

Wheat and Gluten Sensitivity

Environmental Toxins
CU Boulder Jun 2013



Wheat

- This grain is grown on more land area than any other commercial food
- World trade in wheat is greater than for all other crops combined
- Leading source of vegetable protein in human food, having a higher protein content than soybeans or the other major cereals, corn or rice

Genetically Modified Wheat

- Wheat that has been genetically engineered by the direct manipulation of its genome using biotechnology
- Modifications:
 - Resistance to herbicides, insects, fungal pathogens and viruses
 - Tolerance to drought and heat
 - Resistance to salinity
 - Increased content of glutenin to aid bakers
 - Improved nutrition
 - Higher protein content, increased heat stability of the enzyme phytase, increased lysine content
 - Improved qualities for use as biofuel feedstock, production of drugs and yield increases

Genetically Modified Wheat

- As of 2013 NO genetically modified wheat is grown commercially
- May 2013 a strain of Genetically engineered glyphosate-resistant wheat was found on a farm in Oregon
 - Are other farms growing GM wheat unknowingly? Illegally?
 - Will the growth of GM wheat contaminate other wheat with the dispersal of seeds in the wind?

Gluten Sensitivity

- What are the causes of gluten sensitivity?
 - Celiac Disease?
 - Wheat allergy?
 - Non-Celiac Gluten intolerance?

Celiac Disease

- An autoimmune disorder of the small intestine that occurs in genetically predisposed people of all ages from middle infancy onward
- Stops the body from absorbing the nutrients it needs
- Causes:
 - Reaction to Gliadin
 - Gliadin is a gluten protein found in wheat
 - The enzyme tissue transglutaminase modifies the protein and the immune system cross-reacts with the small bowel tissue causing an inflammatory reaction

Gliadin

- Gliadin is a class of proteins present in wheat
- Gliadins and glutenins are the two main components of the gluten fraction of the wheat seed
- The proteins have an ability to activate the Celiac disease through the amino acid sequence
- Celiac disease can go unrecognized for a while which can cause damage to the bodies digestive system and cause other problems like lactose intolerance

Wheat Allergy

- Very rare allergy which can be a food allergy or a contact allergy
- The allergy is limited to the seed storage proteins of wheat or reactions across the varieties of seeds and other plant tissues
- Different from Celiac disease because different immune cells and antibodies are involved

Non-Celiac Gluten Intolerance

- Dysbiosis
- Low-nutrient diets
- Domestication of Wheat

Dysbiosis

- Damaged gut flora
- The immune system will see the products of microbial invasion from the dysbiosis and the undigested gluten fragment at the same time
 - This brings the immune system to think gluten fragment is the microbial invader
- Causes a gluten intolerance

Dysbiosis Causes

- Antibiotic use
- Consuming foods that are indigestible
 - Ex: feeding an infant wheat before it can digest it will cause dysbiosis
- Alcohol
- Toxins released in to environment
- The use of GMO in food supply

All can cause an imbalance in intestinal flora

Low Nutrient Diets

- Lacking Vitamin A causes the body to lose TGF-beta
 - TGF-beta stops the body's immune system of attacking harmless proteins
- Loss of TGF-beta allows the body to attack gluten thinking it is a dangerous protein when it is harmless

Domesticated Wheat

- Cultivation, repeated harvesting and sowing of the grains of wild grasses led to the creation of domestic strains
- Led to changes in grain size, shape, and range of phenotypic variation
- Shorter plants: about 18 in tall
- Different than traditional wheat
 - Change in a particular peptide strand in the gluten molecule
 - This peptide strand wasn't present in ancestral varieties of wheat and is the PRIMARY cause in the gluten intolerance

The RISE of Gluten Intolerance

- The main cause of gluten intolerance increase is that the proportion of gluten protein in wheat has increased a large amount due to hybridization
- With in the past few decades Gluten intolerance has only increased
 - Going from 1 in 2500 nationwide to 1 in 133 people
 - Will the rise continue to increase?
 - Is the increase due to awareness?
- Hygiene hypothesis:
 - Children not exposed to antigens in the environment when their immune systems are developing prevents the gut from developing an immune system against antigens
- Possible cures to the peptide strand is to allow for longer fermentation however this is still being researched

References:

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