THE ASSOCIATION OF EUROPEAN COELIAC SOCIETIES

# POSITION STATEMENT REGARDING GLUTEN-FREE BEER ANALYSIS METHOD LIMITATIONS AND THEIR SAFETY FOR COELIAC CONSUMERS

AOECS
Association of European Coeliac Societies

POSITION PAPER

# INTRODUCTION

Coeliac disease is an autoimmune condition caused by the ingestion of food containing gluten, which is a type of protein that can be found in cereal grains such as wheat, barley and rye.

Coeliac disease may affect up to 1,4% of the global population. When undiagnosed, it can lead to symptoms ranging from minor discomfort to life-threatening conditions, such as severe anaemia.

Currently, the only known effective treatment is a strict, life-long, gluten-free diet.

The Association of European Coeliac Societies (AOECS) is a non-profit umbrella organisation comprised of national coeliac societies in Europe and worldwide.

Together with its members, AOECS represents the voice of coeliac patients and their families in over 40 countries.

The AOECS owns the AOECS Standard for pre-packaged food products and the Crossed Grain Trademark, which is managed by its National Coeliac Societies in their respective countries.

Consequently, thousands of safe gluten-free food products are available on the market and easily recognisable by any consumer.

The AOECS Standard fully adheres to the Codex Alimentarius, which is the collection of standards and guidelines jointly established by FAO and WHO to protect consumer health.

AOECS is an observer member of the CODEX Commission, to advocate for coeliacs and ensure their specific concerns are taken into consideration.


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# GLUTEN-FREE BEER

Beer is generally produced from barley, a raw material that contains gluten. Beer is a fermented product through hydrolysis process. During the *hydrolysis process*[1], the gluten prolamin molecules are broken down into smaller peptides by the addition of yeast and enzymes that breaks molecular bonds. This makes gluten more difficult to detect.

Legislative frameworks might differ worldwide, and both patients and beer producers may encounter different criteria in different markets.

At the European Union level, there is a legislative framework that outlines the peculiarities of the production and safety of hydrolysed products, which need to be taken into consideration by both coeliac patients and beer producers:

- The CODEX Commission under Codex Standard 118-1979 considers hydrolysed gluten-free products as being safe for consumption by people with coeliac disease.
- In Europe, the European Food Safety Authority (EFSA), has not published any opinion or benchmark study regarding the analysis of hydrolysed gluten-free products.
- Current scientific evidence and EU law support licensing and labelling beers made from barley or other cereals as gluten-free products[2].

Therefore, brewers who wish to market gluten-free beers made from gluten-containing cereals such as barley or wheat must be sure that their product has been rigorously tested to ensure compliance with relevant legislation.

Furthermore, the Association of European Coeliac Societies (AOECS) allows the use of its Gluten-Free Trademark on packaged food, provided satisfactory verification against of the production environment and beer against the AOECS Standard.

*[1] A chemical reaction in which a molecule of water breaks chemical bonds.*

*[2] EU Regulation Nº 1169/2011, EU Regulation Nº 828/2014.*

# ANALYTICAL METHODS FOR GLUTEN-FREE BEER

Even if rigour testing is required, currently, the accuracy of gluten analysis in beer might be problematic.

Firstly, Gluten-free beer producers cannot fully control hydrolysis process and so the resulting, broken-down fragments of gluten generated during the process may be different from one batch to another and also from crops and location[1].

Furthermore, some methods are more capable at detecting hydrolysed gluten than others.

Gluten molecules that are (partially or entirely) degraded into small peptide fragments during the fermentation or hydrolysis process are not detected by the "Sandwich ELISA method"[2].

Current scientific evidence shows that hydrolysed gluten can be detected with "R5 competitive ELISA method", which is the method recommended by the CODEX Commission.

Therefore, for fermented or hydrolysed products such as beer, syrup, baby food or soya sauce, the CODEX Commission recommends the use of the R5 competitive ELISA method, which can detect the changed version of the protein.

AOECS Standard fully adheres to the Codex Commission recommendation.

In the last few years, new approaches and studies regarding the sensitivity of the analytical methods for testing gluten in hydrolysed products have been published[3], and novel proposals and methods to determine gluten have been developed as an alternative to ELISA[4]. AOECS and its member societies have closely followed this research.

Most of these studies and publications focus on beer as the main product of study, and some of them support the idea of possible limitations of the R5 competitive ELISA for the analysis of hydrolysed products. To overcome these potential limitations, scientific studies explore the use of analytical methods that show more sensitivity, such as Liquid Chromatography-Mass Spectrometry (LC-MS) or Lateral Flow Immunoassay (LFIA), to quantify the number of immunogenic peptides in the final product with more precision[5].

Although the approaches in these studies point to the effectiveness of their methods, it is important to keep in mind that:

- They are not yet validated to quantify gluten in hydrolysed products[6]
- Reference material for testing hydrolysed gluten-free foods is also an important limitation.

Therefore, further research is needed to accurately quantify gluten content in fermented-hydrolysed foods other than beer, as well as to define calibration standards for different fermentation processes, including hydrolysed process, which can avoid false negative results.

Establishing appropriate references that recognize the different protein and peptide profiles that may be present in final products will help ensure the accurate quantification of gluten[7].

AOECS concludes that all methods currently under examination have limitations and uncertainties, and therefore and until new evidence, the AOECS Standard continues to fully adhere to current CODEX Commission recommendation.

This approach is supported by the Prolamin Working Group (PWG), a multidisciplinary group of experts founded in 1985 to coordinate research on gluten analysis in food and their clinical implications for coeliac patients and other gluten-related disorders

In 2021, the PWG published a Position Paper that stated:

*"More scientific studies are needed to better understand MS-detection of residual gluten in beer and other fermented foods and also to ensure that the R5 competitive ELISA picks up each peptide fragment it should".*

The PWC Position Paper highlights the need to further explore the use of LC-MS and its results, while also acknowledging that the high cost of this method makes it difficult to implement.

AOECS collaborates closely with the PWG and encourages the entire scientific community to promote further research on utilizing alternative methods such as LC-MC, G12 competitive ELISA, or a combination of different antibodies like multiplex ELISA[8].

*[1] H.G. Watson et al. 2018, M.P. Fernández-Gil et al. 2024.*

*[2] Fernández-Gil et al. 2021.*

*[3] K.A. Scherf et al. 2018, H.G. Watson et al. 2019; Fernández-Gil MdP, 2021.*

*[4] A. Cebolla et al. 2018.*

*[5] Liao, YS. Et al 2017, Ja Myun Yu et al. 2021, V. Segura et al. 2023.*

*[6] AOAC Official Methods of Analysis: 22nd Edition, 2023, European Brewery Convention Method 9.51: "Determination of gluten in beer using the R5 Competitive ELISA method.*

*[7] Panda R. et al. 2019.*

*[8] Panda R. et al., 2017.*

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# HEALTH IMPLICATIONS FOR PEOPLE WITH COELIAC DISEASE

Even well-managed coeliac disease with a strong adherence to the gluten-free diet implies an exposure to gluten, mostly inadvertently. This uncontrolled exposure to small amounts of gluten can trigger the autoimmune response, which makes it necessary to study the immunogenicity of remaining peptides[1].

The evaluation of the immunogenicity of gluten-derived peptides, can only be evaluated by clinical studies. However, current studies do not have enough *in vivo models*[2] to clearly define the effects caused by the consumption of remaining peptides on coeliac patients. Only some small in-vitro experiments have been published.

Furthermore, most of the studies carried out at this point put the scope on the analytical method for gluten detection, the chemical composition of the peptides or the immunogenicity of the different peptide fragments. However, none of them consider the direct implications of the immunogenic activity of the remaining peptides on patients with coeliac disease.

AOECS emphasises that more clinical studies are needed and, it encourages researchers to design them and set them up in collaboration with patients, following a “beer non-consumption approach” which be more aligned with the “no harm” and other ethical principles for clinical trials with humans.

[1] *Syage et al. 2018*

[2] *There are two forms of research in pharmaceutical testing: in-vivo and in-vitro (Latin names). In-vivo means ‘within the living’ and occurs on a living organism, while in-vitro means ‘in glass’ – the testing often takes place on cultured cells in a glass testing receptacle.*

# CONCLUSIONS

- At this point, there is limited evidence to say that the R5 competitive ELISA, which is the official method of analysis recommended by CODEX Commission, cannot effectively quantify gluten in hydrolysed products, and hence, one cannot conclude that gluten-free beers are unsafe for coeliacs.

- The potential immunogenicity and inflammatory effects of the detected fragments can only be evaluated by clinical studies. Currently, there are no validated in-vitro models to assess the effects of the remaining peptides on individuals with coeliac disease.

- Although LC-MS is more sensitive than the R5 competitive ELISA, it has not yet been validated to reliably quantify the amount of gluten in beer, so it is not yet an approved method for the detection of gluten. Furthermore, it is too expensive and too demanding in terms of time and skills for the manufacturers to implement it in their production routine.

- New methods for the analysis of hydrolysed products must be studied. Exploring alternative analysis methods is important for food safety, not only in relation to gluten-free beer, but also in relation to other fermented or hydrolysed products that are consumed by coeliacs and so, must be added to the scope of research. AOECS encourages researchers from independent parties, such as the Prolamin Working Group, PWG, to carry out further studies.

- The lack of appropriate calibrants that reflect the protein/peptide profiles is another line of study to be further explored. It is necessary to distinguish between the profiles to define appropriate calibration standards and quantify them properly.

- AOECS encourages producers to use accredited laboratories to their gluten-free beer production analytical controls.

- According to EU Legislation, beer can be labelled as gluten-free even if brewed from cereals containing gluten, and may contain detectable traces of gluten, if these traces are below the 20 mg/kg limit.

- AOECS continue allowing the use of its Gluten-Free Symbol on beer which production has been previously verified against the AOECS Standard which adheres to the R5 competitive ELISA, until alternative methods that can better detect trace gluten are recognised by CODEX.

- AOECS and its Member Societies in the respective countries want to avoid unnecessary fears and help coeliac patients make informed decisions by choosing products that bear the AOECS Gluten-Free Symbol and an Alphanumeric Product Code available on the product packaged. This guarantees the product has been rigorously verified against the AOECS Standard.

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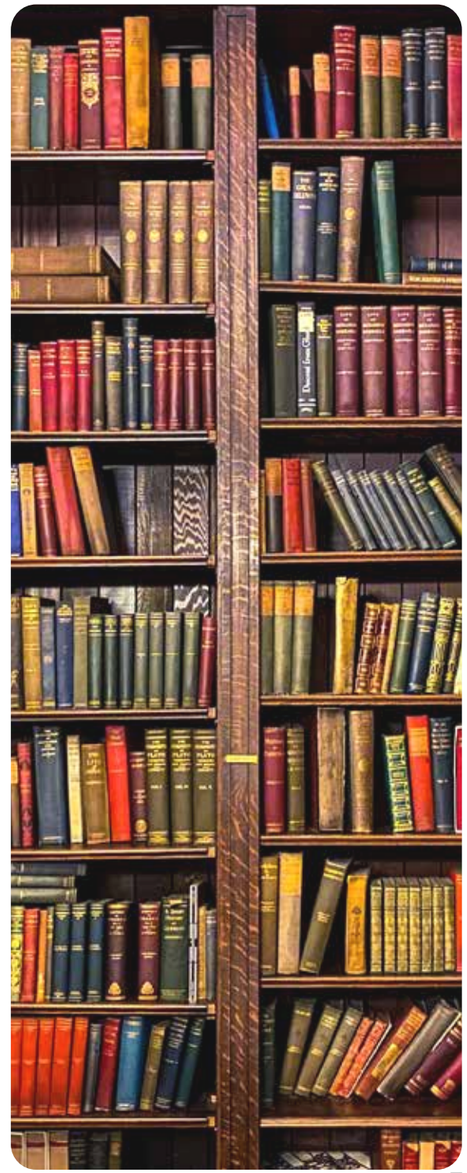

# ABOUT AOECS

AOECS is an independent, non-profit organisation. Since 1988, we have been dedicated to improving the lives of people affected by coeliac disease. AOECS represents 39 European national coeliac member societies and five affiliated coeliac organisations from outside of Europe.

Coeliac disease (also spelled celiac disease) is an autoimmune disorder in which cereals containing gluten trigger an inflammatory reaction in the small intestine.

It is estimated that around 100 million people worldwide suffer from coeliac disease. However, only about 25% of them have received a diagnosis; the rest are either unaware of their condition or suffer from various related ailments.

If left untreated, the disease can lead to a severely reduced quality of life and symptoms such as infertility, osteoporosis and chronic fatigue.

As of today, the only known cure for coeliac disease is a lifelong, strict gluten-free diet.

Read more on www.aoecs.org

Young girl overwhelmed by the selection at a gluten-free festival in the Netherlands.

AOECS Position Paper 20240919_Beer_v2 Published in September 2024 

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