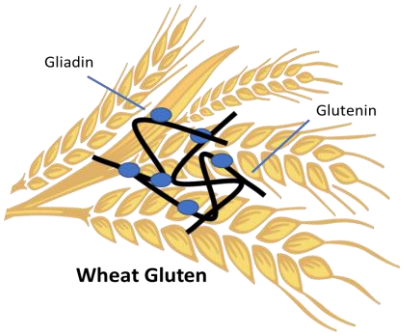
Food Allergy: Gliadin

Celiac Disease (CD), an allergic reaction against gluten, is not considered urgent as it does not induce anaphylactic shock. However, for sensitive individuals, repeat gluten exposure can damage the small intestine, resulting in chronic inflammatory conditions. CD is often a misdiagnosed autoimmune disorder and no definitive treatment for CD exists (1).

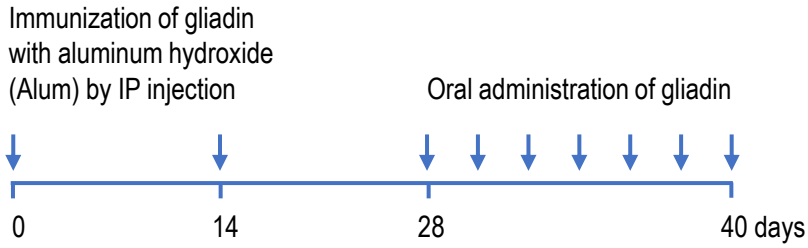


Celiac Disease Model

Many protocols have been published for inducing mouse CD models for wheat-gliadin allergy. The following are sample protocols for allergen challenge procedures using gliadin (one of the allergens in gluten) which are evaluated for humoral immune responses such as serum anti-gliadin IgE and IgG1 antibodies and intestinal permeability (2, 3).

1) Immunization and Oral Sensitization Model (3, 4)

BALB/c mice are sensitized twice, 2 weeks apart, with 50 µg of gliadin adsorbed to 1 mg of aluminum hydroxide by intraperitoneal injection. Two weeks after the second sensitization, the mice are orally administered 10 mg of gliadin in water via an intragastric feeding needle every other day for a total of seven times.

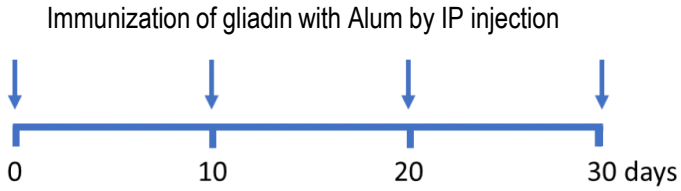


Evaluation:

- Intestinal permeability
- Serum gliadin-specific IgE/IgG1 levels
- Serum gliadin peptide levels
- Serum histamine levels

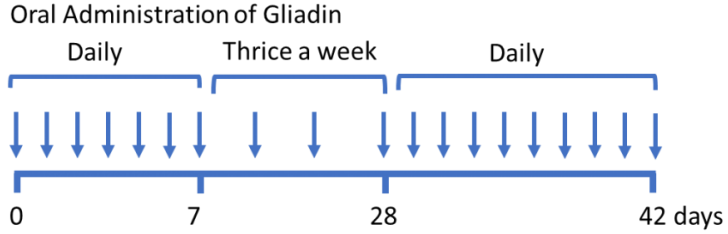
2) Immunization Only (5)

BALB/c mice are sensitized with 10 µg of gliadin adsorbed to 3% aluminum hydroxide by intraperitoneal injection at days 0, 10, 20 and 30.



3) Oral Immunization Only (6)

BALB/c mice are challenged by oral gavage with gliadin (5 mg/day for 1 week, then 5 mg/day thrice a week for 3 weeks) for 4 weeks. At the end of the fourth week, the mice are challenged with gliadin every day via oral gavage for another 2 weeks.



Food Allergy: Gliadin

Evaluating Wheat-Gliadin Allergy Models

In a wheat-gliadin allergy mouse model, serum histamine levels, a marker of mast cell degranulation, were significantly higher than controls. Serum IgG1 and IgE antibody levels against gliadin were also significantly higher, but not IgG2a and IgA antibody levels. In addition, serum cytokine levels showed higher IL-4 (Th2 cytokine) but not IFN-g and IL-12 (Th1 cytokine) and IL-17 (Th17 cytokine), and IL-10 and TGF-b (regulatory T cytokine) levels (3, 4). These results suggest that the Th2 response plays a dominant role in the development of the disease in mice. In another gliadin model, intestinal permeability was evaluated by FITC-dextran 4kDa (6). Therefore, markers for the evaluation of wheat-gliadin allergy in mouse models must be considered and chosen depending on the induction protocols.

It is important to evaluate the ratio of anti-allergen IgE antibody levels to total IgE (non-specific) levels which are also elevated in successfully developed mouse allergy models. Chondrex, Inc. offers the following ELISA kits which can evaluate humoral immune responses in mouse allergic models. For more information about these kits, please visit www.chondrex.com or contact support@chondrex.com.

Products	Catalog # Anti-Gliadin	Catalog # Total Immunoglobulin
IgG Antibody Assay	3051	3023
IgG1 Antibody Assay	3052	3025
IgG2a Antibody Assay	3053	3026
IgG2b Antibody Assay	3054	3027
IgG3 Antibody Assay	Coming soon!	3028
IgM Antibody Assay	3055	3024
IgA Antibody Assay	Coming soon!	3019
IgE Antibody Assay	3050	3005

*Individual monoclonal antibodies against allergens are also available. Please visit www.chondrex.com for more information.

References

1. N. Inomata, Wheat allergy. Curr. Opin. Allergy Clin. Immunol. 9, 238–243 (2009).
2. F. Battais, T. Mothes, D. A. Moneret-Vautrin, F. Pineau, G. Kanny, Y. Popineau, M. Bodinier, S. Denery-Papini, Identification of IgE-binding epitopes on gliadins for patients with food allergy to wheat. Allergy. 60, 815–821 (2005).
3. R. Abe, N. Matsukaze, Y. Yamaguchi, M. Akao, H. Kumagai, H. Kumagai, Wheat gliadin deamidated by cation-exchange resins induces oral tolerance in a mouse model of wheat allergy. Journal of Food Bioactives. 2, 119–128 (2018).
4. R. Abe, S. Shimizu, K. Yasuda, M. Sugai, Y. Okada, K. Chiba, M. Akao, H. Kumagai, H. Kumagai, Evaluation of reduced allergenicity of deamidated gliadin in a mouse model of wheat-gliadin allergy using an antibody prepared by a peptide containing three epitopes. J. Agric. Food Chem. 62, 2845–2852 (2014).
5. M. Bodinier, M. Leroy, S. Ah-Leung, F. Blanc, O. Tranquet, S. Denery-Papini, J.-M. Wal, K. Adel-Patient, Sensitization and elicitation of an allergic reaction to wheat gliadins in mice. J. Agric. Food Chem. 57, 1219–1225 (2009).
6. E. Ferrari, R. Monzani, V. Saverio, M. Gagliardi, E. PaÅ„czyszyn, V. Raia, V. R. Villella, G. Bona, M. Pane, A. Amoruso, M. Corazzari, Probiotics Supplements Reduce ER Stress and Gut Inflammation Associated with Gliadin Intake in a Mouse Model of Gluten Sensitivity. Nutrients. 13 (2021)