

GM Bread Making Promising Strides Against Celiac Disease

By *Nicholas Staropoli* — September 3, 2015



[1] Credit: Aidan via flickr

One thing is for sure: It's hard to miss all the gluten free signs at grocery stores and in restaurants. For some, "gluten free" has become a mantra, as well as a trendy diet. For others, this food subset has always been a necessity for a segment of the population allergic to the gluten protein. And for those suffering from celiac disease, ingesting the protein causes an insufferable amount of pain and discomfort. However, a new genetically engineered (GE) wheat, which is moving towards human trials with bread made from the crop, promises to help expand the gluten-free menu when it becomes available later this year.

The [genome of the common wheat plant](#) [2] (also known as bread wheat, or by its scientific name, *Triticum aestivum*) is very complex. *T. aestivum* has three different genomes from three separate grass species. Genes for gliadins, a component of gluten, are found on two separate chromosomes, but with the three genomes, which makes six locations. All told there are between 50 and 70 genes that produce functional gliadins. This has also made it nearly impossible to make gluten free/reduced wheat via artificial selection, or other breeding techniques. To make a long story short, the process of genetically altering wheat -- in any way -- is a lot more complex than that of most other crops.

Despite this difficulty, one group of Spanish researchers, by silencing most of these genes, has had success in creating reduced gluten wheat. The team is led by Dr. Francisco Barro at the Institute for Sustainable Agriculture (IAS). In 2011, the team announced that it successfully made four lines of wheat with minuscule amounts of gliadins. When the researchers challenged T-cells from celiac patients with this wheat, the modified wheat produced a 95-percent less toxic reaction than normal wheat.

One of the surprises with these plants has been how they compensate for not producing the

gliadins. GE wheat produces 67 percent more of several vital nutrients and essential amino acids than normal wheat. Yet despite these changes, the wheat maintains the same texture, flavor and appearance of unmodified wheat. Further, bread made from the GE wheat has also been a great success, in that those who tested it preferred it to rice bread (a common gluten-free product) and find it similar in most ways to regular bread.

It should be noted that the bread is not completely gluten free, as there still remains a small amount of gliadins in the wheat. The best two strains of wheat reduced gluten content to 96 and 97 percent of that in non-modified wheat. Scientists predict someone with celiacs disease could eat between three and four slices of bread a day made from these strains without feeling the discomfort derived from consuming gluten-laden products.

The next step for this GE crop is a clinical trial, as [Dr. Barro and his staff](#) ^[3] are moving towards testing the bread with celiac disease sufferers. The team is recruiting between 40 and 90 subjects who will undergo a three-day consumption test. If all goes well, the subject group will then eat the bread daily for 3 months, in an effort for researchers to expand their knowledge of this staple of daily life.

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[2] <http://www.biofortified.org/2015/08/gluten-free-gm-wheat-can-help-celiac-patients/>

[3] <http://www.ideal.es/granada/culturas/201409/12/celiacos-granada-testaran-primer-20140912113759.html>