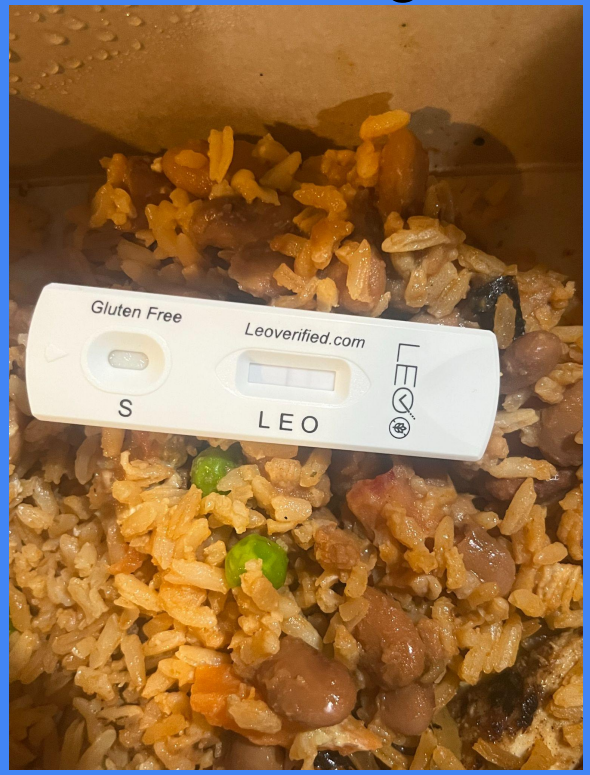
# Gluten Detective

## Testing for Hidden Gluten in Restaurant Foods



I know that people with celiac disease, like me, have to eat strictly gluten free because they get sick from gluten. The problem is, people with celiac disease have to be very cautious because they can get sick from cross contamination with even small amounts of gluten.

This project can help people recognize that there can be gluten in food in restaurants even when the menu says it is gluten free. This can help people with celiac disease to not get sick from gluten being hidden in food by identifying when gluten is detected in meals that are ordered gluten free.

The problem is that gluten can still be found in food that is marked as gluten free in restaurants due to cross contamination with gluten and cause people with celiac disease to get sick.

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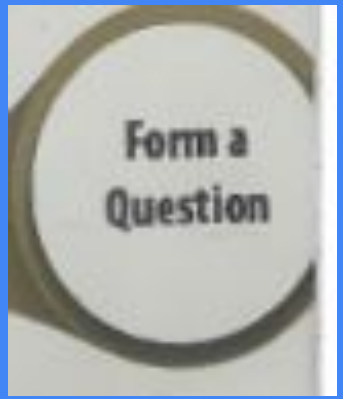
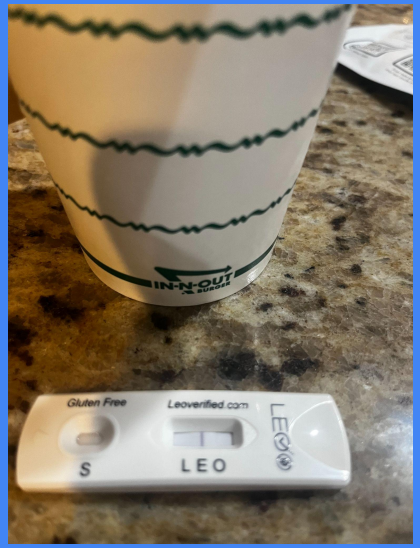



Does a restaurant’s level of business increase the potential of gluten cross contamination in gluten free dishes?

Imagine ordering a gluten-free meal at a restaurant because having celiac disease requires avoiding all gluten, but the food still causes a bad reaction. This happens because of gluten cross contamination in restaurants. Even restaurants with gluten free menus do not always ensure that there will be no gluten in the food. Cross contamination is usually hidden and people with celiac disease do not realize it until it causes an adverse reaction.




Cross contamination can happen in many different ways and occurs when a small amount of food accidentally gets onto another food making it unsafe. For example, if a cook uses gloves while handling gluten-containing food and then uses the same gloves to handle gluten-free food, the gluten can be spread mistakenly. Additionally, flour particles can float in the air and land on gluten-free ingredients, causing cross contamination. “Even tiny amounts of gluten, as small as a breadcrumb, can make someone with celiac disease sick.”[1]

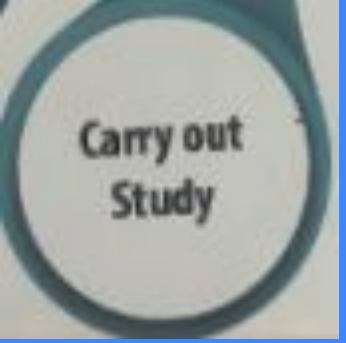
Gluten cross contamination usually occurs during cooking or preparation. This is a serious problem for people with celiac disease, a condition where eating gluten damages their intestines and makes them very sick. According to researchers, a study showed "32% of restaurant foods labeled 'gluten-free' contained detectable amounts of gluten."[2] This means that nearly 1 out of every 3 "gluten-free" restaurant meals might still contain enough gluten to harm someone with celiac disease.

Celiac disease is an intolerance to wheat, rye, and barley. When people with celiac disease eat gluten, their body cannot digest it and they can get sick. Common symptoms include diarrhea, vomiting, abdominal pain, headaches, iron-deficiency anemia, and joint pain. “The only treatment for celiac disease is a strict gluten free diet. There has to be less than 20 parts per million (ppm) of gluten in food to be considered gluten free.” For example, one crumb of a birthday cake can have more than 20 ppm of gluten. This shows how small of an amount of gluten it takes for cross contamination to cause a bad reaction.[3]

The only way to avoid cross contamination is to not eat at restaurants. This choice can limit social activities and dining options for some people. A new at-home gluten detector, called LEO “Love Eating Out”, was recently invented. It is approximately 96% accurate at checking if food is gluten free. “This test can help people with celiac disease feel safer and more confident when eating out at restaurants according to the manufacturers of LEO.”[4]

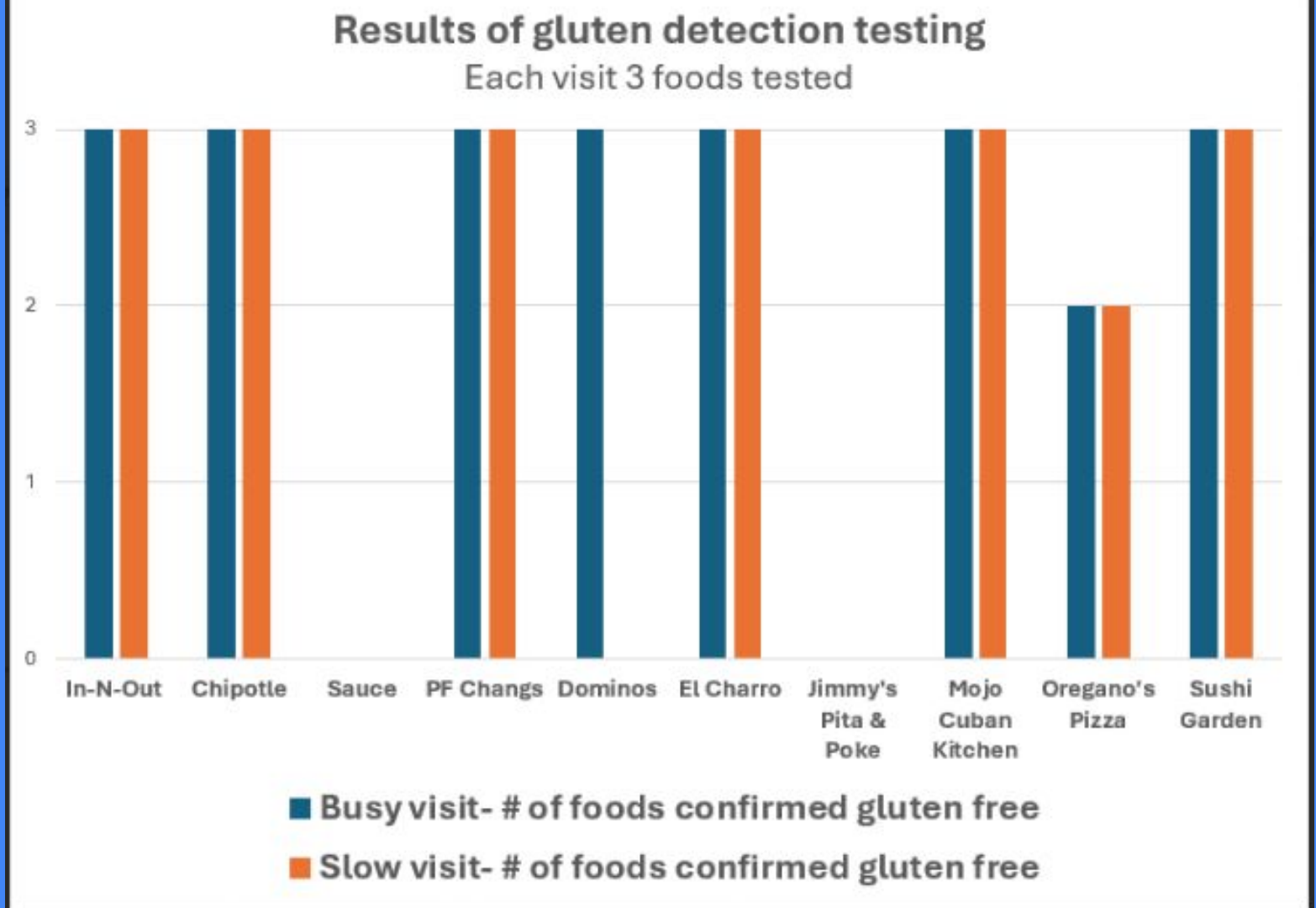
Hypothesis

If it is busier at a restaurant, then it is more likely that there will be gluten cross contamination in a meal ordered gluten free than when the restaurant is slower.



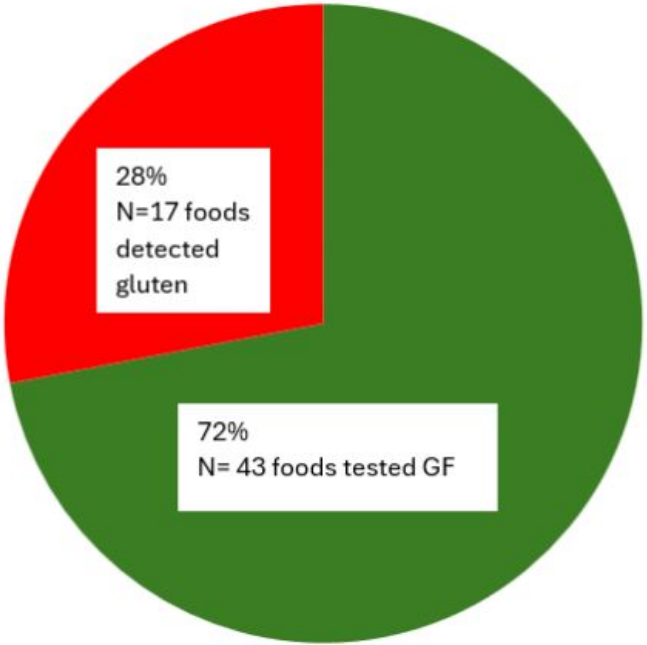

1. Pick a restaurant that offers a  gluten free (GF) menu to visit
2. Note if the restaurant is less than half full (slow) or more than half full (busy)
3. Order three items on the GF menu
4. Make sure to tell the server that it is for celiac disease and gluten intolerance
5. Have a clean area and then wash hands
6. Use the LEO gluten detector to test the food
7. Remove swab from sealed package and dip in a fresh glass of water
8. Swab up to five places. Place swab in the bottle, swirl five times, leave swab in bottle for 30 seconds, pinch bottle sides while pulling swab out, close lid, then shake
9. Add three drops on the “S” window on the LEO GF tester
10. After three minutes, look for a line above the “E” in the LEO for ten PPM or less test result. If you do not see the E line, do not eat
11. Record findings on spreadsheet
12. Repeat process starting at number one visiting at the opposite time of day. If the first time was busy then visit at a slower time next
13. Complete this process at ten different restaurants
14. Analyze the data

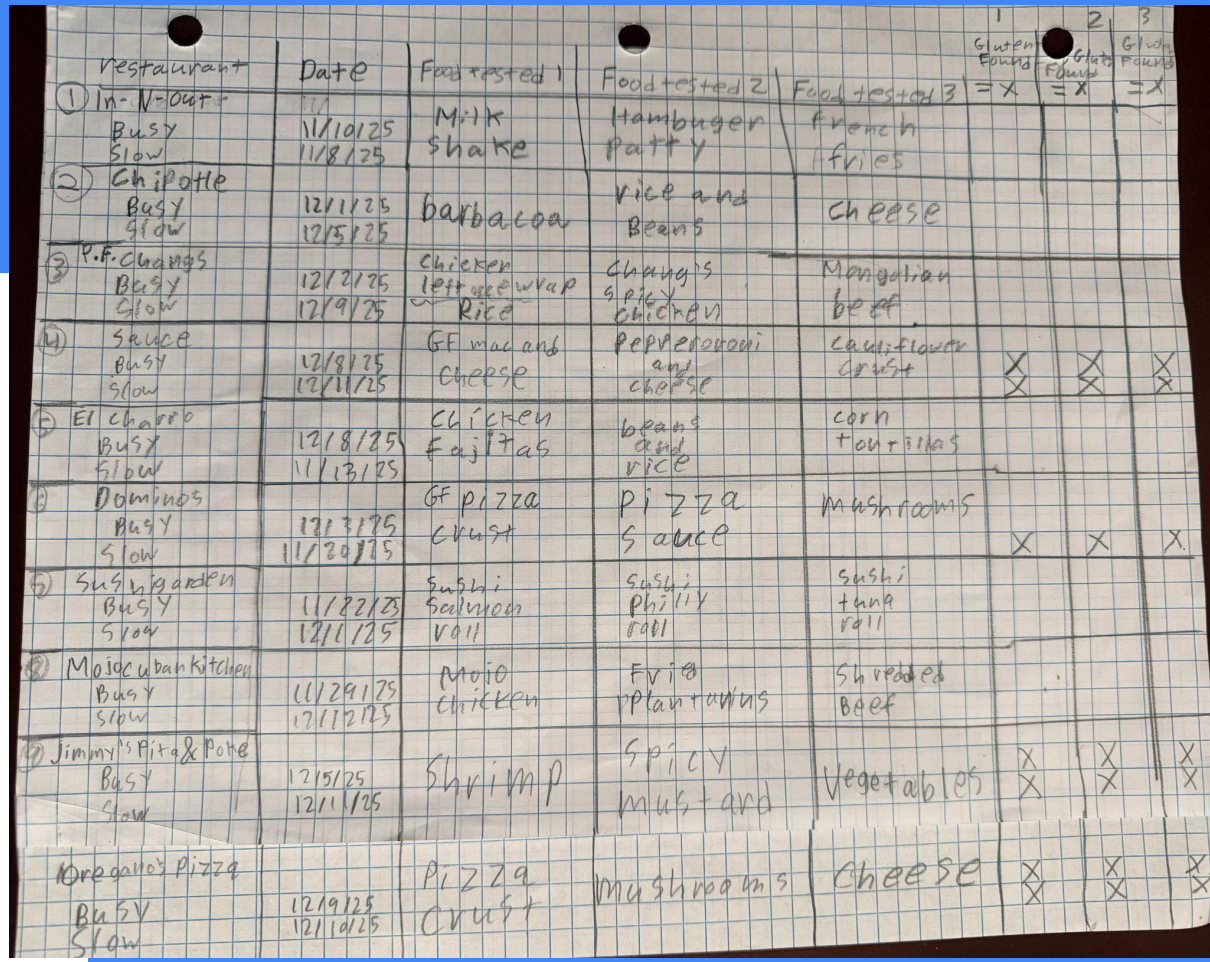
All 3 foods at Sauce, Jimmy's Pita both visits and Dominos slow visit contained gluten and one food at Oregano's had gluten



# Results

Percent of gluten free foods detected

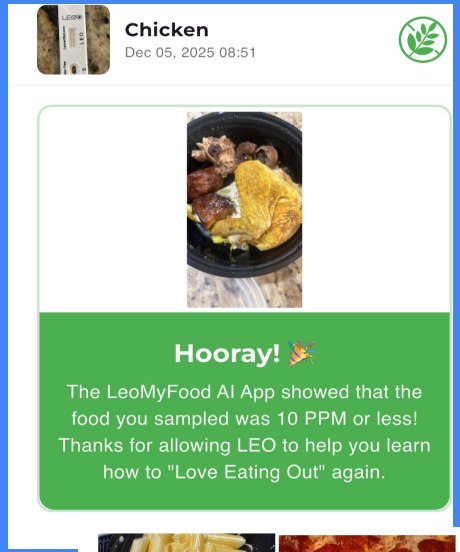


| Restaurant | Date | Food tested 1 | Food tested 2 | Food tested 3 | 1 Gluten Found = X | 2 Gluten Found = X | 3 Gluten Found = X |
|---|---|---|---|---|---|---|---|
| (1) In-N-Out Busy | 11/10/25 | Milk Shake | Hamburger Patty | French fries | | | |
| Slow | 11/8/25 | | | | | | |
| (2) Chipotle Busy | 12/1/25 | barbacoa | rice and Beans | cheese | | | |
| Slow | 12/5/25 | | | | | | |
| (3) P.F. Changs Busy | 12/2/25 | chicken lettuce wrap | Chang's spicy chicken | Mongolian beef | | | |
| Slow | 12/9/25 | Rice | | | | | |
| (4) Sauce Busy | 12/9/25 | GF mac and cheese | Pepperoncini and cheese | cauliflower crust | X | X | X |
| Slow | 12/11/25 | | | | X | X | X |
| (5) El Charro Busy | 12/8/25 | Chicken Fajitas | beans and rice | corn tortillas | | | |
| Slow | 11/13/25 | | | | | | |
| (6) Dominos Busy | 12/3/25 | GF pizza crust | pizza Sauce | mushrooms | | | |
| Slow | 11/20/25 | | | | X | X | X |
| (7) Sushigarden Busy | 11/22/25 | Sushi Salmon roll | Sushi philly roll | Sushi tuna roll | | | |
| Slow | 12/1/25 | | | | | | |
| (8) Mojacubankitchen Busy | 11/29/25 | Mojo chicken | Fried plantains | Shredded Beef | | | |
| Slow | 12/12/25 | | | | | | |
| (9) Jimmy's Pita & Poke Busy | 12/5/25 | Shrimp | Spicy mustard | Vegetables | X | X | X |
| Slow | 12/1/25 | | | | X | X | X |
| Oregano's Pizza Busy | 12/9/25 | Pizza Crust | mushrooms | cheese | X | X | X |
| Slow | 12/10/25 | | | | X | X | X |

# LEO app

With the LEO test, gluten levels above 10 ppm will completely erase the E line. When a faint E line was visible, it meant the gluten content was below 10 ppm. When uncertain due to a faint line, the app (LeoMyFood) was used to assist in understanding the results.



# What happened?

Out of ten restaurants that were tested twice (total of 20 times), where 60 different foods were tested, gluten was detected in 17 foods in 4 restaurants.

In this experiment, when eating out there was a 28% chance for someone with celiac disease to get cross contamination and get sick when ordering gluten free.

Gluten was detected 7 times when the restaurant was busy.

Gluten was detected 10 times when the restaurant was slow.

I noticed a pattern that restaurants that offered gluten free pizza all showed up as having gluten in the gluten free pizzas tested. There were 3 different restaurants tested with pizza. Only 4 restaurants tested positive for gluten and 3 of these were pizza places.

Are there any improvements you would like to make? Anything that surprised you? Was your hypothesis right?

Improvements: would have liked to test each sample twice to confirm results, but the costs of the LEO tests limited being able to do this.

Surprised: Gluten was found more often during slow visits. What seemed to matter was if the restaurant had pizza. I found 83% (N=5) when pizza was ordered it was tested positive for gluten.

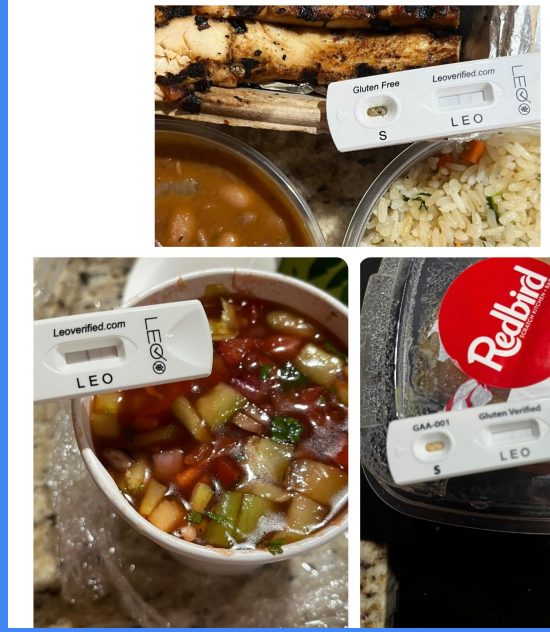
My hypothesis was incorrect. It did not matter if it was slow or busy. Three of the restaurants that had gluten detected had gluten found  on both visits.

# Conclusions

My study supports the previous published study that found 32% of restaurants with GF menus contain gluten. My study was very close and found 28% of gluten detected. What I discovered was how busy the restaurant was did not make it more likely to find gluten cross contamination..

I found cross contamination was likely in restaurants with pizza which could be due to flour in the air or coking on the same surface.

Study strengths: good amount of restaurants tested, high accuracy of LEO test, and visiting restaurants twice.




Weaknesses: could be different servers and cooks each visit and LEO detects over 10ppm being gluten and food labeling allows less than 20ppm to be called GF.

# Works Cited


1. Brooks, Megan. “Gluten May Be Lurking in 'Gluten-Free' Restaurant Food” Medscape, 08 October 2018. https://www.medscape.com/viewarticle/903083?src=wnl_edit_tpal&uac=295621HK&impID=1763110&faf=1 Accessed 7 November 2025.

2. “What is Celiac Disease?” 1998-2025 Celiac Disease Foundation, https://celiac.org/about-celiac-disease/what-is-celiac-disease/ Accessed 18 November 2025.

3. Collin P, Thorell L, Kaukinen K, Maki M. The safe threshold for gluten contamination in gluten-free products. Can trace amounts be accepted in the treatment of coeliac disease? Aliment Pharmacol Ther. 2004;19:1277-1283.

4. Learn how to love eating out again with LEO Gluten Verified. 2025 LEO Verification Systems inc. https://leoverified.com/?srsltid=AfmBOooQUxAzBTbTaYlij-hfUZYKdDeKyxf_v-2_ooNxD0RaCrxT6iDL Accessed 18 November 2025.