

Gluten-free foods cooked in shared fryers with wheat: A pilot study assessing gluten cross contact

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Objective

- To inform consumer recommendations by assessing gluten levels of otherwise gluten-free restaurant fries cooked in shared fryers

Background

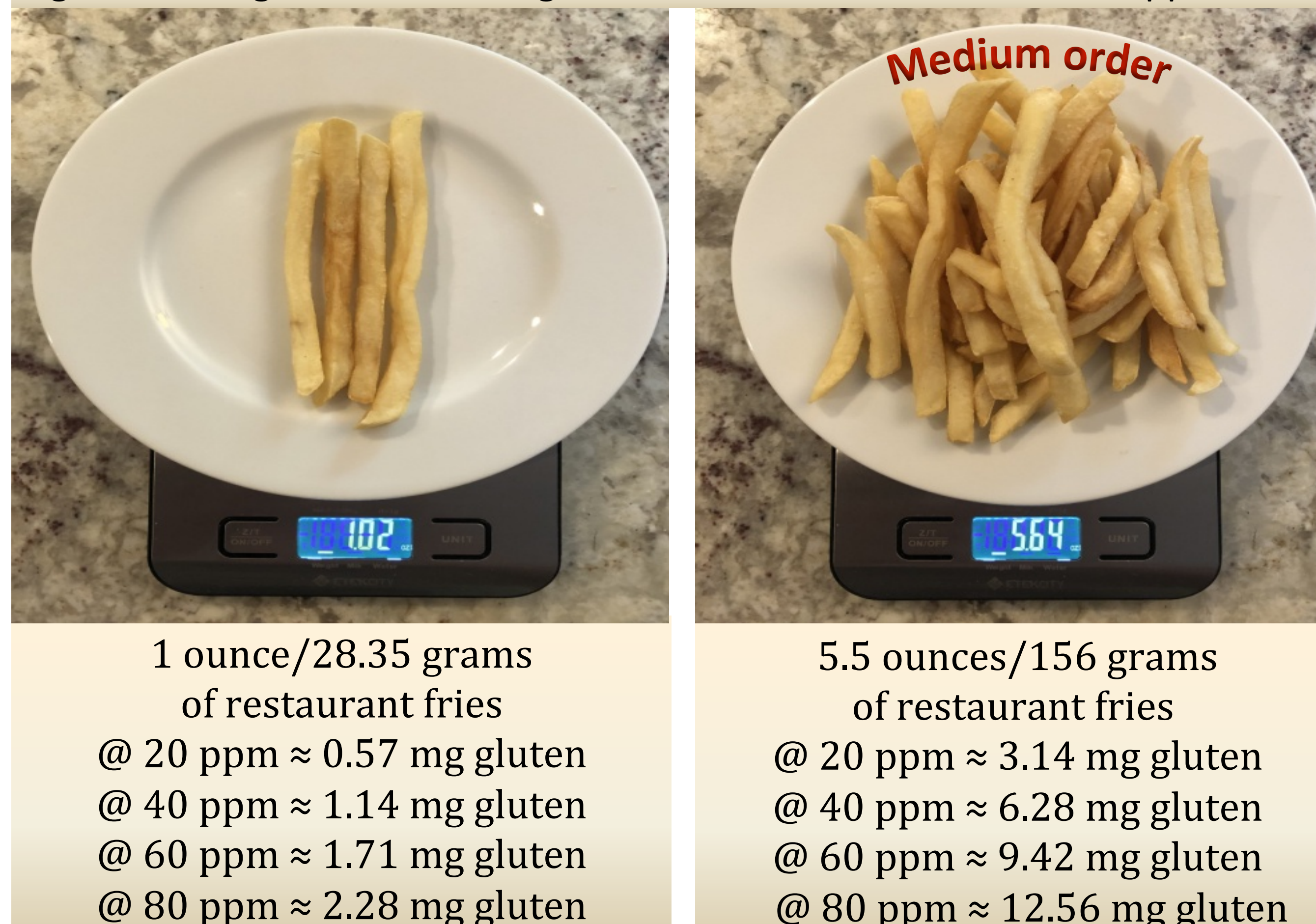
- Consumers with celiac disease discouraged from eating fries from shared fryers
- Recommendation based on presumed gluten exposure versus evidence-based research that gluten cross contact occurs
- Fries cooked in shared fryers marked as gluten free on restaurant menus leads to consumer confusion

Methods

- Convenience sample of 20 orders of plain fries purchased from 10 restaurants
- Restaurants confirmed that fries were free of gluten ingredients and that fryers were used to cook wheat products
- Fries were mailed to Bia Diagnostics, LLC, Colchester, VT, USA
- Each order of fries was homogenized & tested in 1-gram duplicates using the Ridascreen Gliadin R7001 sandwich R5 ELISA & extracted with the cocktail solution R7006 ¹
- Samples were also tested in 1-gram duplicates using the Ridascreen Gliadin R7021 competitive R5 ELISA & extracted with ethanol ²
- 80 extractions were tested (4 extractions from each sample)
- A microwave control was run to assess whether the R5 ELISAs were fit for purpose to test for the presence of gluten in heated oil
- A 60-ppm gluten mixture of wheat flour & canola oil was prepared & tested before & after heating in a microwave to 190°C/374°F
- Samples were tested in duplicate using the sandwich & competitive R5 ELISAs

Table 1. Gluten levels in samples tested					
Gluten levels of restaurant fries cooked in shared fryers * with wheat-containing foods					
Test Code	Sample tested	Sandwich Extraction 1	Sandwich Extraction 2	Competitive Extraction 1	Competitive Extraction 2
F1A	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F1B	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F2A	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F2B	Plain fries, salt only	18 ppm	19 ppm	< 10 ppm	< 10 ppm
F3A	Plain fries, salt only	45 ppm	28 ppm	19 ppm	14 ppm
F3B	Plain fries, salt only	52 ppm	62 ppm	29 ppm	31 ppm
F4A	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F4B	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F5A	Plain fries, salt only	11 ppm	7 ppm	< 10 ppm	< 10 ppm
F5B	Plain fries, salt only	11 ppm	9 ppm	< 10 ppm	< 10 ppm
F6A	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F6B	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F7A	Plain fries, salt only	19 ppm	15 ppm	< 10 ppm	< 10 ppm
F7B	Plain fries, salt only	65 ppm	> 84 ppm	> 283 ppm	> 283 ppm
F8A	Plain fries, salt only	28 ppm	23 ppm	< 10 ppm	< 10 ppm
F8B	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F9A	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F9B	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F10A	Plain fries, salt only	< 5 ppm	< 5 ppm	< 10 ppm	< 10 ppm
F10B	Plain fries, salt only	24 ppm	22 ppm	< 10 ppm	< 10 ppm
Gluten levels of wheat flour and oil mixture in microwave control **					
Temp.	Sample tested	Sandwich Extraction 1	Sandwich Extraction 2	Competitive Extraction 1	Competitive Extraction 2
Unheated	Wheat flour & oil mixture (60 ppm)	72 ppm	55 ppm	165 ppm	109 ppm
Heated to 190°C/374°F	Wheat flour & oil mixture (60 ppm)	49 ppm	60 ppm	16 ppm	< 10 ppm

Figure 1. Milligram amount of gluten in restaurant fries at various ppm levels



10 mg of gluten per day is generally considered by experts to be a tolerable amount for most individuals with celiac disease

Results

Fries

- Using the sandwich R5 ELISA, quantifiable gluten was found in 45% of fry orders ranging from 7 to > 84 ppm
- 25% of fry orders tested above 20 ppm of gluten
- Fries from 6 of the 10 (60%) restaurants were found to contain quantifiable levels of gluten
- Using the competitive R5 ELISA, gluten was found in 15% of fry orders ranging from 14 to >283 ppm

Microwave Control

- The unheated oil and wheat flour mixture tested at a mean level of 64 ppm of gluten using the sandwich R5 ELISA & 137 ppm of gluten using the competitive R5 ELISA
- The oil and wheat flour mixture heated to 190°C/374°F tested at a mean level of 55 ppm of gluten using the sandwich R5 ELISA and <10 ppm & 16 ppm of gluten using the competitive R5 ELISA

Conclusion

- Gluten cross contact may occur when gluten-free foods are cooked in shared fryers with wheat
- Consumers with celiac disease should continue to avoid foods cooked in shared fryers
- Gluten levels are likely underestimates due to the limitations of the analytical methods available for gluten analysis of foods heated to high temperatures

References

¹R-Biopharm AG. RIDASCREEN® Gliadin, Art. Nr. R7001 Instructions. <https://food.r-biopharm.com/wp-content/uploads/sites/2/2016/05/R7001-Gliadin-15-10-09.pdf>

²R-Biopharm AG. RIDASCREEN® Gliadin competitive Art. No. R7021 Instructions. <https://food.r-biopharm.com/wp-content/uploads/sites/2/2016/10/R7021-Gliadin-competitive-16-09-21.pdf>