

Test kit for the detection of toxic gluten in food products

Celiac disease is an intestinal disorder caused by gluten intolerance. Gluten is the generic name for a group of proteins present in countless varieties of grain; different types of grain may contain different types of gluten. Celiac disease affects at least 1 in 200 of the population of the western world, which renders it one of the main food intolerances.

A test developed by Leiden University Medical Centre (LUMC) and perfected by the Celiac Disease Consortium accurately detects the presence of specific gluten fragments that are toxic to celiac sufferers. The test has been patented and offers clear benefits in relation to existing tests available commercially, which are less specific or detect only a portion of the toxic fragments. The test is currently suitable for use in specialized laboratories. The intention is to further develop the test in cooperation with a commercial partner, to render it suitable for use in a standard laboratory or even in the home. The test is one of the key elements for the development of food products that are safe for celiac patients; the food industry has therefore already expressed substantial interest.

The test kit plays a crucial role in the search for safe cereals for Celiac Disease Patients.

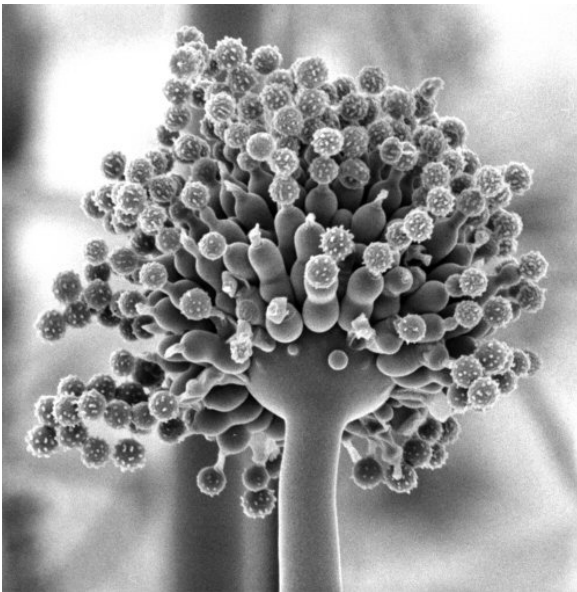
(Spaenij-Dekking EH et al, Gut (2004); Spaenij-Dekking L, Kooy-Winkelaar Y, and Koning F, New England Journal of Medicine (2005))



Enzyme breaks down gluten highly effectively

Gluten proteins are toxic to celiac sufferers. This toxicity can be partially attributed to the fact that the gastro-intestinal tract is not particularly effective in breaking down gluten. Gluten is rich in the amino acid proline, which complicates protein degradation by the enzymes present in the gastro-intestinal tract. As a result, toxic gluten fragments are left behind. Working in cooperation with DSM Food Specialities, the Celiac Disease Consortium has succeeded in showing that an enzyme developed by DSM from the fungal species *Aspergillus niger*, is capable of breaking down proline-rich proteins efficiently. Furthermore, this enzyme has also proven to be effective under the conditions present in the human stomach. As such, the enzyme can strip gluten of its toxic properties before it causes damage to the small intestine.

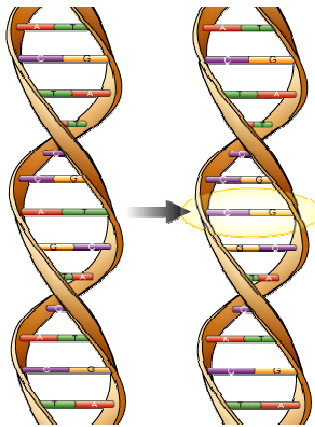
(Stepniak D, Koning F, Trends Biotechnol. (2006); Stepniak D et al, Am.J.Physiol Gastrointest.Liver Physiol (2006); Mitea C et al, Gut (2007))



New method for the diagnosis of celiac disease

Around 90% of patients with celiac disease possess the HLA-DQ2 gene and 5% the HLA-DQ8 gene. While the presence of (either of) these genes is an important precondition for getting the disease, it is not so that everybody with these genetic properties suffers from celiac disease. About 30% of the population carries HLA-DQ2, whereas only 0.5-1% of the population is ultimately affected. Nevertheless, screening for the presence of HLA genes can be useful. This is particularly true for families in which celiac disease already occurs, as these are more at risk. However, the costs of the current method for typing HLA genes form a major limiting factor. Researchers at the Celiac Disease Consortium in the University Medical Center Utrecht (UMCU) have defined a set of SNP markers that which have the high level of specificity and sensitivity required to distinguish HLA-DQ2 and HLA-DQ8. It is possible, using only a limited number of SNP markers, to make a highly reliable prediction of whether a person has either of these genes. The significance of this result is that it offers a fast and relatively inexpensive method for screening large groups of people for the presence of the HLA-DQ2 and HLA-DQ8 gene. This information could then be used to prevent the carriers of either of these genes from actually developing celiac disease.

(de Bakker PI et al, Nat.Genet. (2006))



Teff safe alternative for celiac patients

Eragrostis tef (Teff) is a cereal traditionally cultivated in Ethiopia that is only remotely related to wheat. Teff has a high nutritional value and offers a broad range of applications in food production. A test developed by the Leiden University Medical Center (LUMC) has shown that Teff is completely gluten-free, meaning it can probably be accommodated in the diet of patients suffering from celiac disease. The Celiac Disease Consortium and the Netherlands Celiac Association (NCV) carried out a joint study to determine whether patients also experience Teff as a safe and practical alternative to wheat. The results of this questionnaire showed that already 50% of the patients use or used Teff in their diet. Most of these users are satisfied with the product and there was no increase in CD related complaints after Teff use compared to a normal gluten free diet. (Spaenij-Dekking L, Kooy-Winkelaar Y, and Koning F, New England Journal of Medicine (2005))

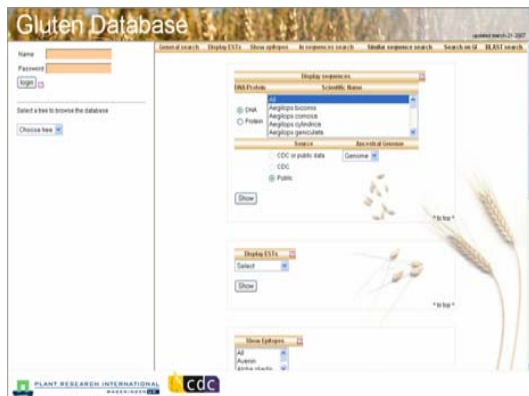


Gluten genomics database

The gluten genomics database developed by the CDC integrates different types of data and is suited to store both the available public data, as well as the data generated within the consortium.

Data types involved include: gluten molecular data (DNA & protein sequences, epitopes), taxonomic data (species, accession, ancestral genome), genetic data (genes, alleles, gluten protein banding patterns), phenotypic data s.l. (e.g. toxicity, industrial quality). Special emphasis is put on developing means to store parameters relating to the 'quality' and the source of the data included in the database. There are several possibilities to search the database and also an algorithm that can predict the sensitivity for deamidation of a protein sequence is available.

<http://appliedbioinformatics.wur.nl/glutendb/index.html>



Healthy Oats

In the field of gluten-free products the CDC cooperates with Bake Five, an industrial bakery, to develop gluten-free products based on oats. This activity has resulted in building a "haverketen consortium" (oat-chain consortium), where a seed trader, a cultivation organization, a marketing organization, the NCV and several research institutions have committed themselves to. The first phase of this project has been approved for funding as an innovative practice project by TransForum Agro&Groen.

Aim of this project is the set-up of a chain which provides high-quality products on the basis of oats. These products are not only meant for celiac disease patients but will be promoted as healthy products in general. A favorable property of oats is that it can be eaten by a majority of the celiac disease patients without causing complaints. Oats are for these patients an important and valuable substitute for wheat, barley and rye and an important supplement on the daily diet. The problem however is that these oat products may not be contaminated with gluten from wheat, barley or rye. Therefore in the first stage of this project focus will be on the establishment of a 100% gluten free food chain for oats which doesn't exist in the Netherlands.



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