



Celiac Disease & The Gluten-Free Diet

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THE UNIVERSITY OF CHICAGO
CELIAC
DISEASE CENTER

Why should I care about celiac disease, anyway?

- Celiac disease/allergies/gluten sensitivity are emerging diagnoses
 - Media attention
 - More physicians are aware
 - Increased prevalence
- Many want to believe gluten-free is the “right” method to lose weight/feel better/decrease abdominal discomfort

*'Go ahead honey,
it's gluten free!'*



A few statistics

- Celiac Disease is the most common genetically-induced food intolerance worldwide, with a prevalence around 1% (and growing!)
- Wheat is among the 10 most common allergens responsible for food allergy (Wang et al. *J Clin Invest*, 2011)
- Non-Celiac Gluten Sensitivity (NCGS) – diagnosis of exclusion; cases of gluten reaction in which both allergic and autoimmune mechanisms have been ruled out
 - Recent data indicate prevalence of NCGS is approximately 0.5% of a national representative sample of US residents (Scand J Gastroenterol, 2013)

Wang et al. *J Clin Invest*. 2011;121(3):827-35.

Venter et al. *Allergy*. 2008;63(3):354-9.

Inomata et al. *Curr Opin Allergy Clin Immunol*. 2009;9:238-243.

Mixed messages in media

- Emerging *Fad* Diet
 - Kim Kardashian tweets, *“Gluten-free is the way to be...”* May 7, 2012
 - *Miley Cyrus blames gluten-free diet as excuse for anorexia – Us Weekly, April 10, 2012*
 - *Chelsea Clinton chose gluten-free wedding cake – menu chosen due to health needs of “gluten-allergy”...should have a “trickle down effect”, July 29, 2010*
 - *Elizabeth Hasselback announces new book “G-free diet” due to an “aversion to gluten”– May 5, 2009*
- Gluten-free is EVERYWHERE
 - New food products popping up daily, food labeling is changing
- Gluten “Sensitivities” vs. Celiac Disease
 - May be a true diagnosis
 - Consumers are misled by inaccurate testing methods (IgG)

WHEAT BELLY



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* The people portrayed in this promotion experienced extraordinary results using Wheat Belly. **REGULAR EXERCISE AND PROPER NUTRITION ARE ESSENTIAL TO ACHIEVING AND MAINTAINING YOUR DESIRED PHYSIQUE.** Even using the same program of diet and exercise, individual results will vary. Results not typical.



Cardiologist William Davis, M.D.

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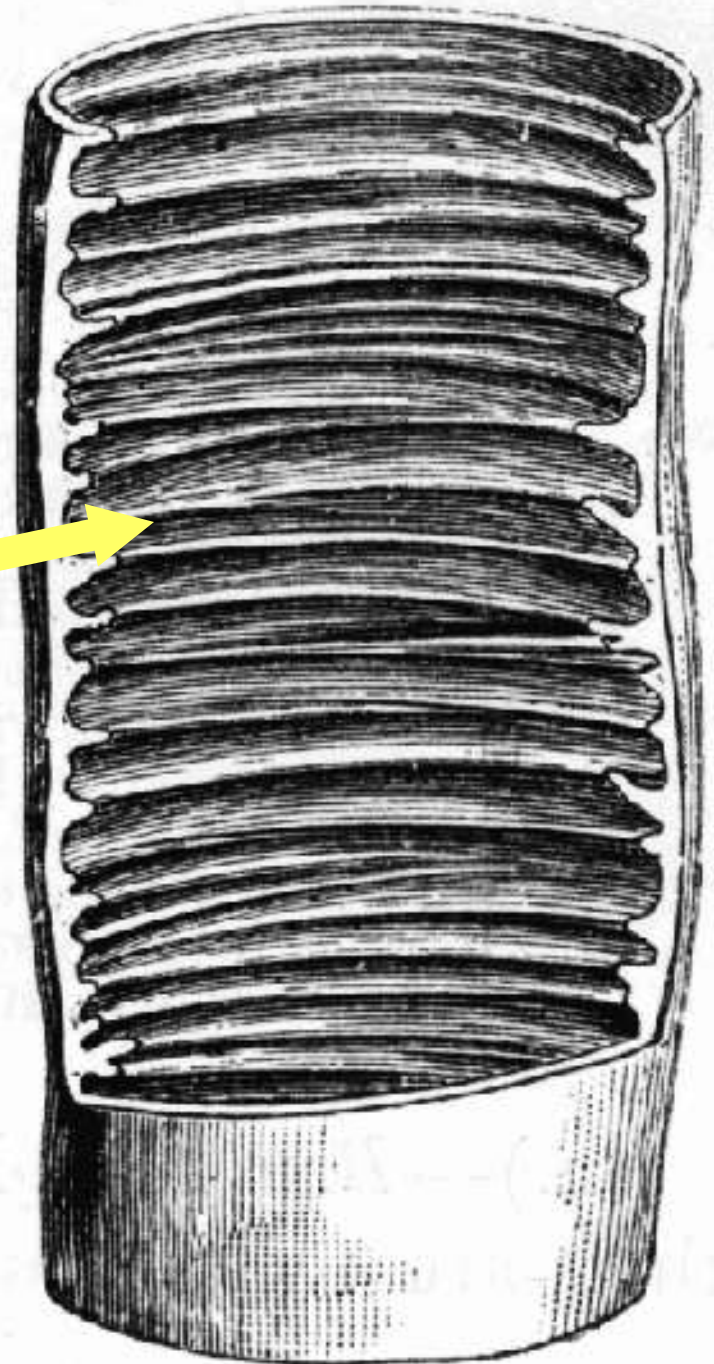
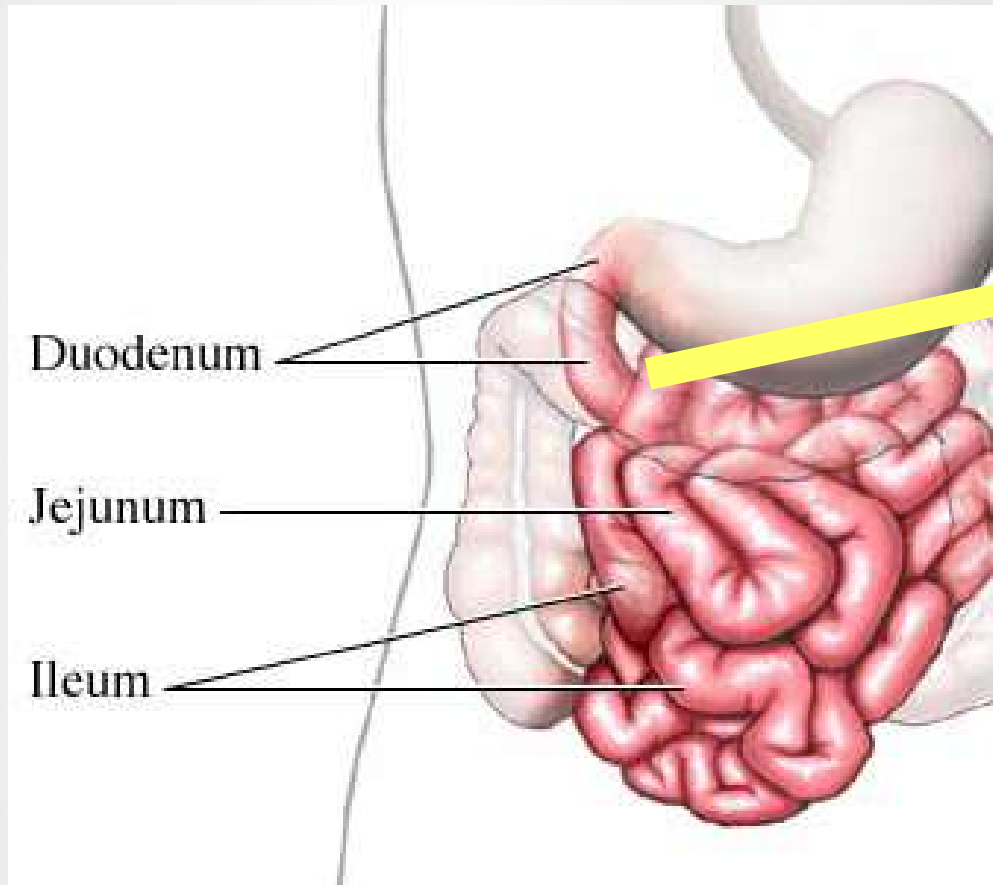
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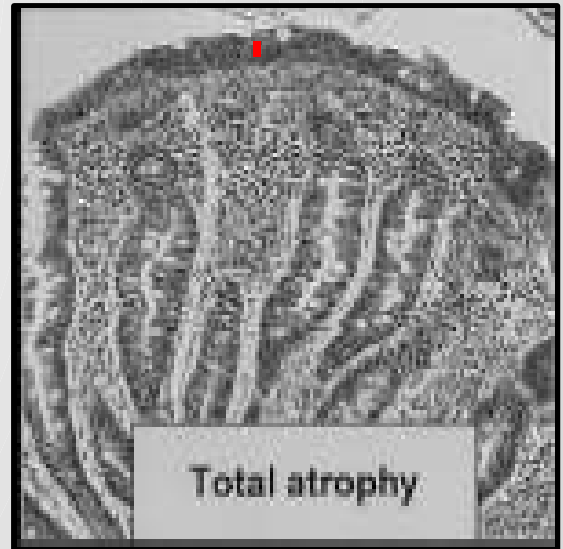
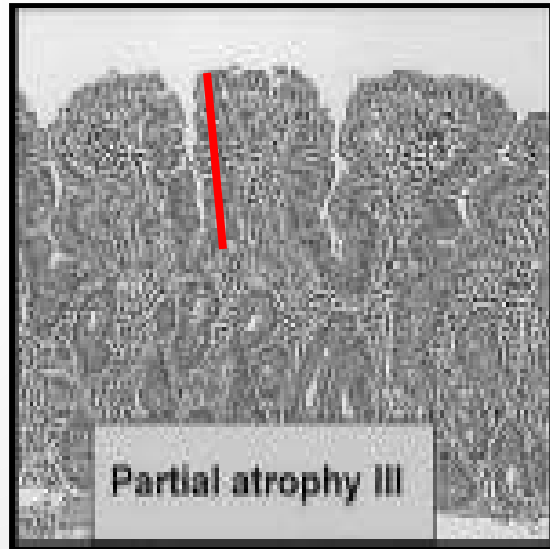
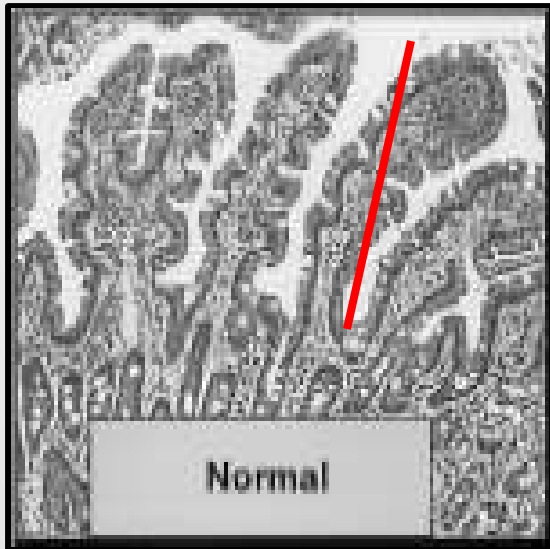
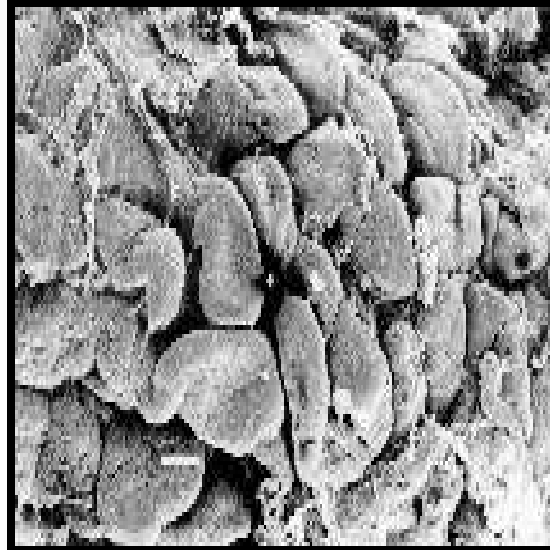
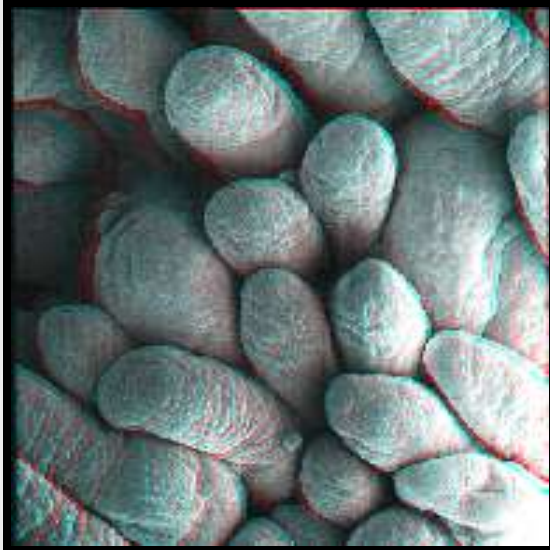
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Celiac Disease

- Intolerance to gluten (wheat, rye, barley)
 - Gluten = general name for storage protein (prolamins) found in these grains
- An autoimmune condition triggered and sustained by the ingestion of gluten in *genetically* predisposed individuals
- Causes an inflammatory damage of the mucosa of the small intestine with resulting malabsorption of nutrients



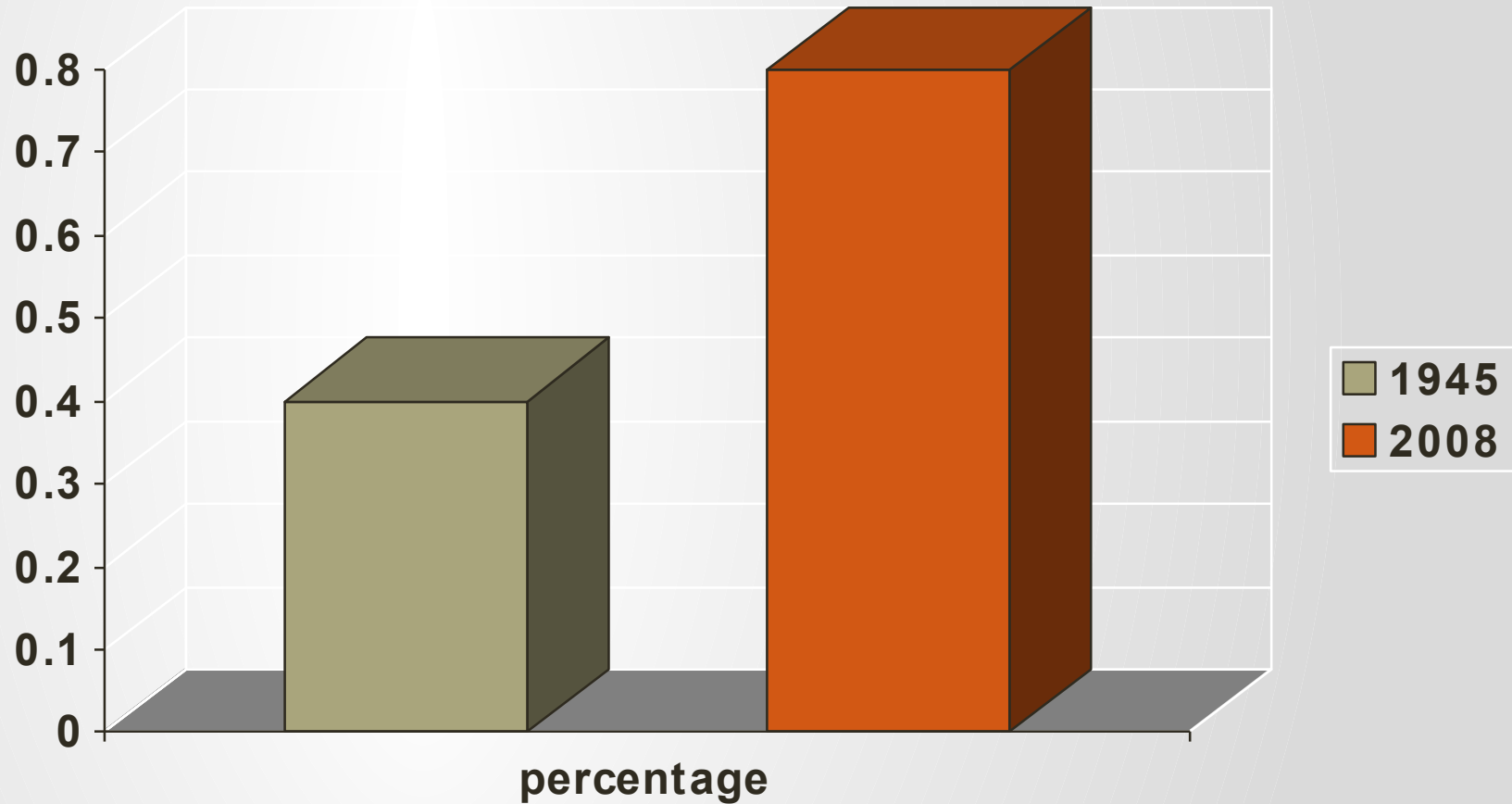
Progression of disease



The role of environment in influencing the development of CD

- Risk increased by:
 - Repeated rotavirus infections
 - Gluten introduced in first 3 months of life
 - Gluten introduced in large amounts
- Risk decreased by:
 - Prolonged breast feeding
 - Introduction of gluten during breast feeding
 - Introduction of gluten in right “time window” and in low amounts

Celiac Disease prevalence in the US is increasing



Celiac Disease Increase

-Increase in Gluten Content?

- Research from D. Kasarda, published in *Journal of Agricultural and Food Chemistry*, 2013 –
 - Hypothesis: Increase in incidence in celiac disease, due to increase in gluten content of wheat resulting from wheat breeding in US.
 - Survey of data from 20th and 21st centuries was carried out
 - Results indicated:
 - No clear evidence of an increase in gluten content of wheat during the 20th century
 - If there has been an increase in celiac disease, wheat breeding for higher gluten content does not seem to be the basis
 - Increase in intake of wheat and gluten *may* play a role
 - Lack of suitable data on incidence of celiac to test these possibilities

We are too CLEAN!

- Hygiene Hypothesis –
 - First proposed in 1989 by David P. Strachen
 - Analyzed 17K British children and found those who had grown up with more siblings (presumably with more germs) were less likely to have allergies and eczema
 - Since then, other explanations have been proposed but not defined
 - **What we do know:** immune system needs bugs. We rely on encounters with germs to protect our body
 - IF early exposure doesn't take place – immune system can become overly sensitive, reacting to non-threats as harmful
 - When combined with genetic traits = Allergies and Asthma

Celiac Disease: the “typical” presentation

- Most common gastrointestinal manifestations
 - Diarrhea
 - Vomiting
 - FTT or weight loss
 - Distended abdomen
 - Abdominal pain
 - Constipation

Extra-Intestinal manifestations “atypical”

- Dermatitis Herpetiformis and other skin disorders
- Short Stature
- Delayed Puberty
- Dental enamel hypoplasia
- Osteopenia/Osteoporosis
- Iron-deficient anemia resistant to oral Fe
- Hyposplenism
- Kidney stones
- Liver and biliary tract disease
- Arthritis
- Neurological problems
 - Ataxia
 - Peripheral neuropathy
 - Epilepsy
- Behavioral changes/Psychiatric Disorders
- Women Sub-In-fertility
 - Miscarriages
 - Low birth weight babies

Celiac Disease is more frequent in other autoimmune conditions

Type 1 Diabetes Mellitus	3.5 - 10%
Thyroiditis*	4 - 6%
Autoimmune hepatitis	6-15%
Addison disease	6%
Arthritis	1.5 - 7.5%
Autoimmune liver diseases	6 - 8%
Sjögren's syndrome	2 - 15%
Idiopathic dilated cardiomyopathy	5.7%
IgA nephropathy	3.6%

() 15% of CD have thyroiditis and 40% anti-thyroid antibodies*

Treatment



Therapeutic Strategies

- Detoxifying gluten before its ingestion
 - Lactobacilli-based sourdough bread from Italy
- Detoxifying gluten while in the stomach, before it reaches the small intestine
 - Using enzymes to completely digest gluten
 - From yeasts (*Aspergillus Niger*: AN-PEP)
 - From bacteria (ALV-003)
 - KumaMax
- Blocking gluten passage across the lining of small intestine
 - Anti-Zonulin (Lorazatide)
- Developing a “therapeutic vaccine” to restore gluten tolerance, thus CURING celiac disease

Gluten-Free Diet

- Avoid all food products containing wheat, rye, barley, and oats and their derivatives
- Gluten = general name for storage protein (prolamins) found in these grains
- Complete exclusion of these foods is essential

Label Reading



- FALCPA (Food Allergy and Labeling Consumer Protection Act)
 - Clear Labeling of top 8 allergens
 - Milk, eggs, soy, peanuts, tree nuts, fish, shellfish and WHEAT (excludes barley and rye)
 - The word “Contains” followed by the name of the major food allergen (milk, wheat, or eggs)
 - A parenthetical statement in the list of ingredients: albumin (egg)
 - Does not apply to meat, poultry, eggs, fresh fruit, alcoholic beverages or pharmaceuticals
 - Does not apply to major food allergens that are unintentionally added to a food as a result of cross contact
 - Does not require use of “may contain” statements
 - Shared storage, transportation, production equipment

Gluten Containing Grains: Foods to *AVOID*

- Barley
- Barley malt, extract
- Bran
- Bulgur
- Couscous
- Durum
- Einkorn
- Emmer
- Farina
- Faro
- Graham flour
- Kamut
- Matzo flour, matzo meal
- Orzo
- Panko
- Rye
- Seitan
- Semolina
- Spelt
- Triticale
- Udon
- Wheat
- Wheat berry
- Wheat bran
- Wheat germ
- Wheat germ oil
- Wheat gluten
- Wheat starch

Gluten-Free Grains:

Foods SAFE to Consume

- Amaranth
- Arrowroot flour
- Baking soda
- Bean flour
- Buckwheat
- Cassava (Manioc flour)
- Corn flour, cornmeal, cornstarch
- Cream of tartar
- Dal or Dahl
- Flax
- Gelatin
- Green pea flour
- Gums: acacia, carob bean gum, carrageenan, cellulose, gualaica, guar, karaya, locust bean, tragacanth, xanthum
- Invert sugar
- Kudzu lecithin
- Legumes: channa, chick peas, gram, lentils, peanuts, peas, soy
- Maltodextrin
- Maltiol (sweetener not related to malt)
- Mannitol
- Millet
- Montina™
- Molasses
- Mustard flour (ground mustard)
- Poi
- Potato flour
- Potato starch
- Quinoa
- Rice bran, rice flour, rice starch
- Sorghum
- Soy flour, soy starch
- Sweet potato
- Tapioca flour, tapioca starch
- Teff
- Tofu
- White vinegar
- Xanthum gum
- Yam
- Yeast

FDA Labeling Rule

- A product may be defined as “GF” if all the following are met:
 - Will not contain an ingredient that is any species of the grains wheat, rye, barley, or a crossbred hybrid of these grains (also referred to as “prohibited grains”)
 - Will not contain an ingredient that is derived from a prohibited grain and that has not been processed to remove gluten (e.g., wheat flour)
 - If the food contains an ingredient that is derived from a prohibited grain that has been processed to remove gluten (e.g., wheat starch), use of that ingredient may not result in the presence of 20 parts per million (ppm) or more gluten
 - The food product contains less than 20 ppm gluten

<http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Allergens/default.htm>.

How much exposure is safe?

- Complete gluten avoidance is extremely difficult
 - Exposure to trace amounts of gluten common even if product is sold as NATURALLY gluten-free
 - Safe threshold for gluten exposure = 10-100 mg
 - Daily intake of 30 mg of gliadin seems not to harm the intestinal mucosa
 - Amount of residual gluten in gluten-free products and the total intake of these products must be considered

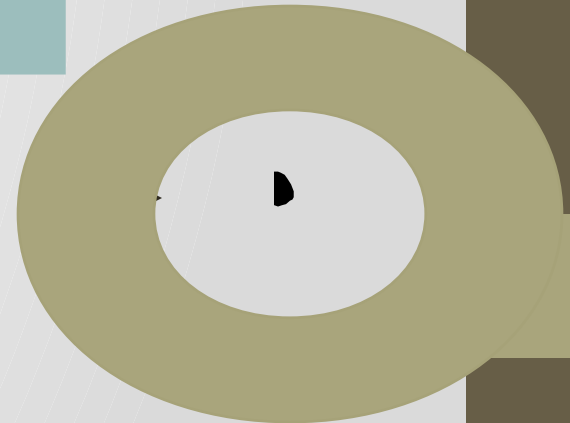
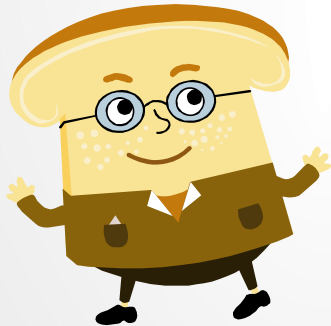


← 50 mg gluten

How much gluten exposure is safe (<100 mg gliadin)?

- On average, one typical slice of wheat bread is approximately 40 grams (weight)
 - Protein makes up 10% of the weight → 4 grams of protein.
 - Gliadin is 1/2 of the protein → 2 grams (200 mg)
 - If a toxic reaction to 100 mg of gliadin, it would take 50 slices to cause an intolerance

Less than 1/2 tsp
bread!!!



What about Oats?

- Research in Europe and the US
 - Oats are well-tolerated by most children and adults when consumed in moderation and do not contribute to abdominal symptoms, nor prevent intestinal healing.
- PLEASE NOTE: regular, commercially available oats are frequently contaminated with wheat or barley.
- “Pure, uncontaminated” oats are available from several companies in the US and Canada
 - These companies process oats in dedicated facilities and their oats are tested for purity. Pure, uncontaminated oats can be consumed safely in quantities < 1 cup per day.

Domino's Gluten-Free Crust

- Gluten Free for Celiacs?
 - Dominos Statement:
 - Pizzas made with Gluten Free Crust are made in a common kitchen. We **do not have a separate area in our kitchens** that are guaranteed free from gluten.
 - While the Gluten Free Crust is certified to be free of gluten, the pizzas made with the Gluten Free Crust use **the same ingredients and utensils** as all of our other pizzas.



The Gluten-Free Diet Plate

FRUITS

2-3 servings per day

- Choose fresh fruit
- Drink fruit juice in moderation
- Consume fruit with skin on to increase fiber content
- Try dried fruits as snacks

MILK & DAIRY PRODUCTS

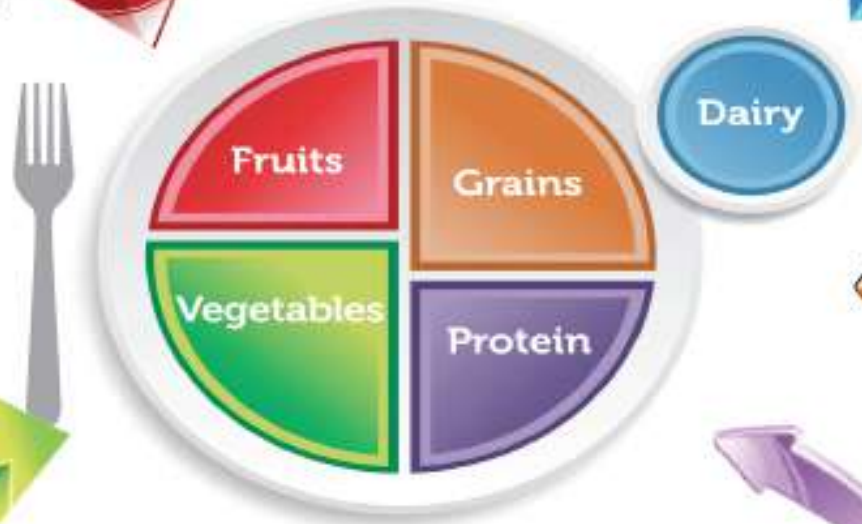
2-3 servings per day

- Choose low-fat dairy
- Read all flavored dairy products ingredients for presence of gluten
- Choose lactose-free alternatives if tolerating dairy is difficult

BREADS & CEREALS

6-9 servings per day

- Include whole grain choices such as:
Amaranth, Buckwheat, Brown Rice, Gluten-Free Oats, Legumes & Quinoa
- Choose less of the refined carbohydrates such as white rice, potatoes, and corn



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VEGETABLES

3-5 servings per day

- Choose bright colored vegetables frequently
- Avoid packaged vegetables with sauces that may be gluten-containing.

MEAT & BEANS

2-3 servings per day

- Choose lean meats more frequently
- Purchase pre-sliced meats
- Try beans at least one time per week

Gluten-free Alternatives

- Amaranth – high in protein, iron, magnesium, phosphorus, manganese
- Buckwheat – rich in iron, zinc, selenium
- Brown Rice
- Chia – omega 3, fiber, protein
- Legumes (garbanzo, lentil, pea flour)
- Oats (pure and uncontaminated) – high in fiber, iron
- Quinoa – high in manganese, magnesium, iron, iron, copper, phosphorus
- Sorghum
- Teff

HOW THESE FOODS MATCH UP...



Nutrition Facts Serving Size: 1 slice
 Amount per Serving **Calories** 90
 10% Daily Value **Total Fat** 1g 2% Saturated Fat

Carbohydrate 19g 6%
 Sugars 2g **Protein** 4g 8% Iron 4%
 Riboflavin (B2) 4% Niacin (B3) 6%
 Folate) 2%

Nutrition Facts Serv. Size: 2oz (57g), Servings per Container About 6, Amount Per Serving: **Calories** 140, Calories from Fat 35, **Total Fat** 4g (6% DV), Saturated Fat 0g (0% DV), *Trans* Fat 0g, **Cholesterol** 0mg (0% DV), **Sodium** 270mg (11% DV), **Total Carbohydrate** 22g (7% DV), Dietary Fiber 1g (4% DV), Sugars 3g, **Protein** 3g, Vitamin A (0% DV), Vitamin C (0% DV), Calcium (2% DV), Iron (2% DV). Percent Daily Values (DV) are based on a 2,000 calorie diet.

A GOOD EXAMPLE...



Nutrition Facts	
Serving Size 3/4 Cup (55g)	
Servings Per Container About 5	
Amount Per Serving	
Calories 200	Calories from Fat 25
% Daily Value*	
Total Fat 3g	5%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 115mg	5%
Total Carbohydrate 42g	14%
Dietary Fiber 6g	24%
Sugars 2g	
Protein 7g	
Vitamin A 0% • Vitamin C 0%	
Calcium 2% • Iron 15%	
Thiamin 8% • Riboflavin 8%	
Niacin 8% • Vitamin B3 15%	
Folate 0% • Magnesium 4%	
Zinc 0% • Pantothenic Acid 0%	

*Percent Daily Values (DV) are based on a diet of 2,000 calories. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Whole Sorghum Flour, Ground Flax Seed, Honey, Raisin Juice Concentrate, Salt

Nutrition Facts

Serving Size 1 c.p (53g)
Servings Per Container about 7

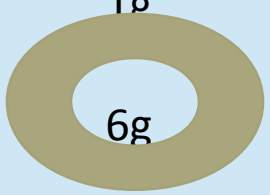
Amount Per Serving	Total Plus Omega-3s	with 1/2 cup sklm milk
Calories	200	240
Calories from Fat	30	30
% Daily Value**		
Total Fat 3.5g*	5%	5%
Saturated Fat 1.5g	3%	3%
Trans Fat 0g		
Polyunsaturated Fat 1g		
Monounsaturated Fat 1.5g		
Cholesterol 0mg	0%	1%
Sodium 90mg	4%	6%
Potassium 125mg	4%	6%
Total Carbohydrate 40g	13%	15%
Dietary Fiber 4g	17%	17%
Sugars 14g		
Other Carbohydrate 21g		
Protein 5g		

Vitamin A	10%	15%
Vitamin C	100%	100%
Calcium	100%	110%
Iron	100%	100%
Vitamin D	25%	40%
Vitamin E	100%	100%
Thiamin	100%	100%
Riboflavin	100%	110%
Niacin	100%	100%
Vitamin B ₆	100%	100%
Folic Acid	100%	100%
Vitamin B ₁₂	100%	100%
Pantothenic Acid	100%	100%
Phosphorus	10%	25%
Magnesium	10%	15%
Zinc	100%	100%



Brand	Serving Size	Calories	CHO (g)	Fat (g)	Fiber (g)
Rudi's Original GLUTEN CONTAINING BREAD	1 SLICE	90	19g	1g	4g
Udi's Whole Grain	2 oz (57g)	140	22g	4g	1g
Udi's Millet-Chia	2 slices (68g)	160	28g	5g	6g
Udi's Cinnamon	2 slices (60g)	160	29g	4g	1g
Kinnikinnick Foods White Bread	2 slices (80g)	140	30g	4g	4g
Ener-G Tapioca Rice	2 slices (56g)	160	22g	6g	4g
Ener-G Brown Rice	2 slices (76g)	200	32g	6g	2g
Ener-G Hamburger Bun	1 bun (55g)	120	21g	3g	4g
Rudi's GF Hamburger Bun	1 bun (74g)	170	30g	6g	2g
Rudi's GF Original Bread	2 slices (74g)	180	34g	3g	2g

Fiber (g)



Gluten Free Market

Low Carb Diet Fat Free Diet Gluten Free Diet



For the American general population, adopting a gluten-free diet is becoming an increasingly popular solution. The market for gluten-free food and beverage products grew at a compound annual growth rate of 28% from 2004 to 2008, to finish with almost **\$4.2 billion** in retail sales last year. By 2017 the market is expected to reach about **\$6.4 billion** in sales.

Status of the GF Marketplace

- About 87 MILLION hits on Google
- Increased awareness in grocery stores
 - GF dedicated aisles
 - Signage alerting customers as to which products are GF on store shelves
 - Gone are the days where GF foods were only sold at local “health food stores” or online markets, but rather now gluten-free foods are readily available at Jewel, Meijer, Marianos, and even Walmart

Summary

- Celiac disease/Wheat Allergy/Gluten Sensitivity is exploding
- GF marketplace is booming
- Increased consumer demand for nutrient-dense, good-tasting gluten-free food



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