

The Science of Crispy, Chewy Cookies

One of the biggest advantages that home bakers have is time. Commercial products are made at least half a day in advance, usually longer, so manufacturers have to come up with clever tricks to mimic what happens in your kitchen. What if we could learn those manufacturing tricks and try them ourselves?



A freshly baked cookie—“just like Mom used to make!”—is crispy on the outside and chewy in the middle. Some enterprising researchers at UC Davis proved this by building an oven inside of their MRI machine and then baking cookies in it, using the MRI to scan what happened to the water inside the dough as it baked. (I’d love to see the grant application for that one.)

A dozen cookies and MRIs later, the researchers had proof: the edge of the cookie definitely dries out—and to a remarkable extent—during baking. After a day or two, however, the moisture evens back out and the cookies revert to having a uniform ductile, soft texture, losing that fresh-baked quality. (And a week later, the sugars recrystallize—that’s how the cookie crumbles!)



Crispy-chewy chocolate chip cookies are *incredibly* hard to make, at least commercially. But good luck calling up and asking the elves making cookies at any of the large commercial manufacturers for tips: these sorts of things are trade secrets, with stories of industrial espionage that spy novelists and Jason Bourne would appreciate. Luckily for us there is one place where industry has to spill its secrets: patents. And in this case, US Patent #4,455,333 (<http://cookingforgeeks.com/book/cookie-patent/>) has the answers.

Each patent includes a background description written to set the stage for the invention, and those descriptions can be a great source for a clear summary of “how things work.” From reading a few cookie-related patents, you’ll quickly learn that soft cookies have a water concentration of 6% and higher, while crispy cookies are drier. This makes sense—moisture is a key variable in texture. So how can you control the moisture in your cookies?

Check out the ingredients listed on packaged crispy cookies as compared to the same brand’s packaged chewy cookies. In the brand I checked, cornstarch and molasses show up only in the chewy ones.

Crispy cookies are actually the easier of the two to make: create a dough that holds less water, or bake your dough longer, and the final product will be drier. To make chewy cookies, you have to formulate the dough so that it holds on to more water as it bakes, but you can’t just add more water into cookie dough (that’s what causes cookies to flatten out and results in burnt, feathered edges). Here are the common ways of making cookies chewier:

Substitute glucose/fructose-based sugars for sucrose.

In baking, sugars dissolve in water from eggs and butter. As the dough heats up, the sugar water forms a syrup, but—this is the key!—different types of sugars will absorb different amounts of water (the solutions saturate at different points). Sucrose molecules, being roughly twice the size of fructose and glucose molecules, don't create a solution with as much water, cup for cup. This means a dough that uses simpler sugars will hold on to more water. Lots of white sugar (sucrose)? You'll get crispy cookies. More brown sugar (sucrose, glucose, and fructose)? You'll have chewier cookies. Corn syrup? You'll get even chewier cookies (it's 100% glucose—high-fructose corn syrup is different from what you buy at the store). Glucose and fructose sugars are *monosaccharides*—the simplest form of sugar—and will keep more moisture in the cookie, so any source of those will work.

Add cornstarch. Cornstarch doesn't dissolve in cold water, but as it heats up it will gelatinize, absorbing water, and prevent that water from leaving the cookie as it bakes. (Speaking of patents, there's one that adds a ground-up gel, something sort of like Jell-O, into the dough—yet another clever trick for chewy cookies.)

Use bread flour. Gluten, too, will increase chewiness, as its elastic nature means that the baked good won't fracture and break. Using a higher-gluten flour will modestly aid you, although it's not common in chewy dough recipes; there's a lot of sugar and fat in the dough to get in the way. Melting butter affects this variable: the water from the butter, when melted, will help with gluten formation (see page 249 for more on controlling gluten).

Bake them for less time. In addition to making dough that holds on to water better, there's another obvious trick for making chewier cookies: don't bake the cookies as long! (Chilling the dough is a related tactic, but you could just bake them for less time.) I looked at the baking times listed for the first six recipes I found online for “chewy chocolate chip cookie recipe”; the average bake time was 12 minutes, 20 seconds. “Crispy chocolate chip cookie recipe”? 14 minutes, 55 seconds—a full 2½ minutes longer! (The average temperatures were only a few degrees off, essentially equivalent.)

In reality, chewy versus crispy cookies ends up being a balancing act of all of these tricks, along with subtler tactics, such as tweaking the dough's pH or, depending upon the type of cookie, including humectants such as raisins, which hold on to water.

Everyone has an opinion about how gooey, chewy, or crispy a cookie should be. I've had one person insist on eating almost-raw “6-minute cookies”—baked at 350°F / 180°C for 6 minutes—while serious milk-dunkers wouldn't consider anything less than a 15-minute cookie acceptable.

As a rough rule of thumb, for a ½-ounce (14g) cookie baked at 350°F / 180°C:

- 7–9 minutes: *gooey*
- 10–12 minutes: *chewy*
- 13–15+ minutes: *crispy*

If your cookies aren't coming out the way you like, in terms of gooey-chewy-crispy, change how long you're baking them. Using the same dough, crispy cookies will take about 25–30% longer to bake than chewy cookies.

If you want really crispy, thoroughly golden brown cookies, drop the temperature to 275°F / 140°C and bake for about 30 minutes.

Patent-Violating Chocolate Chip Cookies

Fortunately for us, that patent (#4,455,333) has expired, so the only trouble you'll run into with these cookies is people fighting over who gets to eat the last one!

The average chewy cookie recipe bakes for 12½ minutes; crispy cookie recipes usually bake for 15 minutes. Making a cookie that's extra-crispy on the outside and extra-chewy in the middle can't be done by changing the baking time, because...well, physics. The trick to these "crispy on the outside, chewy in the middle" cookies is to make two different doughs! This idea came to me after reading about a patent from the 1980s that uses the same technique.

Set out two bowls. Label one "crispy" and the other "chewy." In each bowl, measure out:

- ¼ cup (30g) rolled oats
- 1 cup (140g) flour
- ½ teaspoon (2g) baking soda
- ½ teaspoon (2g) salt
- ¼ teaspoon (1g) cinnamon

Then, to *just* the "chewy" bowl, add:

- 1½ tablespoon (12g) cornstarch

Using a whisk, mix the dry ingredients in each bowl to blend them.

Set out two more bowls, and also label them "crispy" and "chewy." In the new "crispy" bowl, add:

- ½ cup (113g) unsalted butter (or better yet, shortening)
- ⅛ cup (25g) light brown sugar
- ½ cup (100g) white sugar

In the empty "chewy" bowl, add:

- ½ cup (113g) unsalted butter
- ½ cup (100g) light brown sugar
- ¼ cup (88g) light corn syrup

Using a hand or stand mixer, cream until incorporated and smooth each of the sugar-butter mixtures.

To each of the sugar-butter bowls, add:

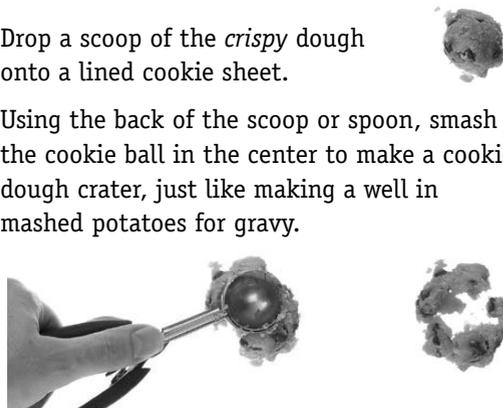
- 1 teaspoon (4g) vanilla extract
- ½ teaspoon (2g) lemon juice
- 1 large (50g) egg

Blend until fully incorporated. Add the dry ingredients, making sure to add the right dry ingredients into the right wet ingredients. Blend again to fully incorporate. To each bowl, add and then stir to combine:

- 1½ cups (250g) semisweet chocolate chips
- ¾ cup (75g) chopped walnuts

Now, for the patent-violating part: smashing the two doughs together in a way that puts the crispy dough on the outside of the cookie and the chewy dough in the middle.

1. Drop a scoop of the *crispy* dough onto a lined cookie sheet.
2. Using the back of the scoop or spoon, smash the cookie ball in the center to make a cookie dough crater, just like making a well in mashed potatoes for gravy.



3. Drop a scoop of the *chewy* dough inside the crater.



4. Mash the two doughs together.



If you like, add a pinch of very coarse sea salt on top of each cookie before baking.

Bake at 350°F / 180°C for 10–12 minutes, taking care to not overcook them; otherwise, the chewy center will come out crispy!



Notes

- If you're familiar with refrigerator cookies, instead of following the two-scoop method, you can form a log with the chewy dough in the center, wrapped by the crispy dough. This takes more work, but gives a more uniform edge on the cookie.
- If you don't have corn syrup and you're itching to try this right now, honey is a potential substitute: at 38% fructose, 31% glucose, it's remarkably similar to corn syrup in that both are monosaccharides (sucrose is a disaccharide). Of course, honey will bring its own flavor and color to the cookie, but that might be interesting, depending upon the type of cookie you make. Crispy-chewy oatmeal cookies, anyone?

What happens if you flatten a ball of cookie dough before baking it? Or use fridge- or room-temperature dough? Play, experiment, and see what happens!



For my cookie recipe, flattening the dough made a size difference only for the crispy dough version. Using fridge- versus room-temperature dough didn't make a difference in size but did change the texture.