Cookie Science:

*Ingredient Functions*

Lisa Pluff
FCS Teacher - Culinary & Baking
Manhattan High School
Cookie Business - Cookie Creations
More than JUST Cookies!

Lisa Pluff
(913)484-9854
LisaC_107@yahoo.com
Flour

• STRUCTURE
• Absorbs liquid
• Cake – finer and lower protein
• All-purpose – protein level depends on the brand
• Bread – thicker, chewier texture, higher protein
• Bleached flour – can absorb more liquid, color
Sugar - Functions

- Sweetness
- Texture
  - Moistens – liquefies when heated
  - Tenderizes – sugar is hygroscopic, so it prevents water from being used for gluten development
- Leavening during creaming through air incorporation
- Color – browns through caramelization and Maillard browning
Sugar - Types

• Granulated – made from sugarcane or sugar beets
• Brown – granulated sugar + molasses
  • More butterscotch flavor and draws in more moisture due to molasses
  • Dark has more molasses
• Powdered sugar – more finely ground than granulated sugar
Fat - Functions

• Tenderizes – coats starches and proteins to prevent gluten development
• Creates sensation of being moist because can’t be absorbed by starches or proteins
• Leavens – creaming incorporates air
• Flavor – most often flavor, all fats contribute richness
• Browning – milk solids in butter Maillard reaction
Fat - Types

• Butter
  • Melting point (90°F) similar to body temperature so melt-in-you mouth sensation
  • CRUCIAL to cookie dough outcome
  • Room temperature
    • Gives slightly when pressed with your finger but still hold its shape
    • Flexible but no cracking
    • 65-67°F
    • Optimal temp in order to incorporate enough air in creaming and keep cookies correct thickness
  • Better to be too cool than too warm
Fat - Types

• Shortening – 100% fat, no water
  • Higher melting point (110-120°F) so...
    • Leaves film in your mouth
    • Thicker texture
    • Lacks flavor

• New “plant butters” – confirm fat content 80%

• North American butter – at least 80% butterfat

• European butter – minimum 82% butterfat
  • Smoother, creamier mouthfeel
  • Lower water content – firmer and slower to melt; effects end results in baking

• Use unsalted butter! No industry standard for how much salt is in a pound of salted butter
Tricks to Softening Butter

• Microwave – be careful!!
  • Microwave 5 second intervals while turning the stick of butter each time

• Cube
  • Cut butter into smaller pieces and let it sit until reaches cool room temperature

• Cream butter by itself before adding sugars
Eggs - Functions

• Structure (egg white)
  • Proteins act as tougheners
• Leavening property
• Fats and emulsifiers (egg yolk)
  • Lecithin – emulsifier found in the egg yolk
    • Retains moisture and slows staling
  • Tenderize
  • Chewier cookie
• Usually large eggs are used in baking but use what the recipes calls for
Parts of the Egg

- White
  - Mainly moisture
  - Some protein
  - No fat
  - Structure and moisture

- Yolk
  - Some protein
  - Less water
  - All of the fat content of an egg
  - Contains the emulsifier (lecithin)
  - Tenderness and richness
Fresh Egg – Test

- Place egg in bowl of water
- Lays on side at bottom – still very fresh
- Stands upright on bottom – still fine to eat but should be used soon
- Floats to top – not good for eating and should be discarded
Leavening

• Physical – air incorporation during creaming
• Chemical – baking soda, baking powder
• Flat, coarse final product – not enough leavening
• Collapsed after baking – too much leavening
• Comparison graphic, Lab Manual Appendix and online
Baking Soda

- Alkaline
- Activated by liquid and acid present
- Acid ingredients – buttermilk, sour cream, yogurt, lemon juice, vinegar, brown sugar, natural cocoa powder (not Dutch)
- Too much – metallic flavor
- Elevates pH, brown color, more spread
- 4 times stronger than baking powder
Baking Powder

- Baking soda, acid, starch
- Usually double acting
  - First reaction – when combined with liquid
  - Second (slower) reaction – heat from the oven
- Creates lift and thickness
Other Ingredients

• Bittersweet and semisweet chocolate – no regulation to distinguish (look at packaging to determine % of chocolate), both must contain at least 35% pure chocolate

• Milk chocolate – at least 10-15% cacao

• White chocolate – no chocolate solids; cocoa butter with dry milk powder, vanilla, soy lecithin

• Coating chocolate – not real chocolate, cocoa butter has been replaced by other fats, doesn’t require tempering to hold its formed shape

• Melted chocolate – do not use chocolate chips (cocoa butter is often times replaced with hydrogenated oil)! Use freshly chopped baking chocolate to ensure it melts smoothly
Other Ingredients

- Natural cocoa powder – highly acidic
- Dutch process cocoa powder – slightly acidic because treated with alkali to neutralize acidity; more mellow flavor
- Chocolate Tasting Sensory Lab in manual
Salt

- Enhances sweetness
- Fine sea salt best for baking
- Can also use table salt
- If use kosher, use a bit more
  - 1 tsp. table or fine salt = 1 ¼ tsp. kosher salt
Equipment

- Kitchen scale
- Portion scoop – even baking
- Oven thermometer – place in center of the middle oven rack to ensure oven temperature is accurate
- No dark pans to prevent overbrowning
- Cooling rack
Preheat

• Preheat oven – after the beep, wait 15 minutes to ensure oven has actually preheated
• Use an oven thermometer
Measuring

• Scale your ingredients! - ACCURACY

• Whisk dry ingredients to remove clumps and ensure leaveners are evenly distributed

• Students using volume measuring tools at home—confirm proper method for dry and liquid measurement
Temperature of ingredients

• Cool room temperature
• Butter - 67°F
• Eggs
• Flour stored and used within a month
Creaming

• Pay attention to speed and time
• Medium high
• 2-3 minutes
  • Scrape every minute
• Smooth, pale in color, fluffy, don’t want it sandy or gritty
• Cool room temperature butter
• Blends and incorporates air
  • Want enough air to give some lift
  • Too much air → collapse
Mixing

• Eggs one at a time
  • Thoroughly combine
  • Scrape after each
• Slowly add dry ingredients, mix until just combined
• Slowly stir in mix-ins
Shaping

- Use portion scoop
- Even baking
- Parchment line pan to preserve pan; grease pan only if directed
- Don’t overcrowd the pan
- Some recipes may call for you to slightly press down
Baking

• Try to keep the oven shut
• Just slightly moist in the center
Cooling

• Cool as long as recipe says to on pan
• Then continue to cool with cooling rack
  • Cools more quickly and evenly, avoids too much carryover baking
Plating

• Portion scoop
• Roll the dough between your palms for most cookies
• Garnish – with more mix-ins
• Reshape – use a biscuit cutter to even out any misshapen edge
Freezing Drop Cookie Dough

• Scoop and freeze on cookie sheet
• Balls of dough can be placed in an airtight container and stored in freezer for up to 6 weeks
• Bake from frozen: drop temperature by 25°F and add a few minutes on baking time
• Or can bring dough to cool room temperature and bake as recipes states
Contact Information | Questions?

- Lisa Pluff
- LisaC_107@yahoo.com
- (913)484-9854
- Via HomeBaking.org