

Optimized Grilled Cheese

Beth K. Martin¹, Chengxiang Qiu¹, Jay Shendure^{1,2,3,4}

1. Department of Genome Sciences, University of Washington, Seattle, WA, USA.
2. Brotman Baty Institute for Precision Medicine, Seattle, WA, USA.
3. Allen Discovery Center for Cell Lineage Tracing, Seattle, WA, USA.
4. Howard Hughes Medical Institute, Seattle, WA, USA.

Submitted October 14, 2022, Happy Birthday Jay!

Abstract

Grilled Cheese Sandwiches are delicious. Here we describe a method for making an epic one.

Introduction

The Grilled Cheese Sandwich has been around for over 100 years¹, sustaining hungry people through the Great Depression in the 1920s, to becoming a beloved comfort food of poor college students and picky eaters in the present day. But how can we make it bigger? We developed a method for making a giant grilled cheese that is not only simple to assemble, but able to pass the strictest quality metrics (i.e. Will Jay eat it?)

Development of the protocol

We searched the literature and discovered a previous version of a Giant Grilled Cheese². We thought, "hey that looks totally doable" but there wasn't a detailed protocol available. So here it is.

Comparison to other methods

There are many variations of the grilled cheese sandwich, but unfortunately they are all ultimately restrained by their dimensions and will realistically only feed 1-2 people. In contrast, this protocol will enable you to feed a labful of people *in parallel* with just a single sandwich.

Limitations

The size of the grilled cheese is ultimately limited by the size of your oven and baking sheets. We were limited by our equipment which only allowed for a 21"x15" sandwich. However this protocol is easily scalable if you can accommodate an even larger version.

Overview of the Protocol

There are two main sections to the protocol that can be split over two days. If you are desperate for grilled cheese, you can combine Days 1 and 2 into a single day.

- 1) Day 1 - Dough preparation and baking.
- 2) Day 2 - Slicing, assembly and final baking.

Materials

Reagents

Bread Flour (16 cups + extra)

Water (7 cups) (warm but not hot)

Vegetable Oil (1-3/4 cups)

Sugar (7/8 cup)

Salt (2-1/3 Tbsp)

Yeast (bread machine type) (1/3 cup)

Butter (4 sticks, divided and melted)

Sliced cheese (~50 slices)

Vegetable oil cooking spray

Equipment

Kitchen oven at least 30" in width

2 Large baking sheets 21"x15"x1" (Nordic Ware)

Large (16") adjustable cake leveler (Wilton)

Parchment paper (Kirkland)

The biggest mixing bowl you can find or a large pot

Pastry brush

Plastic Wrap (Kirkland)

Pizza peel, edgeless baking sheet, or piece of stiff clean cardboard for flipping large pieces of bread over.

Protocol

Bread Preparation

Timing: 3 hours

1. In the biggest motherfucking bowl that you can find, add the water, sugar, and yeast. Let sit for a few minutes until you see bubbles forming
2. Add the oil, salt, and 4 cups of flour. Stir until flour is incorporated, but you don't need to get all the lumps out.
3. Add another 4 cups of flour and stir until incorporated. Repeat with another 4 cups of flour.
4. Dust a large clean surface with flour.
5. Add the last 4 cups (16 cups total by now) of flour to the dough, it will now be too thick to stir with a spoon, so use your hands to incorporate the flour as much as you can and then dump the whole thing onto the dusted surface.
6. Knead the giant wad of dough by hand and add more flour just until the point where it stops being too sticky.
7. Let dough rest for about 10 minutes.
8. While the dough is resting clean and dry the original bowl.
9. Continue kneading dough until smooth. **CAUTION** Do not add any more flour than necessary to keep it from sticking to the table. Too much flour will make the dough too stiff.
10. Spray the bowl with cooking spray and transfer the dough to the bowl. Spray plastic wrap with cooking spray and cover the top of the dough. Allow to rise at room temperature (warm-ish) for 1 hour. It might overflow the bowl. If you have two big bowls you can divide the dough into 2 halves now, or do it after this first rise.
11. While the dough is rising, line the baking sheets with parchment paper, leaving ends long enough to grab later.
12. Brush 1 stick of melted butter on the parchment paper until it is all covered with butter.
13. After the dough has risen, punch it down and divide into 2 halves if it hasn't been divided already. **TROUBLESHOOTING**
14. Press each half into a rectangle shape completely filling each baking sheet.
15. Spray plastic wrap with cooking spray and cover dough completely.
16. If you have a proofing setting on your oven, use that to do the final rise in the pans. Otherwise let rise in a warm room, until the dough has doubled in size and is above the edges of the pans, about 30-40 minutes.
17. Remove the pans from the oven if you were using it for proofing the dough, and preheat oven to 350F.
18. **IMPORTANT** Remove plastic wrap and bake both halves of bread. It will take approximately 45-70 minutes. You'll want the top to be golden brown and the internal temp should be at least

190F. You might find that one half will cook faster than the other because of the lack of air circulation, so just check frequently until they are done. Let cool completely. Cover bread with plastic wrap until assembly. **PAUSE POINT**

Assembly

Timing: 2 hours

19. Preheat oven to 400F
20. We will be removing the tops of each bread half so that it looks like a giant slice of bread. Set the height on the cake leveler accordingly. While gently holding down the bread, use the cake leveler to slice off the top with a sawing motion. It's important to hold the bread down or else it will lift off the pan as you cut it and you will cut off too much. Repeat on second half. Discard tops of bread or give to the birds outside.
21. Using the parchment paper to lift, remove one of the slices from its pan and set aside.
22. Pour 1.5 sticks of melted butter into the pan and use the pastry brush to spread evenly. Set the pan level in a 4C fridge for 5min to harden the butter.
23. Flip the pan with the butter upside down and place on top of the bread slice that is still in its pan. Hold the two pans together and flip the bread into the newly buttered pan, with the cut side down in the butter. Remove the parchment paper. This is your bottom layer.
24. Lay two layers of sliced cheese onto this slice, covering it completely but avoiding the edges.
25. Using four hands, a pizza peel, or rimless cookie sheet, gently lift the second slice off its parchment paper and place on top of the cheese, cut side up, making sure its completely supported in the middle as you lift it.
26. Brush another 1.5 sticks of melted butter on top.
27. Bake for 20-45 minutes or until the top is golden brown and the cheese in the center has melted. If the top is browned but the bottom is still not toasty, then cover the top with foil and bake for longer.

Troubleshooting Guide

Step	Problem	Possible Reason	Solution
13	My dough didn't rise!	Bad yeast, too cold.	Allow more time for rising, move to a warmer room.
13	The dough has a life of its own and is taking over the kitchen!	Your room is TOO warm	End the rising time early
27	Cheese is not melted in the middle	Oven too cold, cheese too cold	Add more cooking time.

Acknowledgements

We thank the entire Shendure Lab for their enthusiastic support and general awesomeness, and QTPi for being the goodest girl.

Author Contributions

B. K. M. adapted the protocol and baked the bread. C.Q. contributed to the final assembly. J.S. provided quality control.

Corresponding authors

Correspondence to Beth Martin (martin91@uw.edu) ORCID 0000-0002-9661-014X.



Figure 1. Giant Dough Ball. This is for two giant slices of bread.



Figure 2. Second Rise. The dough is pressed into the baking sheet and covered in plastic wrap that has been sprayed with cooking oil.



Figure 3. Baked bread. Notice the golden brown coloring.

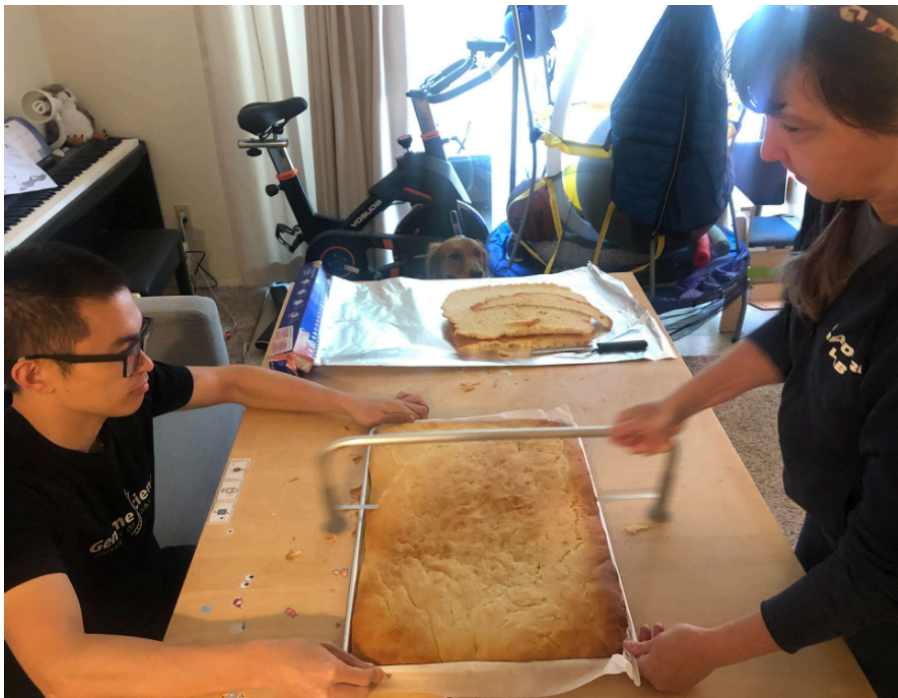


Figure 4. Slicing the bread with a cake leveler. You can see that we did not hold this piece down as we were cutting it and consequently this piece got mangled. Do not do it like this.



Figure 5. Grilled Cheese Assembly. In the foreground is a well-sliced slice of bread. In the background we are adding the 2 layers of cheese.

Anticipated Results



References

1. The History of the Grilled Cheese Sandwich, *How Stuff Works*, (2022).

<https://recipes.howstuffworks.com/history-of-grilled-cheese.htm>

2. Zhou, A. et. al. I Made A Giant 20-Pound Grilled Cheese For HellthyJunkFood. *Tasty*, (2019).

<https://youtu.be/bEPdGCOYWeE>