

New Oat Assay Completes Gluten Analysis Puzzle

What is 'Gluten'?

Gluten is a collective description for the main storage proteins (prolamins) of wheat, rye, barley, and oats, or their crossbred varieties, to which some individuals are intolerant. Gluten intolerance encompasses several types of gluten-related disorders, most notably coeliac disease, a common autoimmune condition of increasing prevalence¹. Symptoms of this disease are triggered by prolamins from wheat (gliadin), rye (secalin), barley (hordein) and, in some patient populations, oats (avenins)².

Avoidance of gluten in the diet is the cornerstone of coeliac disease management and therefore analysis to detect and quantitate gluten from wheat, rye, barley, and oats constitutes a crucial element of this dietary treatment.

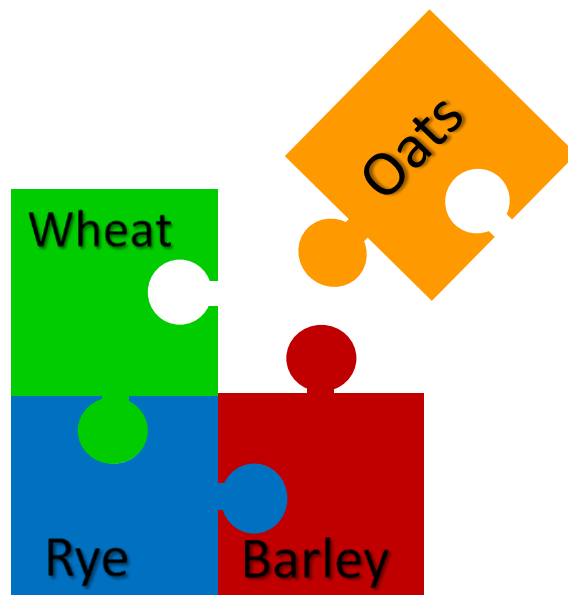
Immunoassays for Gluten

Although a variety of immunoassays have been developed that allow for the detection and quantitation of wheat, rye and barley prolamins, there has not been a kit available for oat prolamins until now. The ELISA Systems Oat Protein Detection kit specifically detects oat avenins allowing quantitative detection of oat gluten, therefore fulfilling a much-needed role in the gluten analysis of food. The absence of cross-reactivity with other gluten prolamins ensures the assay is also complementary with existing gluten assays to facilitate the complete quantitative monitoring of gluten-containing cereals.

The sensitivity of the oat kit is consistent with current commercially available gluten kits which have Limits of Quantitation ranging from 2 – 5 ppm gluten (for wheat this equates to approximately 2.5 -6.25 ppm total protein).

ELISA Systems Oat Protein Residue Assay Details:

<i>Format:</i>	Double antibody (sandwich) ELISA
<i>Specificity:</i>	Oat Avenin
<i>Lower Limit of Quantitation:</i>	2.5 ppm Oat Protein
<i>Upper Limit of Quantitation:</i>	25 ppm Oat Protein
<i>Extraction Time:</i>	20 mins
<i>Assay Time:</i>	50 mins



Specific Application Areas for the Oat Protein Detection Kit

Gluten allergen management

In a regulatory context, the CODEX Alimentarius Commission includes oats in its definition of gluten³, and this is also reflected in many national jurisdictions governing the labelling of gluten in foods. For example, in the EU, UK, Canada, Australia and New Zealand, the intentional addition of oats requires mandatory declaration on the label to indicate the presence of a gluten-containing grain. It is therefore important to have a specific analytical method that can monitor and quantitate oats in a

food production environment. The availability of the Oat Protein Detection kit therefore facilitates ingredient control and consequently may also promote increased use of oats as an alternative grain source to take advantage of its nutritional profile and cost benefits.

Verifying Gluten-Free status

In Australia and New Zealand, the requirements for Gluten-free labelling are regulated under the Food Code Standard 1.2.7 (Schedule 4), Nutrition, health and related claims. Currently, a food making a gluten-free claim must not contain:

- (a) detectable gluten; or
- (b) oats or oat products; or
- (c) cereals containing gluten that have been malted, or products of such cereals.

The distinction for oats largely reflects the previous lack of methodology to allow their detection in food. The Oat Protein Detection kit therefore represents an invaluable tool in verifying gluten-free status of ingredients and finished products. Further, the ability to now quantitate all gluten-containing grains should promote discussions on an acceptable threshold for non-intentionally added gluten. This would alleviate the issues regarding the development of increasingly sensitive gluten detection methodologies which make a non-detectable threshold impractical. It would also be in concordance with many other jurisdictions where up to 20 ppm gluten is permitted for gluten-free claims.

One additional aspect for consideration is the relatively low toxicity of oat avenins compared to the prolamins from the other gluten-containing grains. This is a consequence the very low immunogenicity of oat avenins in most coeliac patients and the fact that avenins make up only 10-15% of total oat protein^{1,4}. For this reason, many countries permit oats to be labelled gluten-free to indicate lack of contamination with the more toxic prolamins from wheat, barley and rye. In other jurisdictions, such as Australia and New Zealand, the use of a gluten-free claim on oats is prohibited.

Cleaning Validation and Verification

The new ELISA Systems Oat Protein Detection kit can test samples from raw and cooked products, nutritional supplements and environmental samples such as rinse waters and swabs. These quantitative and qualitative applications will allow validation of cleaning protocols and ongoing verification of allergen status.

References

- (1) Tye-Din *et al.* Celiac Disease: A Review of Current Concepts in Pathogenesis, Prevention, and Novel Therapies. *Front Pediatr.* 2018;6:350. doi:10.3389/fped.2018.00350.
- (2) Hardy *et al.* Ingestion of oats and barley in patients with celiac disease mobilizes cross-reactive T cells activated by avenin peptides and immuno-dominant hordein peptides. *J Autoimmun.* (2015) 56:56–65. 10.1016/j.jaut.2014.10.003).
- (3) Codex Alimentarius Commission. Foods for Special Dietary Use for Persons Intolerant to Gluten Rome: FAO-WHO (2008).
- (4) Tanner *et al.* Preparation and Characterization of Avenin-Enriched Oat Protein by Chill Precipitation for Feeding Trials in Celiac Disease. *Front. Nutr.* (2019) 6:162. doi: 10.3389/fnut.2019.00162.