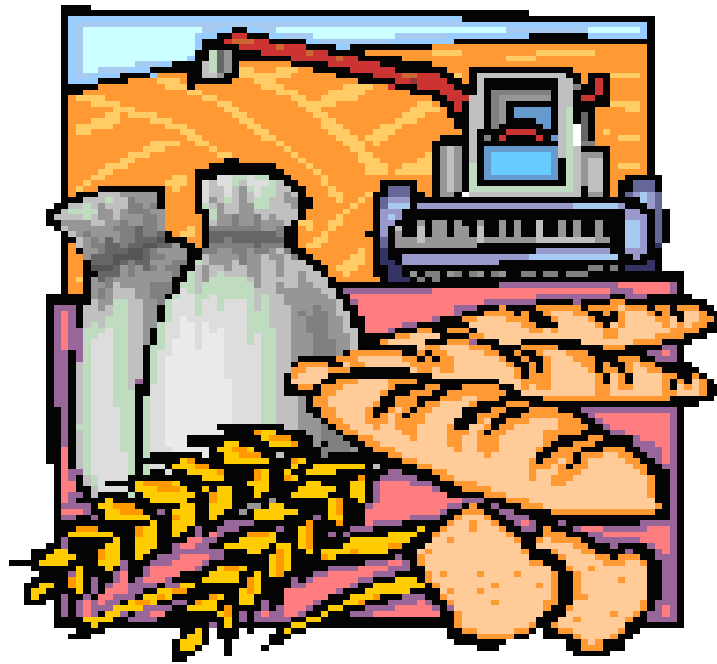


Baking Sciences: Salt Savvy



Lab Goal: Students will examine the origins of salts used in baking, its function as an ingredient; and produce and evaluate a bread product with and without salt.

Introduction:

Based on its price at the supermarket, salt doesn't command much respect. In fact, it is as important to humans as air—balancing blood volume and maintaining cell and tissue health. Only in recent years have processed foods become a source of too much sodium. Visit www.mypyramid.gov for healthy sodium guidelines.

Salt is history and economics. Salt was used as wages—*salarium* (Rome) or *salary* today— and was taxed. As early as 250 B.C. (Carthage), wars were fought over salt. Ancient trade routes, cities and highways are named for salt. Salt is an abundant but valuable food ingredient.

Teacher Supplies:

Containers of iodized, non-iodized, Kosher, and salt substitutes
Whole wheat flour (preferably a white whole wheat flour-)
Unbleached all-purpose
Active dry yeast
Sealable bags (for dough if refrigerating to shape on Day 2).
Baking sheet pans, cornmeal and/or parchment pan liners
Ovens
Optional resource: Home Baking Association *Bakers Dozen*
Salt Segment, www.homebaking.org

List for students the ingredient functions of salt:

In cooking and baking salt:

- contributes its own flavor
- enhances other foods' flavors
- controls yeast fermentation
- influences crust color in baked foods
- helps freeze ice cream
- preserves foods (meats, butter, fish, pickles)
- is used to pull moisture or bitterness from foods (cucumbers, egg plant, cabbage)

Ingredient Lab: Explore properties of salt

Explore: Salt is heavier than other seasonings.

1. Mix 1 tablespoon *each* of salt and pepper on a plate.
2. Rub a plastic straw with felt or wool to create a static charge on the straw.
3. **Teacher: Have students tell (“hypothesize”) what they think will happen if you hold the straw just above the salt and pepper.** Q: Which product will jump to the straw? A: *Salt is too heavy to be lifted by the static charge, pepper is not.*
4. **Critical Thinking:** Will 1 tablespoon of flour and 1 tablespoon of salt weigh the same? (Check it out with scales) In baking, this affects how products mix.

Salt Geography

In cities such as Norwich or Greenwich—which is “place where salt is dug” (Saxon) OR Salzburg (Austria)

Get a map...In the U.S., major salt mines are located where there was once a sea, such as in Hutchinson, Kansas.

Salt is...

- a natural, consumable rock—called **halite**
- cubic crystals that may be coarse (kosher) or fine (popcorn and seasoning salts)
- Sodium chloride=NaCl
- formed by **ionic bonding** between an acid (hydrochloric acid) and a base (sodium chloride)
- neutral pH in a water (aqueous) solution
- 2.6% of seawater by weight
- also Potassium Chloride (KCl)—a salt substitute—a different kind of salty taste without the sodium
- sometimes **iodized** (sodium iodine) to help prevent hypothyroidism (goiters)

Baking Lab: Pita Bread

Instructions: Use the following recipe to test and observe the differences in a bread made with and without salt. Students will observe, measure and report how salt controls yeast fermentation, provides quality to a finished bread product and important taste factors.

A. Controls: Use the same size and type of bowl, temperature of water and other ingredients, mixing/kneading method and length of time, and environment (room temperature) for all three.

Variable 1: Omit salt.

Variable 2: Cut the salt in half and prepare the pita as directed.

Variable 3: Prepare the dough as directed.

For two day labs: After mixing each dough, place in a large plastic sealable bowl or food bag sprayed with pan spray or oil. Squeeze out all air. Seal and label.

Refrigerate. Teacher, punch each dough after 45-60 minutes.

Day 2: Punch dough, and place on counter one-hour before they are to be shaped.

B. Measure and make notes: How much does each dough increase in size/volume in 30 minutes? 45 minutes? Is there an aroma difference?

C. Shape, bake and sample. Write a three paragraph report: What crust color (browning) variations can you describe between the two products? How does flavor compare? Is there a difference in aroma between products? Which product would be best for a meal?

Pita Pocket Bread

Ingredient

Whole wheat flour
Water, 80 degrees F.
Active dry yeast
Salt
Olive or vegetable oil
Unbleached all-purpose flour

Makes 8, (2.75 oz) pitas.

Measure

1 $\frac{3}{4}$ cups
1 cup
2 $\frac{1}{4}$ teaspoons
1 teaspoon
1 teaspoon
1 to 1 $\frac{1}{4}$ cups

Weight

8 oz. (220g)
8 oz. (220ml)
 $\frac{1}{4}$ oz. (7g)
 $\frac{1}{4}$ oz. (7 g)
1/8 oz. (4.5g)
4.5-5 oz. (125-175g)

Directions:

1. Blend the whole wheat flour, water, and yeast until well mixed, stirring about 2 minutes.
2. Allow to stand, covered, about 5 minutes (until yeast begins to foam).
3. Stir in the salt and all purpose flour, $\frac{1}{2}$ cup at a time, until a dough ball forms. Turn onto lightly floured counter and knead, adding only small amounts of flour while kneading.
4. Knead until the dough is smooth, elastic and no longer needs flour to handle.
5. Place dough in a bowl, cover loosely with lid and let rest (ferment) 45 minutes (timed) in a draft free warm (78-82 degrees F.) place (unheated oven, cupboard, microwave oven). Note: All dough must be placed in the same environment. Measure volumes (height X width) at 30 and 45 minutes and compare sizes.

Nutrition Facts	
Serving Size (78g)	
Servings Per Container	
Amount Per Serving	
Calories 170	Calories from Fat 10
% Daily Value*	
Total Fat 1g	2%
Saturated Fat 0g	0%
Cholesterol 0mg	0%
Sodium 290mg	12%
Total Carbohydrate 34g	11%
Dietary Fiber 3g	12%
Sugars 0g	
Protein 6g	
Vitamin A 0%	Vitamin C 0%
Calcium 0%	Iron 15%
*Percent Daily Values are based on a diet of 2,000 calories a day. Your daily values may be higher or lower depending on your calorie needs.	
Calories: 2,000 2,800	
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

6. Punch down the dough. Form into a log and divide into 8 equal pieces. Shape these pieces into round, smooth balls (like dinner buns) and cover with a damp clean non-terry towel or turn the bowl over them to prevent drying. Let rest 5-10 minutes.
7. Preheat oven to 475 to 500°F. (very hot). (This is not a mistake. In the mid-East they will bake at 900°!)
8. Roll and flatten each round piece of dough until about 6-8 inches in diameter and ¼-inch thick. Let circles rest and re-roll if they spring back. Place on ungreased baking sheet pans, sprinkled lightly with cornmeal, parchment paper liners, or heated baking stone.
9. Bake very briefly—just until surface begins to brown and “freckle” with color, two to four minutes. They will puff up and form the pocket as they bake. Great Entertainment! Do not open the oven during this time; heat will be lost and the pockets will not form.
10. Cool on a wire cooling rack. (Storage Tip: Pita are fresh only one day because they contain no sugar and little fat. Wrap and freeze if not eaten the day they are baked.)

Source: *Ethnic is Now*. Sharon P. Davis/Kansas Wheat Commission www.kswheat.com

Evaluating Pitas

As each group completes their test bake, have students keep track of the pita, whether it was a salt or no-salt pita. A possible rubric to use is:

Pita Lab Rubric	Very acceptable	Okay Need	Improvement
Pita Variable: _____			
Top and bottom crust	Evenly golden Not burned or pale	Edges browned	Very pale Greasy or doughy appearance Brown on only top OR bottom
Volume	Doubled in height	Raised somewhat	Same flat height as dough
Interior crumb	Flaky, tender	Moist and not too dry to eat	Dense, wet, crumbly or doughy, oily or greasy
Flavor	Rich, a little sweet Wheaty, pleasant	Pleasant flavor	Too much oil or fat flavor Coats mouth; unpleasant
Keeping quality after 1 day	Still flavorful Good aroma/moist	Edible but not best	Stale (dry; firm) Off flavor

Taking it Home:

Teacher: If possible bring a food label from commercial pita bread to compare nutrition labels.

In many countries, pita are eaten as a daily bread, even used instead of utensils.

- What part of the food pyramid does it come from? (Grain/wholegrain)
- How many servings is one of the pita prepared in this lab? (2.5)
- Why is pita a great staple (look this word up if students don't know it) food? (Low in fat/no saturated fat; high in complex carbohydrates, low in sugar, not too high in sodium)
- How does the product you made in lab compare to the store-bought pita?

Compare

Cost: \$ _____ at store. Home-made cost ~ \$ 0.80 for eight pita.

Nutrition label/ingredients: Store-bought are usually higher in sodium.

Are they whole grain?

Quality: Store bought are often stale or firm, because pita have a very short shelf life. Do freshly made taste a lot better?

- What would you serve inside your pita?

Take Home Assignment: Send home enough pita per student, and assign them to prepare a meal around the pita. Use the following form to report results.

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Dear Parent:

Your student needs to get in the kitchen **often** to feel comfortable helping prepare food and cleaning up afterwards. Please plan to share a meal (breakfast, lunch or dinner) using the Pita Pocket Breads prepared in lab today.

What to Do: Write a simple menu and prepare it. Be sure the menu has

- one food from every food group in the menu
- color and a pleasing mixture of textures, flavors and temperatures
- "normal" not mega-sized portions

Need help? Check at www.mypyramid.gov for food groups and portion sizes

Menu Served:

_____	(Beverages)
_____	(Fruits)
_____	(Veggies)
_____	(Meat, beans, eggs, nuts)
_____	(Dairy or soy milk)
_____ Pita Bread _____	(Grains/whole grain)
_____	(Other)

When did you make and enjoy this meal with your family? Date/Time: _____

Who cleaned up the dishes and kitchen? _____

Did you turn off TV and talk? ___yes ___no

Did your family enjoy the pita ___yes ___no If not, why? _____

Signed: _____(Parent) _____(Student)

See the Sites

Carey Salt Mine, Reno Co., Kansas—www.mindat.org
German Salt Museum (Deutsches Salzmuseum)—Lüneberg, Germany
www.members.aol.com/saltmuseum/index.html
Morton International—www.mortonsalt.com
The Cook's Thesaurus on Flatbreads. <http://www.foodsubs.com/Flatbread.html>
The Salt Institute—www.saltintstitute.org
The Salt Museum, Northwich, Cheshire, England
www.liverpool.com/frodsham/places/salt.html
Salzburg or Hallstatt Salt Mine
www.austria.eu.net/image/salz/mines.html
Wieliczka Salt Mine, Krakow, Poland
<http://whc.unesco.org/sites/32.htm>

Resources and References

- Bakers Dozen.*** Salt Segment. 2005. Home Baking Association. DVD.
www.homebaking.org
- Cooking Wizardry for Kids.*** Margaret Kenda and Phyllis S. Williams. 1990.
Barron's Educational Series.
- Food Lover's Companion.*** Sharon Tyler Herbst. Barron's Educational Series.
www.barronseduc.com 1-800-645-3476
- Solve it with Salt.*** Morton International. 100 North Riverside Plaza, Chicago, IL
60606-1597
- What Einstein Told His Cook. Kitchen Science Explained.*** Robert L. Wolke.
2002. Norton Publishing Co.—www.wwnorton.com

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KS.