BUILDING BETTER BAKERIES: SAFETY EVALUATION OF GLUTEN-FREE GOODS FROM FRONT RANGE PRODUCERS

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Introduction

- Approximately 13% of Americans report following a gluten-restricted diet driven in part by dietary restrictions resulting from increased rates of celiac disease and other gluten sensitivities.
- Regulations for labeling gluten-free foods defined by WHO/FAO Codex Alimentarius Commission specify a limit of 20 ppm gluten, however, some individuals with celiac disease have been shown to respond to gluten content below this threshold.
- Cross-contact, or the unintended transfer of gluten to gluten-free products during preparation or handling, is a known risk for gluten contamination in dining establishments.
- Recent data highlight significant knowledge gaps among artisanal bakers across the state of Colorado regarding gluten as an allergen-like protein, celiac disease, and the risks of cross-contact in gluten-free food production.
- Education regarding food safety risks related to gluten and implementation of proper hygiene control protocols are necessary for protecting gluten-sensitive individuals, but the efficacy of current training protocols is currently unknown.

Internship Goals

- Evaluate the frequency of gluten cross-contact in artisanal GF baked goods produced in the Front Range.
- Develop informational materials about gluten contamination and celiac disease for food producers across the state of Colorado.

Education & Career Relevance of Internship

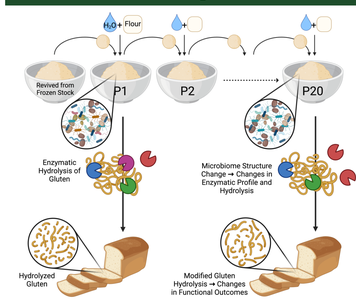

Figure 1 Microbial diversity in sourdough starters may influence their functionality in celiac-safe food production.

As a doctoral student in Food Science, this project aligned with my ongoing research into the effects of fermentation on the inflammatory properties of gluten protein (**Fig. 1**). Participation in this internship allowed me to expand my technical skills in the laboratory, reinforce food safety concepts from coursework and practice the application of my knowledge through the development of effective outreach materials for industry professionals.

Methods

Sample Collection

A total of 32 gluten-free baked goods (**Fig. 2**) from 16 bakeries across the Front Range were tested for gluten content to determine if they meet legal requirements to be considered gluten-free using a commercial enzyme-linked immunosorbent assay (ELISA) (**Fig. 3**).

Figure 2 Gluten-free baked goods.

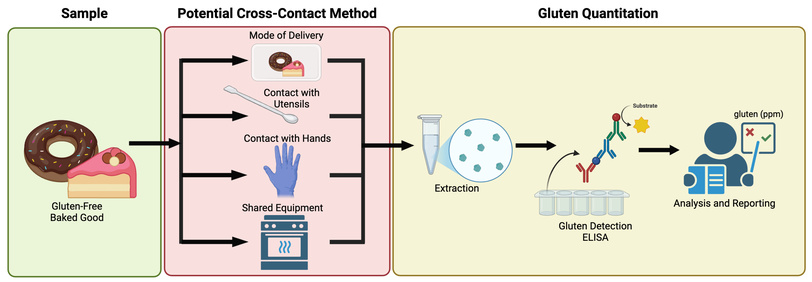

Figure 3 Sampling and analysis scheme for identifying potential cross-contact of gluten-free baked goods with gluten.

Safety Evaluation

During sample collection, dining establishments were observed for their adherence to current recommendations for avoiding cross-contamination, including:

- **Allergen Disclaimer:** Display of a short statement informing customers about the possible presence of allergens in a product.
- **Service Counter:** Surface between employee and customer is free of flour or food debris.
- **Food Preparation Workspace:** Surfaces in direct contact with gluten-free foods are either completely separate or cleaned between uses.
- **Storage Environment:** Items are stored separately from gluten-containing foods.
- **Employee Handling:** Gloves are changed, or hands washed regularly.

Figure 4 Examples of food handling and display methods used by bakeries visited for this study.

Results

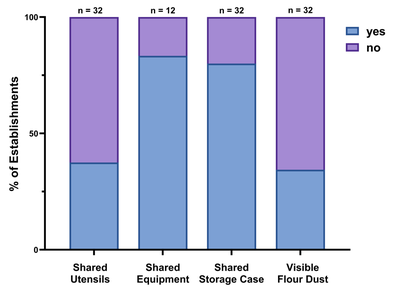

Figure 5 Establishments types visited include café, bakery, and restaurant. Food production and handling practices varied per establishment. (A) Shared utensils (B) Shared equipment; fewer samples were included due to preparation workspace visibility limitations (C) Shared storage case (D) Visible flour dust on surfaces.

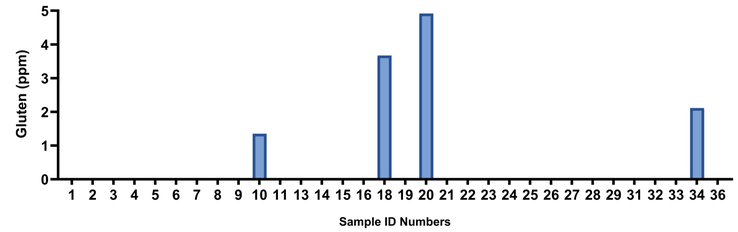

Figure 6 Of the 32 samples collected from 16 unique establishments, only 4 contained gluten. Notably, the legal limit of detection is 20 ppm.

Conclusions

- In total, 75% of the samples collected were served from shared storage cases.
- Gluten detection fell below the legal limit of detection for all samples.
- Four samples showed evidence of potential cross-contact with a gluten-containing product. Though the levels were below the legal limit of 20 ppm, this reduced level has still been shown to trigger a response in some individuals with celiac disease.
- Three of the gluten-positive samples came from facilities with visible preparation areas, where food debris on surfaces and inconsistent handling practices were observed.

Next Steps

- Our findings will be used to inform professional development training for employees of the food industry.
- These data will be used to write a proposal to continue our research through the Food Safety program area of USDA NIFA.

Acknowledgments

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