grocery store. With fall just around the corner -- the harbinger of bake sales and holiday entertaining -- it's time to start harnessing the power of flour for your next baking project!

Keep in mind that the harder the wheat, the higher the protein content in the flour. Soft, low protein wheats are used for cakes, pastries, cookies, and crackers, while hard, high protein wheats make excellent breads.

## White flour

The finely ground endosperm of the wheat kernel.

## All-purpose flour

White flour milled from hard wheats or a blend of hard and soft wheats. It gives the best results for a variety of products, including some yeast breads, quick breads, cakes, cookies, and pastries. All-purpose flour is usually enriched and different brands will vary in performance. Protein content varies from 8-11 percent.

## Bread flour

White flour that is a blend of hard, high protein wheats and has greater gluten strength and protein content than all-purpose flour. Bread flour is milled primarily for commercial bakers, but is available at most grocery stores. Protein varies from 12-14 percent.

## Cake flour

Fine-textured, silky flour milled from soft wheats with low protein content. It is used to make cakes, cookies, crackers, quick breads and some types of pastry. Cake flour has a greater percentage of starch and less protein, which keeps cakes and pastries tender and delicate. Protein varies from 7-9 percent.

## Self-rising flour

Also referred to as phosphate flour, a convenience product made by adding salt and leavening to all-purpose flour. It is commonly used in biscuits and quick breads, but is not recommended for yeast breads. One cup of self-rising flour contains 1½ teaspoons baking powder and ½ teaspoon salt. Self-rising can be substituted for all-purpose flour by reducing salt and baking powder according to these proportions.

## Pastry flour

Has properties intermediate between those of all-purpose and cake flours. It is usually milled from soft wheat for pastry-making, but can be used for cookies, cakes, crackers and similar products. It differs from hard wheat flour in that it has a finer texture and lighter consistency. Protein varies from 8-9 percent.

## Whole wheat flour

This flour is milled from the entire kernel of hard red wheat either by grinding the whole-wheat kernel or recombining the white flour, germ and bran that have been separated during milling.

The presence of bran reduces gluten development, therefore, items baked with whole wheat flour tend to be heavier and more dense than those made from white flour. The insoluble fiber content is higher than in white flours.

## White whole wheat flour

This flour is milled exactly like whole wheat flour and is nutritionally equivalent to whole wheat flour as well. The only difference is that whole white wheat flour is made with a white, not red wheat variety. The bran of white wheat is lighter in color and has a milder flavor than red wheat and therefore the flour has these properties as well.

## Gluten flour

Usually milled from spring wheat and has a high protein (40-45 percent), low-starch content. It is mixed with other non-wheat or low-protein wheat flours to produce a stronger dough structure. Gluten flour improves baking quality and produces a high-protein bread.



For more information on all things wheat foods, visit us at [wheatfoods.org](http://wheatfoods.org)



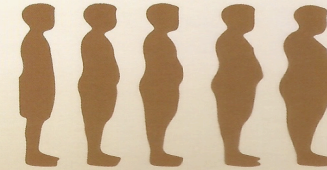
# What is Gluten?

Proteins *glutenin* and *gliadin* combine to produce *gluten*.



Gluten-free items may contain more calories and sugars, so...

a *gluten - free diet* may cause you to *gain weight!*

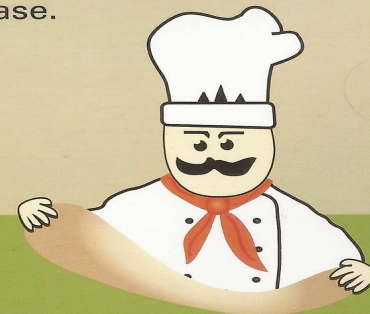


Celiac disease is an auto-immune *disorder* where gluten affects the small intestine. You have to carry the gene(s) to develop celiac disease.

# 1%

Around *one percent* of Americans have celiac disease.

Gluten gives dough *elasticity* and *volume* and makes bread *chewy*.



Infographic Source:  
[KansasWheat.com](http://KansasWheat.com)

More about Gluten  
[WheatFoods.org](http://WheatFoods.org)

View *The Truth About Wheat* at  
[okwheat.gov](http://okwheat.gov)



# FLOUR...is NOT Just Flour

Provides structure (or not) in batter, baked products

- Gluten forms based on **protein** in flour (*glutenin and gliadin*)
- Gluten develops when flour is mixed with liquid
- Forms structure (web), traps CO<sub>2</sub>= “dough rises”
- Quick breads may use lower gluten flour and are mixed very little for tender structure.
- May use up to ½ whole wheat flour of same % protein with good results
- “Heritage,” ancient grains, legume or seed flours may or may not contain gluten

**Flour is NOT Just Flour** video, lab:

<https://www.homebaking.org/distance-learning/>

More about [Ancient and Pseudo Grains](#).

Download  
this free  
sample lab





# Baking with Non-wheat Flours

Offers

1. Variety, additional whole grains, flavors
2. Wheat-allergic\* (<0.5% pop)
3. NCGS or Celiac options \* *Non-Celiac Gluten-Sensitivity (NCGS <1-6%) or Celiac disease (<1% pop)*

Option 1: Make no change, standard recipe

Use  $\frac{1}{4}$  (25%) or less non-wheat flour(s) or cornmeal +  $\frac{3}{4}$  wheat flour

Rye and barley flours offer some gluten

Option 2: Wheat allergy--1:1 sub for 1 c. wheat flour

1 c. or blend non-wheat flours amaranth, barley, corn, millet, rye, sorghum,

OR  $\frac{7}{8}$  c. brown or white rice flour, teff flour

Option 3: Gluten Free, Next slide



*A Baker's Dozen Lab Manual  
Labs 1 and 3. HomeBaking.org*



# Gluten-

# Free (GF) Baking



## Gluten-free Flour Blend

Makes 3 cups.

Brown rice flour (or part sorghum) 2 cups

Potato starch 2/3 cup

Tapioca starch (aka flour)\* 1/3 cup

Xanthan gum 1 tsp.

Use wire whisk to blend well.

\*May substitute corn starch for tapioca

Source: landolakes.com

Other blends: Kingarthurflour.com

More @ [HomeBaking.org/glossary](http://HomeBaking.org/glossary)

Wheat, barley and rye are NOT GF.

Use 25% (1/4) more baking powder per 1 c. wheat- or gluten-free flours

Use ¼ c. almond flour in cookie recipes

Cream guar/xanthan gums w/butter

Xanthan gum *per cup GF flour*:

Cookies-1/4 tsp.

Cakes, ½ tsp.

Quick breads, ¾ tsp.;

Yeast breads, 1 to 1 ½ tsp.

Pizza dough, 2 tsp.

Guar gum, in similar amounts, is best for severe corn or soy allergies.

Sources: PanhandleMilling.com

NEW! SimplySorghum.com

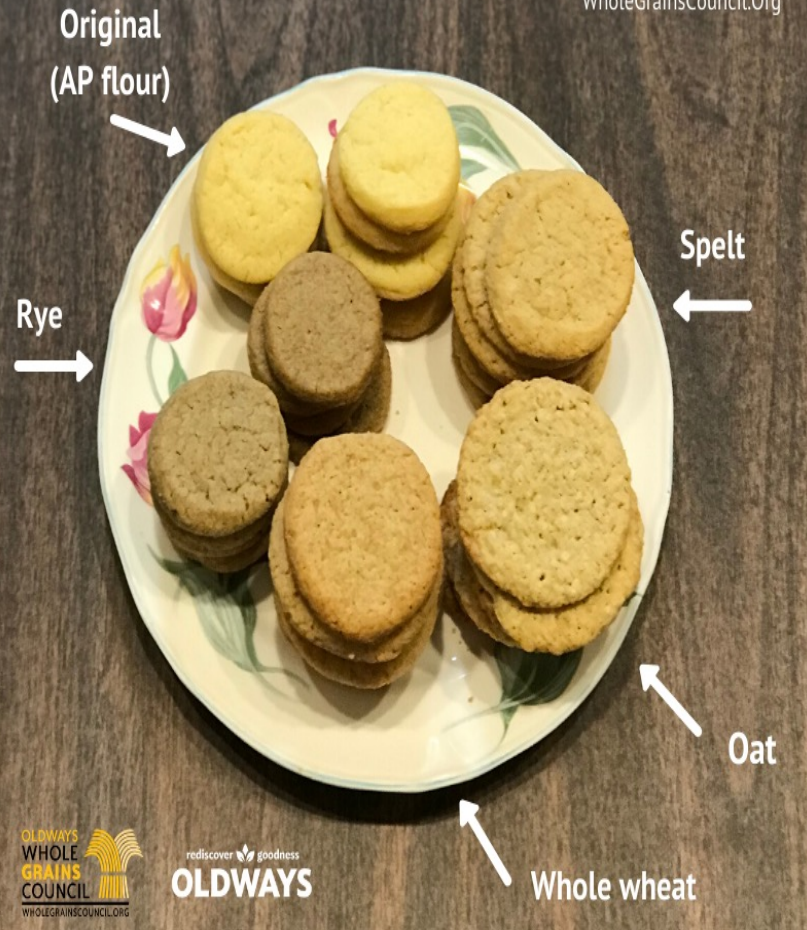
# Develop Essential Baking Test Kitchen aka R&D Skills



Taste of Home Blog, 12/2019  
[www.wholegrainscouncil.org](http://www.wholegrainscouncil.org)

## FOUR WHOLE GRAIN FLOUR VARIATIONS

WholeGrainsCouncil.Org



# Whole Wheat Flour Substitution

NOT *whole wheat flour* if

...enriched, bleached, all-purpose, cake, pastry, self-rising

NOT *whole-grain* if ...de-germinated, bran, germ or pearly

## Any recipe:

→ Fluff flour, spoon, level OR weigh

→ Substitute enriched wheat flour with 1 T, up to ½ (50%) whole wheat flour

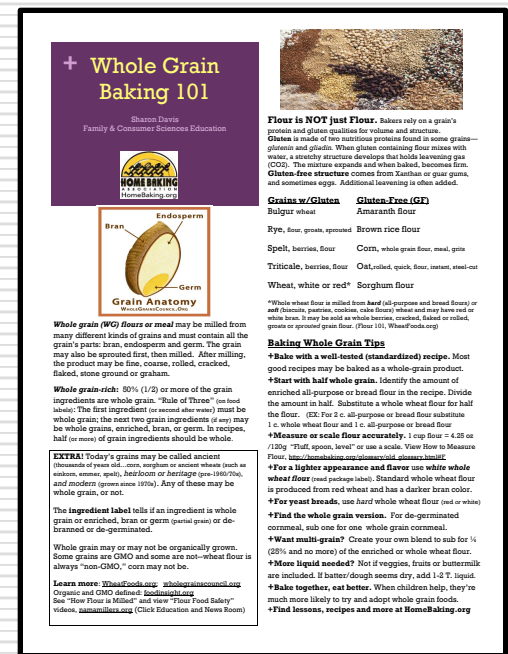
Download Guide at HomeBaking.org

+++++

“Whole grain” =

8 g whole grain (or more) per serving

Include *total* whole meal and flour weights



**+ Whole Grain Baking 101**  
Sharon Davis  
Family & Consumer Sciences Education

**Flour is NOT just Flour.** Bakers rely on a grain's protein and glucose qualities for volume and structure. **Gluten** is made of two nutritious proteins found in some grains—glutenin and gliadin. When gluten containing flour mixes with water, a stretchy structure develops that holds leavening gas (CO<sub>2</sub>). The mixture expands and when baked, becomes firm. **Gluten-free** structure comes from Xanthan or guar gums, and sometimes eggs. Additional leavening is often added.

Grains w/ Gluten	Gluten-Free (GF)
Bulgur wheat	Amaranth flour
Rye, flour, groats, spiro	Brown rice flour
Spelt, berries, flour	Corn, whole grain flour, meal, grits
Triticale, berries, flour	Oat-flaked, quick flour, instant, steel-cut
Wheat, white or red*	Sorghum flour

**Grain Anatomy**  
Bran Endosperm Germ

**Whole grain (WG) flours or meal** may be milled from many different kinds of grains and must contain all the grain's parts: bran, endosperm and germ. The grain may also be approved first, then milled. After milling, the product may be fine, coarse, rolled, cracked, flaked, stone ground or graham.

**Whole grain-rich:** 80% (1/2) or more of the grain ingredients are whole grain. **\*Rule of Three\*** (on food labels): The first ingredient (or second after water) must be whole grain; the next two grain ingredients (if any) may be whole grains, enriched, bran, or germ. In recipes, half (or more) of grain ingredients should be whole.

**EXTRA!** Today's grains may be called ancient (thousands of years old...corn, sorghum or amaranth wheat (such as emmer, einkorn, spelt, hard-soft or heritage) pre-1800/90s, and modern (grown since 1970s). Any of these may be whole grain, or not.

The ingredient label tells if an ingredient is whole grain or enriched, bran or germ (partial germ or de-germinated or de-germinated).

Whole grain may or may not be organically grown. Some grains are GMO and some are non-wheat flour is always "non-GMO," corn may not be.

Learn more: [WhatFoods.org](http://WhatFoods.org) [wholegrainassessment.org](http://wholegrainassessment.org)  
Organic and GMO defined: [FoodMatters.com](http://FoodMatters.com)  
See "How Tox is Milled" and Watch "Flour Food Safety" videos: [pamamiller.org](http://pamamiller.org) (Click Education and News Room)

**Baking Whole Grain Tips**

- **Bake with a well-tested (standardized) recipe.** Most good recipes may be baked as a whole-grain product.
- **Start with half whole grain.** Identify the amount of enriched all-purpose or bread flour in the recipe. Divide the amount in half. Substitute a whole wheat flour for half the flour. (GF: For 2-cup all-purpose or bread flour substitute 1-cup whole wheat flour and 1-cup all-purpose or bread flour.)
- **Measure or scale flour accurately.** 1 cup flour = 4.25 oz (130g) "fluff, spoon, level" or use a scale. **View How to Measure Flour** [www.homebaking.org](http://www.homebaking.org)
- **For a lighter appearance and flavor use white whole wheat flour (and perhaps less).** Standard whole wheat flour is produced from red wheat and has a darker bran color.
- **For yeast breads, use hard whole wheat flour (red or white)**
- **Find the whole grain version.** For de-germinated cornmeal, sub one for one whole grain cornmeal.
- **Want multi-grain?** Create your own blend to sub for 1/4 (25% and no more) of the enriched or whole wheat flour.
- **More liquid needed?** Not if veggies, fruit or buttermilk are included. If batter/dough seems dry, add 1-2 T. liquid.
- **Bake together, eat better.** When children help, they're much more likely to try and adopt whole grain foods.
- **Find lessons, recipes and more at HomeBaking.org**

Download,  
[www.HomeBaking.org](http://www.HomeBaking.org)



# English Muffin Batter Bread

**10 oz FLOUR (vary flour type to compare how flour functions)**

**1¼ teaspoons yeast**

**1 Tablespoon sugar**

**1 teaspoon salt**

**¼ teaspoon baking soda**

**1 cup whole milk -- (8 ounces)**

**¼ cup water -- (2 ounces)**

**1 Tablespoon vegetable oil**

**Shortening to grease the pan**

**1 Tablespoon Semolina flour or cornmeal -- to coat the bread pan**

1. Heat the milk in the microwave approximately 20 seconds or until 70-80 degrees.  
CHECK milk WITH A THERMOMETER!! (BEST TO SCALD AND COOL IF TIME ALLOWS)
2. Prepare the pan with shortening and sprinkling with about 1 tablespoon of semolina flour.
3. In the large mixing bowl whisk the flour, yeast, sugar, salt, and baking soda.  
TAKE OUT THE WHISK AND DO NOT USE AGAIN!
4. Add the oil and water with the milk.
5. Stir the liquids into the dry ingredients with a wooden spoon.
6. Beat the batter for 5 more minutes with a wooden spoon. TAKE TURNS STIRRING.
7. Spoon the batter into the prepared pan.

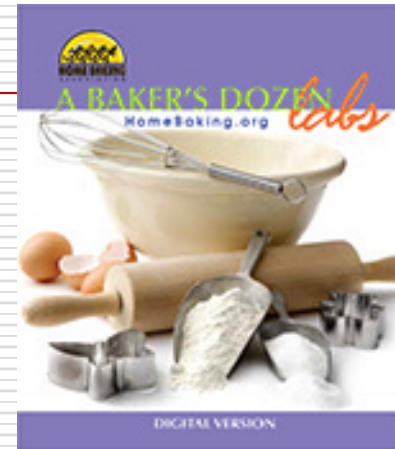
Label the side with masking tape with kitchen number, hour, and type of flour used. Put in the refrigerator overnight.

Day 2 Preheat the oven to 400 degrees. Bake for 20 TO 25 minutes. \*\*

**\*\*YOU MUST USE AN INSTANT READ THERMOMETER AND TAKE THE INTERNAL TEMPERATURE. INSERT THE THERMOMETER NEAR THE END AND THE TEMPERATURE SHOULD BE 185 TO 190 DEG**

Cool the loaf of bread for 5 to 10 minutes and slice and compare textures.

Lab 3: Flour, Cornmeal





# English Muffin Batter Breads

(Use to support Flour is Not Just Flour)

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# Conduct Substitution Science

Apply Test Kitchen and R&D Baking Science, Consumer Sensory Tests



### Egg Substitutes: Do they really work?

**Question:** What are some possible egg substitutes if you wish to market an egg-free baked good?

**In this lab students will:**

1. Bake Banana Cupcake control recipe and four egg substitute variables.
2. Compare control and variable products.
3. Measure or score products for flavor, volume, texture, tenderness, color.

**Supply List:** Each recipe/lab group will need:

- Small and medium mixing bowls
- Hand-held electric mixer
- Ruler
- Wire whisk
- Large metal spoon
- Rubber spatula
- Ice cream or food scoop
- Dry and liquid measuring cups or scales
- Measuring spoons
- Six-cup medium muffin tin
- Paper baking cups

**Banana Cupcakes**

Yield: 6 medium (2.2 oz/62g) cupcakes    Preparation time: 10 minutes    Baking time: 20-22 minutes

Ingredients	Measurement	Weight
Shortening	¼ cup	1.7 oz/48g
Sugar	1/3 cup	2.3 oz/66g
Egg	1 large	1.75 oz/50g
Vanilla extract	½ teaspoon	4.5g
All-purpose flour	¾ cup	3.2 oz/90g
Baking powder	¼ teaspoon	2.5g
Baking soda	¼ teaspoon	1.15g
Salt	¼ teaspoon	1.5g
Mashed ripe banana	½ cup	4 oz/115g

**Directions**

1. Preheat oven to 350° F. Line muffin tin with paper cup liners or lightly coat with cooking spray.
2. In a large mixing bowl, cream shortening and sugar using an electric mixer. Cream until light and fluffy. Add egg (or egg substitute) and vanilla, mixing well until fluffy.
3. In a small bowl, whisk to blend the flour, baking powder, baking soda and salt.
4. Add the blended dry ingredients and the banana to the creamed mixture, mixing just until combined.
5. Fill lined or greased muffin cups 2/3 full of batter, using an ice cream or food scoop to portion into the cups. Be sure to scrape the bowl clean of batter.
6. Bake 20 to 22 minutes, until golden brown.
7. Cool slightly on wire rack; remove cupcakes from muffin tin and place on cooling rack to finish cooling.
8. Evaluate results!

**Source:** Kids A Cookin'. A Kansas State Research & Extension Food and Nutrition Program, kidsacookin.org

### KITCHEN SCIENCE: Baking for Special Needs

Prepared by Sharon Davis, Family & Consumer Sciences Education, www.homebaking.org

Experience "test-kitchen" science in classrooms or out-of-school programs! Use griddles, waffle irons, ovens or skillet!

- Do-it-Yourself (DIY) baking is part of an "active lifestyle," burning 125+ calories per half hour of shopping, mix-in place prep, mixing and clean up!
- DIY! baking meets the needs of a variety of "customers."
- Choose ingredient adaptations and use with almost any favorite recipe to meet a special need—reduced sodium, adding whole grains, fruits or veggies, nuts, potassium, ingredient allergies. (See example recipe, p.2.)

**1) View or print control recipe, Orange Raisin Nut Bread** [www.kidsacookin.org/recipe/orange-raisin-nut-bread](http://www.kidsacookin.org/recipe/orange-raisin-nut-bread)  
Bake this prize-winning recipe as the control product. Note: Flavors and moisture will improve if bread muffins are sampled five days after baking the bread.

**2) Assign each baking scientist or team one substitution (variable) to test for customer acceptability.** Label each product with a number and variable being tested. Insert a paper strip with the variable number written on it. Place paper Substitution Variable options

- Reduce sodium. Help achieve the recommended 2300mg sodium per day.
  - Use small portion for salted butter
  - Add 1 teaspoon flaxseed dry spice or 1 tablespoon orange-raisin mix when reducing salt
  - For 1 cup butter/milk, use 1 cup yogurt OR milk!

**Flour Variables**

- Bake 1 whole grain
- Switch half to ½ of the flour in the recipe

### Local Connections: Get to Know a Baker

Invite a professional baker, local home baker (adult or teen), home or professional baker, event home baker (adult or teen), catering baker, experienced baker without formal service baker, or baking teacher to come to the class.

1. Have students prepare questions to ask their baker ahead of time.
2. Encourage the guest baker to demonstrate at least one specialty skill—baking, decorating, spritzing, hand-rolled pastry, local cultural specialty.
3. Ask the baker how they got started baking and 5 things students can do to improve their baking skills in the kitchen, and managing their time.
4. Have the baker highlight the food safety, handling and other regulations they follow, and new baking trends they are following.
5. If possible, have the baker who came to discuss how they developed and kept a new product.
6. If no local baker is available—Go online. Computer Lab.
  - Call: 800-255-5863
  - Call: 781-388-2000
  - Call: 800-255-5863
  - Visit the Test Kitchen professionals at [kidsacookin.org](http://kidsacookin.org)
  - Visit the Flour Baker's Institute - [myflourbaker.com](http://myflourbaker.com)
  - National Festival of Breads - [nationalfestivalofbread.com](http://nationalfestivalofbread.com)

**How to Use Evaluation Form:**

- 1) Tally each category—taste, color, aroma, appearance.
- 2) Calculate the percentages making each category.
- 3) Example: If out of 15 surveyed thought it was good—33%.
- 4) Each named category must have a 50% comparison position approved before the product will sell.

**A MATTER OF TASTE Lab Evaluation Form**

Product Name Tasted: \_\_\_\_\_ Lab group: \_\_\_\_\_ Date: \_\_\_\_\_

I think the food product tastes \_\_\_\_\_ very good \_\_\_\_\_ good \_\_\_\_\_ okay \_\_\_\_\_ improvements needed

The food tastes \_\_\_\_\_ heavy \_\_\_\_\_ sweet \_\_\_\_\_ bitter \_\_\_\_\_ salty \_\_\_\_\_ sour \_\_\_\_\_ not what I expected

The color is \_\_\_\_\_ great \_\_\_\_\_ too pale \_\_\_\_\_ too dark \_\_\_\_\_ not right for the product

The aroma (smell) is \_\_\_\_\_ inviting \_\_\_\_\_ not strong \_\_\_\_\_ too weak \_\_\_\_\_ not inviting

The food looks \_\_\_\_\_ yummy \_\_\_\_\_ okay \_\_\_\_\_ improvement needed

The portion size is \_\_\_\_\_ just right \_\_\_\_\_ too small \_\_\_\_\_ larger than needed

I would enjoy eating this food again: \_\_\_\_\_ yes \_\_\_\_\_ no \_\_\_\_\_ maybe

Comments: \_\_\_\_\_

\_\_\_\_\_ A BAKER'S DOZEN LAB - Your Baker \_\_\_\_\_

**EGCS Lab eight**

HomeBaking.org

DIGITAL VERSION

### 5 Great Baking Tips

1. Preheat your oven.
2. Measure ingredients correctly.
3. Use the correct measuring tools.
4. Don't overmix.
5. Bake in the center of the oven.

HomeBaking.org

[https://www.homebaking.org/wp-content/uploads/2019/07/final\\_kitchenscience-1.pdf](https://www.homebaking.org/wp-content/uploads/2019/07/final_kitchenscience-1.pdf)

[https://www.homebaking.org/wp-content/uploads/2019/07/power\\_of\\_eggsfinal.pdf](https://www.homebaking.org/wp-content/uploads/2019/07/power_of_eggsfinal.pdf)



# Apply baking food safety practices

*Decline in good practices linked to Social media..internet authorities...food network Chefs...*

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**Lead Researcher Nancy L. Cohen PhD, RD. LD, LDN**

University of Massachusetts, Amherst study

73% of consumers gain food safety info from media

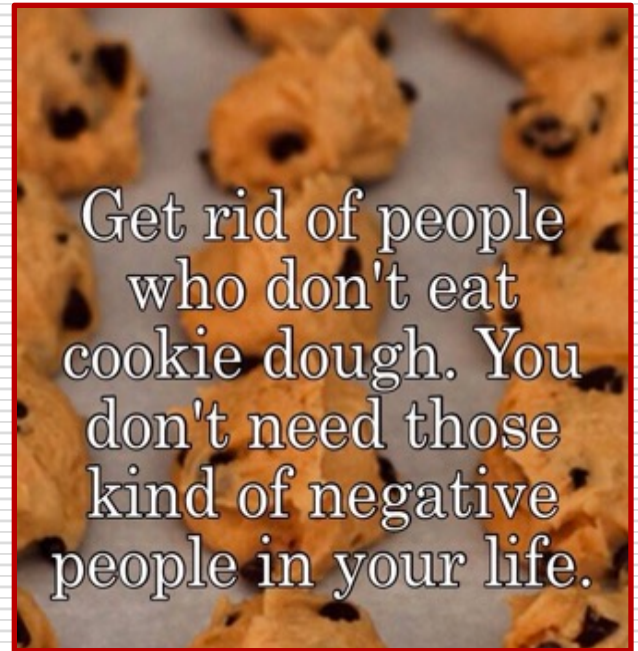
- 33% distrust government sources
- 50% trust media sources

Survey adapted from Massachusetts Food Establishment Inspection guidelines

- 39 episodes, ten popular US cooking shows
- 70% “majority of practices rated were out-of-compliance w/ regulations
- 93% failed to cook to time/temp

*Compliance with Recommended Food Safety Practices in Television Cooking Shows. JOURNAL OF NUTRITION EDUCATION & BEHAVIOR. Nov/Dec 2016*

*Published by Elsevier. Cohen@nutrition.umass.edu*



# Consumer education will be a long-term effort

**Interim solution:**  
Industry collaboration for  
improved safety language



## **SAFE HANDLING INSTRUCTIONS:**

Raw flour is not ready-to-eat and must be thoroughly cooked before eating to prevent illness from bacteria in the flour. Do not eat or play with raw dough; wash hands, utensils, and surfaces after handling.

North American Millers' Association (NAMA) Voluntary Food Safety Statement



The #1 U.S. retail brand has added statements to the top and side of its flour bags.



# Use Baking Consumer Sciences *critical thinking skills*

Ask WHY... Does this or doesn't this work?



**Cooking Light** Magazine, Sara Tane—July 29, 2016

□ <http://www.cookinglight.com/eating-smart/smart-choices/safe-to-eat-cookie-dough>

## ***How you can safely eat raw dough...millions of hits...***

*"Frequent flour recalls are starting to make everyone's favorite part of cookie making (licking the bowl clean) seem life-threatening.*

*However if you take the time to toast your flour before Using it in your recipe you not only kill any lingering Bacteria, like E.coli, also adds delicious nutty flavor from toasting process."*

Sara even provided pictorial step-by-step how-to, plus finished cookies to prove baking properties unchanged BUT...

(Sharon's note: There are too many variables- pan size, oven temp. Final "kill step" temperature not achieved)

**2 cups flour**  
**Cookie sheet**  
**350° F.**  
**5 minutes**



# Engage Baking Food Safety Ready Resources

[www.HomeBaking.org/baking-food-safety/](http://www.HomeBaking.org/baking-food-safety/)

**BAKING FOOD SAFETY guide**  
HomeBaking.org

## 6 Simple Baking Food Safety Steps

- 1 Store raw flour, baking mixes, dough and eggs separately from ready-to-eat foods.
- 2 Before baking, tie back long hair, clean counters, assemble ingredients and equipment, wash hands, and apron-up.
- 3 Keep separate the measuring, mixing and handling of unbaked batter or dough from cooling, serving and packaging of baked products.
- 4 Clean tools, work surfaces and equipment with hot, soapy water or disinfectant.
- 5 Test baked products with wooden toothpick or cake tester and thermometer at center to ensure products are completely baked.
- 6 Wash hands before you taste, serve or package baked goods.

**BAKER'S BOTTOM LINE FOR FOOD SAFETY:** Dough is not ready-to-eat. Flour, as well as eggs, baked before eating to prevent illness from bacteria, utensils, and surfaces after mixing and handling.

HomeBaking.org

**BAKING FOOD SAFETY guide**  
HomeBaking.org

## BAKED GOODS TEMPERATURES guide

Maximize quality and confirm products are fully baked. Take an internal temperature at the center of the product when oven timer indicates it may be done. These temperatures confirm your product is fully baked.

- 150°F – Cheesecakes (remove from oven at 150°F to avoid cracking; temperature should rise to 160°F as it cools to ensure bacteria are killed)
- 160°F – Quiche, meringue pies, bread pudding, chocolate custard, flan, molten chocolate cakes
- 165°F – Stuffing and casseroles, leftovers, chocolate cream pie, meat- or poultry-filled breads like empanadas, pot pies, pasties, calzons, or bierocks
- 170-175°F – Custard and fruit pies, flan, crème brûlée
- 180-210°F – Yeast breads (roll rolls 180°F, crusty bread 210°F)
- 200-209°F – Most cakes, cupcakes, quick breads, scones, biscuits, pecan pie

After baking: Cool product on wire rack. Wash hands before handling products. Refrigerate egg-rich, cream- or meat-filled baked goods within two hours of baking. Yeast breads are best stored at room temperature or frozen if not eaten in one day.

HomeBaking.org

## 6 Simple Baking Food Safety Steps

Find a complete Baking Food Safety Checklist on the back.

- 1 STORE raw flour, baking mixes, dough and eggs separately from ready-to-eat foods.
- 2 BEFORE BAKING, tie back long hair, clean counters, assemble ingredients and equipment, wash hands, and apron-up.
- 3 KEEP SEPARATE the measuring, mixing and handling of unbaked batter or dough from cooling, serving and packaging of baked products.
- 4 TEST baked products with wooden toothpick or cake tester and food thermometer at center to ensure products are completely baked.
- 5 CLEAN tools, work surfaces and equipment with hot, soapy water or in dishwasher.
- 6 WASH HANDS before you taste, serve or package baked goods.

## Baked Goods Internal Doneness Temperatures

Maximize quality and confirm products are fully baked by reaching these at-center temperatures:

150°F	160°F	165°F	170°-175°F	180°-210°F	200°-209°F
Cheesecakes (Remove from oven at 150°F to avoid cracking; temperature should rise to 160°F as it cools)	Quiche Meringue pies Bread pudding Baked custard Clafouti Molten chocolate cakes	Stuffing & casseroles Leftovers Chocolate cream pie Meat-, cheese- or poultry-filled breads (Empanadas, pot pies, pasties, calzons, bierocks)	Custard pies Fruit pies Flan Crème brûlée	Yeast breads (Soft rolls 180°F Crusty bread 210°F)	Most cakes (Round cake 210°F) Cupcakes Quick breads Scones Biscuits Pecan pie

**DING!** When oven timer indicates product is done, take an internal temperature at the center of the product.

Cool product on wire rack. Wash hands before handling products. Refrigerate cream- or meat-filled baked goods within two hours of baking. Yeast breads

### DID YOU KNOW FLOUR IS A RAW INGREDIENT? IT'S TRUE.

**WHEAT COMES FROM THE FARM, IS MINIMALLY PROCESSED, THEN PACKAGED FOR USE**

### SO YOU SHOULD NEVER EAT RAW FLOUR!

**HEALTH & SAFETY TIPS:**  
**DON'T EAT RAW DOUGH OR BATTER**

**WASH HANDS, BAKING TOOLS AND SURFACES WITH SOAP AND HOT WATER**

**AND**  
**ONLY EAT FOOD THAT CONTAINS FLOUR WHEN IT IS FULLY COOKED**

Learn more at [www.cannex.com/FlourSafety](http://www.cannex.com/FlourSafety)

HomeBaking.org

## Baking Food Safety Lesson

Prepared by Shaon Davis, Family & Consumer Sciences Educator, HomeBaking.org

### Computer Lab One-Pager Assignment

1. Go to [FightBac.org](http://FightBac.org)
2. Draw and write a Food Safety Plan one-page that includes: title, who, what, where and how you'll apply three food safety goals at school or a favorite activity. Use 3 images. 10-15 words. 3. Share w/ class or group. \*\*\*\*\*

### Baking Food Storage Guide to zoning ingredients, batter, dough, and baked goods.

[www.HomeBaking.org/baking-food-storage](http://www.HomeBaking.org/baking-food-storage)

### Home Baking Association

How to bake glossary, guides [www.HomeBaking.org](http://www.HomeBaking.org)

### International Food Information Council

Consumer advocacy. Learn more about baking ingredients. [www.foodinsight.org](http://www.foodinsight.org)

### North American Millers Association

Visit [www.NAMM.org](http://www.NAMM.org) (Kids Zone) and [DidYouKnowVideo.com](http://DidYouKnowVideo.com)

### Partnership for Food Safety Education

Learn what food-borne illness is, how it happens, and how to prevent it. [www.foodsafetyed.org](http://www.foodsafetyed.org)

### Recalls, Market Withdrawals, & Safety Alerts

Visit the website food recall resource <http://www.fda.gov/oc/ohrt/>

### Did You Know? Flour Food Safety

North American Millers Association

**DO NOT EAT RAW FLOUR OR BATTER**

**SO YOU SHOULD NEVER EAT RAW FLOUR!**

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Lesson Supply Checklist:

- o Sink, aprons, hair ties
- o Microwave oven(s)
- o Microwaveable mix(es) - 1 recipe per team
- o Mug Muffin ingredients - 1 recipe per team
- o Food thermometers
- o Toothpicks
- o Fork for stirring
- o Spoon(s) for sampling
- o Napkins
- o Copy Baking Food Safety Checklist, one per person, pencil or pen

**EXTRA: No microwave? Prepare ingredient kits for Microwave Chocolate Cake. In-Mug to take and bake at home. Identify safety steps together and take a internal temperature. Is it "fully cooked?" Recipe: [cannex.org](http://cannex.org)**

### Leader Objectives: Guide participants to

1. Define raw ingredients and why fully baking is essential.
2. Assess personal baking food safety practices (Checklist)
3. Locate reliable consumer food safety resources.
4. Insert food safety directions to recipe they prepare
5. Use internal food temperatures and visual cues to assure products are fully cooked/baked (minimum 160° F.)
6. Cool, handle and package or serve baked goods separately from raw flour, eggs, batter or dough.

### Lesson Steps:

**Step 1. View Did You Know flour food safety video.**  
[www.namm.org/learn-more-about-flour-food-safety-video](http://www.namm.org/learn-more-about-flour-food-safety-video)

**Critical Thinking Q:** Grain is cleaned in the field by combines as it is harvested. Millers clean and temper grain at the flour mill. What's the difference between being "raw and clean" and "fully baked or cooked?" (o: Grain and flour are clean, but still raw and can carry harmful bacteria. Temperatures that kill bacteria (165°F minimum) aren't reached until ingredients are fully baked or cooked.)

**Step 2. Read the Blueberry Mug Muffin recipe.**  
**Critical Thinking Q:** State food safety steps needed in the recipe's steps. (o: 1) wash hands, counters, and again in step 3) before handling baked items. 2) don't lick bowl; scrape and wash bowl; return eggs to refrigerator and flour to cupboard. 3) test muffin at center for doneness. Use Temperature Chart internal baking temperatures)

### Blueberry Mug Muffin

Adapted from origin recipe at [appetites.com/recipe/](http://appetites.com/recipe/)

**Ingredients –**

- o 2 tablespoons unsalted butter
- o 1/4 cup all-purpose flour (may be half whole wheat flour)
- o 1/4 cup brown sugar
- o 1/4 teaspoon each baking powder and ground cinnamon
- o 1/4 teaspoon ground nutmeg
- o 1 large egg, yolk only
- o 1 tablespoon milk
- o 1 tablespoon oil
- o 1 tablespoon blueberries (fresh, frozen or dried)

**Directions:**

- 1) In small bowl or cup, use fork to blend dry ingredients. Mince butter into large (1/2 oz. or larger) coffee mug. Microwave butter in melted, about 30 seconds. Add blended dry ingredients, milk and vanilla. Stir to blend with fork. Add blueberries, stirring until distributed.
- 2) Microwave 60-90 seconds or until muffin pulls away from sides and top is dry. Take temperatures at center – 160° F. minimum. (Temperature rises 5° to 10° F. as muffin finishes.) Do not over cook. Cool slightly before enjoying.
- 3) Optional: Drizzle with 2 tablespoons powdered sugar mixed with 1/4 teaspoon lemon juice or water. Serve's 1 to 2. Nutrition: One recipe provides 570 calories, along fat, 245 mg cholesterol, 280 mg sodium, 71g carbohydrates, 2g dietary fiber, 71g protein

**Step 3. Teams prepare Blueberry Mug Muffin recipe.**  
**Critical Thinking:** Use Temperature Chart and food thermometer to test muffin at center and Checklist to assess Baking Food Safety skills.

Visit our center for optimum product completion and Checklist to assess Baking Food Safety skills.

**Family & Consumer Sciences Competencies, 2016, 3.0 (Access complete resource: [www.nabec.org](http://www.nabec.org))**  
Consumer and Family Resources, 2.1-3.0 (Access complete resource: [www.nabec.org](http://www.nabec.org))  
Individuals and Families, 1.1-3.0 (Access complete resource: [www.nabec.org](http://www.nabec.org))  
Food Production and Services, 4.1-4.2 (Investigate health, wellness, and safety issues of individual and families. Food Production and Services, 4.2 -Characterize food safety and sanitation procedures. Nutrition and Wellness, 14.4-4.5-Evaluate factors that affect food safety from production to consumption.)

## Baking Food Safety Checklist

### Before You Begin

- Tie back or cover long hair and beards; remove jewelry.
- Wash hands with warm water and soap.
- Change dish cloth or sanitize sponges daily.
- Wash baking surfaces and appliances with warm, soapy water.
- Put on a clean or disposable apron.
- Read the recipe and assemble ingredients and tools.
- Rinse wash hands before beginning to measure and mix.
- Be sure you have clean hot pads or handles baked food.

### Measure, Mix & Portion

- Follow storage and use rules for fresh eggs, egg substitutes and all perishable baking ingredients.
- Shell eggs in separate small bowl to avoid eggshell in mixing bowl.
- Keep bowls and utensils being used for eggs, raw batter or dough separate from cooling rack or finished products.
- Chop and dice nuts, fruits or veggies for baking on cutting board reserved for ready-to-eat foods; store cutting board's separate from raw ingredients such as flour, meat and eggs.
- Portion batter or dough onto baking sheets or into pans in an area away from already baked and cooling products.
- Sprinkle into fresh small amounts of batter from mixing tools or flour or meat left from breaded, breaded or shaping products.
- Wash baking surfaces and tools in dishwasher or with hot, soapy water.

### Bake, Test Temperature & Cool

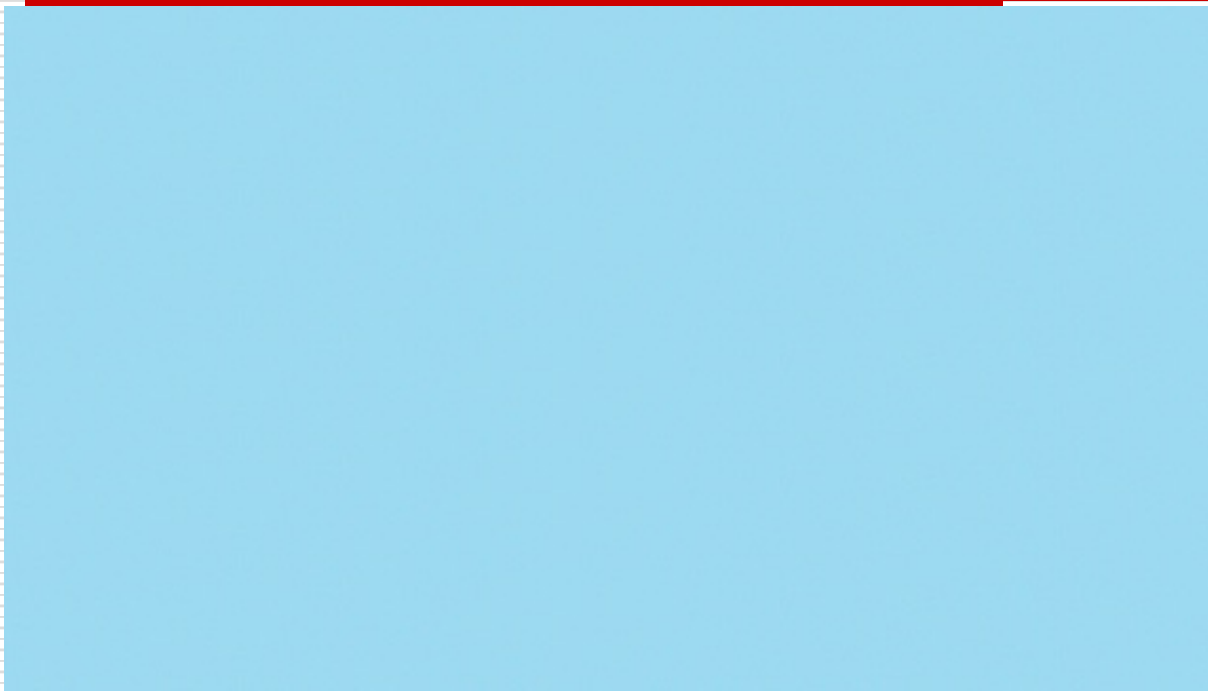
- Unbaked flour, eggs, batter or dough can cause food-borne illness if eaten.
- Food safety experts agree that foods are properly cooked or baked when they are heated for a long enough time and to a high enough temperature to kill harmful bacteria.
- Follow these steps to fully bake foods before eating:
  - EGG wash glazes:** Prepare egg wash and re-prepare; apply the wash before product is placed in the heated oven. Discard any unused egg wash.
  - Check to be sure product is done at center; brown color doesn't mean product is done.
  - Use a tooth pick or cake wire to test product to see if there is raw batter at the center of pancakes, muffins, quick breads or cakes. Pick should come out with a few crumbs clinging to it, not wet batter.
  - Use a food thermometer placed at center of products, and wait until desired temperature is maintained (See Baked Goods Internal Temperature Guide on reverse).
- HOT TIP:** If baked goods is browned but not done yet, lightly flip top over crust to prevent over-browning and continue baking until center reaches internal temperature desired.
- Use clean oven mitts to handle pans. Wash mitts regularly.
- Cool products in an area away from where flour is measured and batter or dough are prepared.
- Cool baked goods on wire cooling racks, not counter-top.

### Related Resources

- HomeBaking.org
- How to Wash Pottery
- Ingredient and Baked Goods Storage Guide
- KidsaCookin.org
- Tips & Techniques, Food Safety, in Spanish and English
- FightBac.org
- Partnership for Food Safety Education
- Michigan State Extension
- Sanitizing Kitchen Sponges

HomeBaking.org

# Did You Know Flour Food Safety



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Endorsed By:

Watch the video at [www.namamillers.org/floursafety](http://www.namamillers.org/floursafety)

**Wheat, Corn, Oat and Milling Science:** View how wheat goes from Field to Table  
[https://www.youtube.com/watch?v=Kn-D\\_BiuOvU](https://www.youtube.com/watch?v=Kn-D_BiuOvU)

How wheat is milled into flour, [namamillers.org](http://namamillers.org) , Education, Kids Zone  
NEW Baking Food Safety video Did you Know, Canadian Millers or NAMA

[http://www.namamillers.org/wp-content/uploads/2017/08/RHflourSafety\\_ENG\\_CNMA-NAMA2.mp4](http://www.namamillers.org/wp-content/uploads/2017/08/RHflourSafety_ENG_CNMA-NAMA2.mp4)



# What needs to change in the picture?



Critical Thinking:  
Have students write in the  
baking food safety steps in  
their next  
recipe/formulas  
used in lab...

Example:

[Hot Chocolate Cookies](#)

Fight Bac! Food Safety Style Guide

A: Baked muffins should not be  
Cooling near raw flour or eggs.



# FAT

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- Adds flavor
- Tenderizes, flakiness\*
- Delays staling
- Large amounts interfere with formation of gluten



More at: [landolakes.com](http://landolakes.com) and [crisco.com](http://crisco.com)  
<http://webexhibits.org/butter>

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# FAT



- Types: Butter, margarine, shortening, lard, oil, coconut oil
- Butter, margarine = 80% fat  
Shortening, oil, lard = 100% fat
- \*Cutting in coats flour, makes batter “short” or tender\*
- \*Creaming traps air for leavening  
(Note: oil will not shorten, cream)
- Increases keeping quality
- Keeps the product from sticking

**\*Temperature matters:**  
Keep fat COLD for scones,  
biscuits, pastries  
Melting points:  
Lard, 85°F  
Butter, 90°F  
Shortening, 112°F

**Reducing fat** in baking is tricky—it may add liquid, sugars

- Applesauce for oil, fat – begin with only ¼ substitution
- Use specific recipes for reduced fat margarines as they vary in liquid content – Go to: [www.countrycrock.com](http://www.countrycrock.com)
- HBA’s new Smart Snack *A Bakers Dozen* recipes, HomeBaking.org

# SUGARS

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- Provide a sweet flavor,
- helps tenderize the product
- carmelizes, providing color and texture

- May be

*granulated*, powdered, brown, raw

**or** new blend of sugar and stevia

*fluid*—agave nectar, honey, molasses, corn syrup, maple syrup

- More at [sugar.org](http://sugar.org), [karosyrup.com](http://karosyrup.com), [honey.org](http://honey.org), [chsugar.com](http://chsugar.com) and [dominosugar.com](http://dominosugar.com)



# SUGAR

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- Food for yeast
- Adds flavor
- Helps brown crust
- Too much delays yeast action and softens gluten. Ex: Sweet roll dough may need more yeast due to high amounts of sugar slows fermentation—greater than  $\frac{1}{2}$  c. sugar/4 c. flour
- Agave nectar, honey, molasses, sorghum may be substituted for 50-100% of sugar--adjust liquids
- Stevia/sugar blends usually sub for  $\frac{1}{2}$  the sugar

Note: Honey is 20% water and 1  $\frac{1}{2}$  X sweeter than sugar.

Videos and More at [www.sugar.org](http://www.sugar.org)

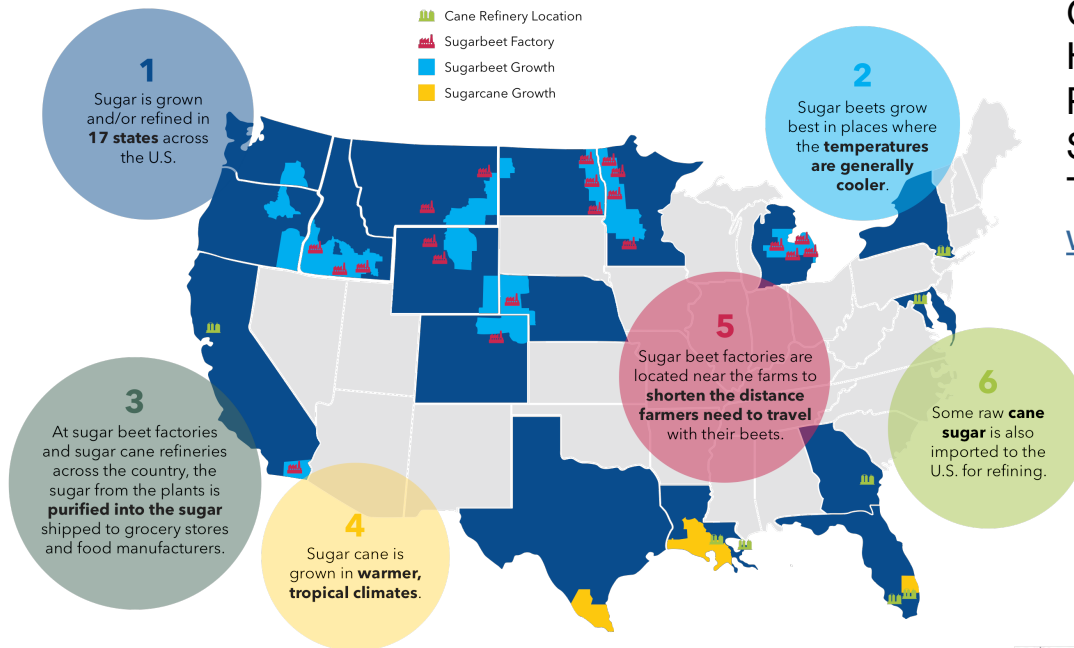
*Test kitchens: [chsugar.com](http://chsugar.com), [dominosugar.com](http://dominosugar.com), [karosyrup.com](http://karosyrup.com)*



# Is Sugar Natural??

## Where Does Sugar Come From?

6 QUICK FACTS



**1**  
Sugar is grown and/or refined in **17 states** across the U.S.

**2**  
Sugar beets grow best in places where the **temperatures are generally cooler.**

**3**  
At sugar beet factories and sugar cane refineries across the country, the sugar from the plants is **purified into the sugar** shipped to grocery stores and food manufacturers.

**4**  
Sugar cane is grown in **warmer, tropical climates.**

**5**  
Sugar beet factories are located near the farms to **shorten the distance farmers need to travel** with their beets.

**6**  
Some raw **cane sugar** is also imported to the U.S. for refining.

Get Facts vs Myths  
How Well Do You Know Sugar  
Photosynthesis videos + more  
Sugar 101  
Types of Sugar  
[www.Sugar.org](http://www.Sugar.org)

the **sugar** association





# NEW! Sugar STEAM Kit From the Field to the Table

There is much more to sugar than you might think! Learn sugar's history, how it is naturally made by plants, its impact on the environment, why it is added to foods and more in this new STEAM packet for grades 7-12.

**STEAM = Science, Technology, Engineering, Art, Math**

FREE K-12 downloadable\* resources  
<https://www.sugar.org/resources/educators/>

\*Educational resources may also be ordered at no cost on our web-site, [www.sugar.org](http://www.sugar.org)



THE POWER OF EGGS



Image Source: [www.eggs.com](http://www.eggs.com)

Delaine A. Stendahl  
Whitehall Memorial Schools  
Whitehall, WI

Educator Award lesson,  
Download, LEARN,  
HomeBaking.org

# EGGS

- Add color and flavor
- Improve food value
- Form fine crumb and tender crust
- When beaten; adds volume, leavening
- May need to be at room temperature—68-72° F.
- In quick breads or cookies: 1 T. flaxmeal + 3 T. water = 1 large egg OR ¼ c. soft tofu

More at: American Egg Board [www.aeb.org](http://www.aeb.org)

Flax meal is found in the grocer's flour or cereal aisle.



# LIQUIDS

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Liquid dissolves the ingredients and forms a mixture. Liquids may be:

- Water
- Milk
- Buttermilk
- Juice
- Mashed Fruit
- Grated/shredded veggies



## Notes:

Butter and margarine are 20% liquid (80% fat)

Shortening and oil have no liquid (100% fat)

Spreads (*tub or stick*) will add more liquid—they may be almost half liquid so will alter your results if used 1 for 1 with butter, margarine, shortening or oil.

Gluten develops when liquid is mixed with flour. The protein in the flour forms gluten. Lower protein flour, more fat, less handling, less liquids are important for tender pastry, scones, biscuits.

# LIQUIDS

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- Combines with protein in flour to form gluten
- Milk improves food value and delays staling.  
Milk should be scalded and skimmed to stop enzymatic action—improves volume of yeast products



Lab 9 and  
Baking Science  
Experiments re  
Scalding, Liquids

# Fruits, Veggies Add Liquid, Sugar in Baking

## Most fruits, veggies are 80-92% water

1 cup shredded apple, carrot, mandarin oranges, zucchini; cooked pumpkin, sweet potato, squash; beets; mashed or pureed bananas, strawberries...

~ ¾ to 7/8 cup water

1 cup water = 1 cup shredded carrots + ¼ cup water

## Whole grain baking

2 c. whole grain flour, add ¼ c - ½ c any above

## If the fruit/veggie is acidic:

↓ 1 Tablespoon baking powder to  
1½ - 2 tsps baking powder + ½ tsp baking soda



A Bakers Dozen Smart Snack Recipes, Carrot Cupcakes

[www.HomeBaking.org](http://www.HomeBaking.org)

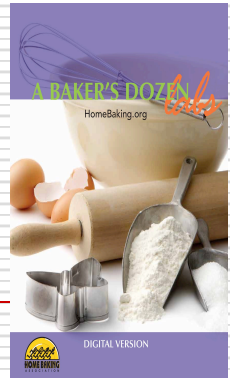


Child Nutrition & Wellness, Kansas State Department of Education  
in collaboration with the non-profit Home Baking Association

New Summer 2016



# Build Home to Career Connections



- Nearly 50% of KSU Baking Science students began baking at home or through 4-H, FCS
- Home bakers: saves \$\$\$, improve nutrition, meals
- Community service bakers share learning, support others
- Baking professionals: test kitchens; baker in retail, food service, restaurants, child care, wholesale bakeries; milling product development R&D
- And YES, FCS bakers teach, research, develop businesses



## ***Bake to Build FCS STEAM***

### **A Baker's Dozen Labs**

*Oatmeal Raisin Cookies, Baking Science Lab*

Presented by

**Lisa Pluff**, FCS Teacher

Manhattan High School, KS

with

**Sharon Davis**, FCS Education

Director, HBA Program Development



# SALT

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- Adds flavor; salt essential to health
- BUT, need to balance Na (sodium)  
K (potassium), Mg (magnesium)

(Another reason *why fruits, veggies, whole grains matter*)

- Controls yeast action and strengthens gluten
- Too little makes texture  
dense and heavy;  
flavor will be flat or yeasty



Kosher vs. table

1 tsp table salt = 1 1/4 tsp kosher

# Salt in Baking

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- ❑ “Potassium chloride only” substitutes not recommended

## Daily sodium and potassium targets:

- ❑ Sodium—1500mg (over 51 years) to 2300 mg
- ❑ Potassium—4700 mg from food



Child Nutrition & Wellness, Kansas State Department of Education  
in collaboration with the non-profit Home Baking Association

*New Summer 2016*

**Ages 2- 5 in U.S. average 2310 mg; 8-12 = 3260mg; 13-19 = 3480 mg**

- ❑ Smart Snack baking: 200mg or less per serving

Center for Disease Control. 3/2013. [http://www.cdc.gov/salt/pdfs/children\\_sodium.pdf](http://www.cdc.gov/salt/pdfs/children_sodium.pdf)

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# SPICES & FLAVORINGS

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Measure spices and flavorings carefully to get the right taste or flavor. ¼ tsp. dried herb = 1 tsp. fresh

- Sweet spices: Cinnamon, nutmeg, cardamom, anise, ginger
- Savory: Herbs, basil, oregano, pepper
- Salt
- Vanilla, maple, lemon, almond flavoring
- Citrus peel, zest or juice



# Chocolate

Add body, bulk and unique color and flavor to products

- ❑ Unsweetened (100% cacao)
- ❑ Bittersweet (60%+ cacao)
- ❑ Dark (cacao varies, 70-99%)
- ❑ Semi-sweet (35% or more)
- ❑ White (no cacao, cocoa butter)
- ❑ Cocoa powders—"Dutch" process  
(neutralizes acids—use baking powder, or add buttermilk)

Natural baking cocoa (naturally acidic, use baking so



*Chewy Double Chocolate Smart Snack Cookie*  
A Baker's Dozen Recipes  
HomeBaking.org



Kingarthurflour.com

# LEAVENING AGENTS

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- An ingredient that adds or produces gas in a dough or batter.
- The gas makes the product rise and/or have a light texture.
- Leavening agents in baking are:
  - Baking Powder
  - Baking Soda
  - Cream of Tartar
  - Eggs
  - Air
  - Steam



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Much more: A Bakers Dozen Labs, Lab 4 *Creating Lift*, [www.HomeBaking.org](http://www.HomeBaking.org)

# YEAST

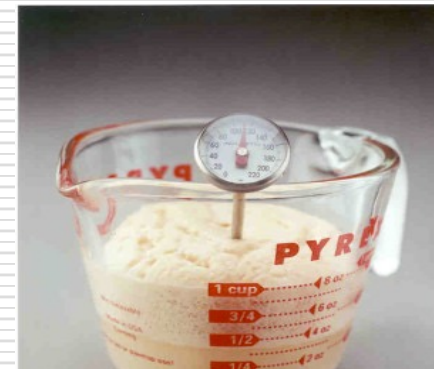
A leavening agent; Increases volume

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**Types:** NOT Brewer's or Nutritional yeasts

- Active Dry Yeast (ADY); fast/instant/breadmachine
- Professional bakers:
  - Fresh Cake or Compressed Yeast
- Specialty yeasts: home and pros  
Platinum®, [redstaryeast.com](http://redstaryeast.com)
- Home bakers: Active dry, fast-rising, cake (in dairy case)
- Cream or liquid yeast (commercial bakeries)



Yeast activity test  
Gluten window test  
[Redstaryeast.com](http://Redstaryeast.com)

Baker notes: TEMPERATURES and TIME MATTER.

Yeast dies at, or near, 140° F. Yeast and yeasted dough may be frozen or refrigerated-bring yeast and dough to room temp before baking.

Long-fermentation dough requires less yeast.



# WHAT'S THE DIFFERENCE BETWEEN BAKING POWDER and BAKING SODA?

Both are leavening agents which cause baked goods to rise, BUT THEY ARE NOT CREATED EQUAL.



## BAKING POWDER

Contains both an acid and an alkaline component (usually baking soda) which react to release carbon dioxide.

VS.

## BAKING SODA

Must be combined with an acid ingredient such as buttermilk or molasses to react and release carbon dioxide.



Carbon dioxide bubbles in batter cause baked goods to rise.



Carbon dioxide bubbles in batter cause baked goods to rise.

### CAN CONTAIN TWO KINDS OF ACID:

**SLOW-ACTING ACID**  
will not react until heated



**FAST-ACTING ACID**  
reacts in a wet mixture



ACID

DOES NOT CONTAIN ANY ACID

### TWO TYPES OF BAKING POWDER:



#### SINGLE ACTING

Includes only slow OR fast reacting acid



#### DOUBLE ACTING

Contains both slow and fast reacting rises with addition of liquid AND again with heat



*Don't have all day?*  
**QUICK BREAD TO THE RESCUE!**



Both baking powder and baking soda provide faster leavening than yeast fermentation. That's why breads and muffins made with either are called "quick breads."

### MORE ABOUT SODA

Can leave a bitter taste if not combined with acid

Reacts with liquid, not heat.

Because it reacts with liquid upon contact, baking soda should always be combined with other dry ingredients first.

For best results, batter should be placed in the oven immediately.

*This bit of kitchen genius brought to you by*

**CLABBER GIRL**

www.clabbergirl.com

## 5 MINUTE ACTIVITIES

Activities to break the ice, fill down time, or get students excited to learn!

Author: Sharon Davis, [www.homebaking.org](http://www.homebaking.org)  
 Co-author: Orlene Patten, [www.homebaking.org](http://www.homebaking.org)  
 Host & Editor: Susan Pugh & Barbara Stumm, [www.homebaking.org](http://www.homebaking.org)

Learning ZoneExpress™  
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Chocolate Whole Wheat Waffles