

# Clinical Management of *Celiac Disease* in Athletes



School of Education  
& Allied Studies

First in Education. Second to None.

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# What is *Celiac Disease*?



# Background

- Body sensitivity to gluten
- Autoimmune response
- Cellular damage results
  - Small intestine
- Nutrient Absorption



# Also known as...

- Celiac sprue
- Gluten sensitive enteropathy
- Coeliac Disease
- Gluten intolerance
- Gee-Herter-Heubner disease
- Non-tropical sprue



# Common Differential Dx with CD

Addison Disease

Pernicious Anemia

Celiac Disease

Crohn's Disease

Diverticular Disease

Fibromyalgia (CRPS)

Lactose Intolerance

Illness/Disease	Signs and Symptoms
Addison disease	Weakness Fatigue Weight loss Nausea, vomiting Anorexia Chronic diarrhea Bronze discoloration of the skin Adrenal dysfunction
Pernicious anemia	Weakness Sore tongue Paresthesia in extremities Paleness of lips, gums, and tongue Pale to bright yellow-colored skin Nausea, vomiting Fatigue Weight loss Diarrhea and flatulence
Celiac disease	Arthralgia Myalgia Cognitive and attentional disturbances Diarrhea Gastrointestinal discomfort Painful skin rashes Slowed growth patterns Significant weight loss Vitamin deficiencies
Crohn disease	Right lower quadrant pain Cramping and tenderness Flatulence Nausea Fever Diarrhea Marked weight loss Weakness Lack of ambition
Diverticular disease	Recurrent left lower abdominal quadrant pain Alternating constipation and diarrhea Difficult defecation Gas Irritable bowel habits Low-grade fever Leukocytosis
Fibromyalgia	Complex pain patterns Hypersensitivity to normal stimuli Diffuse to specific myalgias Mood disturbances and irritability
Lactose intolerance	Mild to severe intolerance to milk products Gas and accompanying flatulence Cramping Diarrhea Sunken appearance of eyes



# Histology





# Normal vs. Pathological Villi





# Comparison







# Crypt Hyperplasia



# Prevalence of CD

- Typical stats range between 1 in every 250-300 people\*
- More recent data suggest 1 in every 100-150 people\*\*

\* Worldwide: geographic regions vary

\*\*Ciacci et al ( *Scand J Gastroenterol*, 1995 Nov, 30:11, 1077-81); Marcu Maaki et al., 2006.



# Geographic & Regional Factors

- CD is common in European countries: Ireland, Italy, Sweden, & Austria.
  - Northern Ireland, for example, one in every 300 people has CD.
- In Finland, prevalence may be as high as one in every 100 persons.
- CD also occurs in N. America where the prevalence has been estimated at one in every 3000 people.

# Geographic & Regional Factors

- Most population studies underestimate the prevalence of CD because many patients who develop CD have few or no sx's until later in life.

(van Dijk & Klinkhamer, 2009)

- Iceberg model

- A recent study in the U.S. suggests that the prevalence of CD in the U.S. is similar to Europe.

# The Impact of CD in Athletics\*

- NCAA reports approx. 380,000 athletes\*\*
  - If 1:3000 = **127** athletes
  - If 1:250-300 = **1267-1520** athletes
  - If 1:100-150 = **2533-3800** athletes

\* Leone, JE. Celiac disease in physically active populations: Is good health in athletics an underlying under-recognized concern? Proceedings of the 13<sup>th</sup> International Coeliac Disease Symposium, 2009, p. 83-84.

\*\* Source: *NCAA CHOICES* Program: 2008



# The Impact of CD in Athletics

- Approximately 7.2 million H.S. athletes in U.S.\*
  - If 1:3000 = **2400** athletes
  - If 1:250-300 = **24,000-28,800** athletes
  - If 1:100-150 = **48,000-72,000** athletes



# How to identify CD

## Symptoms of celiac disease may include:

- gas
- recurring abdominal bloating and pain
- chronic diarrhea
- pale, foul-smelling, or fatty stool
- weight loss / weight gain
- fatigue
- unexplained anemia (a low count of red blood cells causing fatigue)
- bone or joint pain
- osteoporosis, osteopenia
- behavioral changes
- tingling numbness in the legs (from nerve damage)
- muscle cramps
- seizures
- missed menstrual periods (often because of excessive weight loss)
- infertility, recurrent miscarriage
- delayed growth, failure to thrive in infants
- **pale sores inside the mouth, called aphthous ulcers**
- tooth discoloration or loss of enamel
- itchy skin rash called dermatitis herpetiformis



# CD: Signs & Sx's





# The Culprit

- GLUTEN



# Consequences

- Stunted growth
- Failure to thrive
- Loss of key minerals & nutrients
  - Vit. K, Na<sup>+</sup>, Ca
- Weight Loss
- Seizures
- GI ulcers/CA (adenocarcinoma)
- Death...



# Identification & Treatment Options

## Identification

- ELISA panel test
- Immunoglobulin A (IgA)
- anti-tissue transglutaminase (tTGA)
- IgA anti-endomysium antibodies (AEA)

## Treatment

- Strict GFD
- Tx for skin issues
  - Dapsone
- Vitamin & mineral supplementation

# Essentials of the GFD

Allowed Foods	
Amaranth	Potatoes
Arrowroot	Quinoa
Buckwheat	Rice
Cassava	Sago
Corn	Seeds
Flax	Soy
Indian rice grass	Sorghum
Job's tears	Tapioca
Legumes	Wild Rice
Millet	Yucca
Nuts	

Thompson T. *Celiac Disease Nutrition Guide*, 2nd ed. Chicago: American Dietetic Association; 2006. © American Dietetic Association. Adapted with permission. For a complete copy of the *Celiac Disease Nutrition Guide*, please visit [www.eatright.org](http://www.eatright.org).



# GFD (Cont.)

## Foods To Avoid

- Wheat Including einkorn, emmer, spelt, kamut
  - Wheat starch, wheat bran, wheat germ, cracked wheat, hydrolyzed wheat protein
- Barley  
Rye  
Triticale (a cross between wheat and rye)

# GFD (Cont.)

## Other Wheat Products

Bromated flour  
Durum flour  
Enriched flour  
Farina  
Graham flour

Phosphated flour  
Plain flour  
Self-rising flour  
Semolina  
White flour

## Processed Foods that May Contain Wheat, Barley, or Rye\*

Bouillon cubes  
Brown rice syrup  
Chips/potato chips  
Candy  
Cold cuts, hot dogs, salami, sausage  
Communion wafer  
French fries  
Gravy

**Dr. Schär, Ltd. Listing**

\* Most of these foods can be found gluten-free. When in doubt, check with the food manufacturer.



# Case Studies in Athletics



# Case Study #1

## Celiac Disease Symptoms in a Female Collegiate Tennis Player: A Case Report

- **Treatment:** The athlete underwent a series of blood & allergen tests to confirm/refute a dx of CD. When CD was suspected, dietary modifications were made to eliminate all wheat-based & gluten-based products from the athlete's diet.
- **Uniqueness:** The athlete was able to fully compete in a competitive NCAA D-I tennis program while experiencing the debilitating effects associated w/ CD. The immediacy of sx onset was notable because the athlete had no history of similar complaints.



Result	Value (mcg/dL)	Allergen	Clinical Significance			Reference Range		
			Insignificant	Moderate	Significant	Insignificant	Moderate	Significant
<b>Dairy</b>								
Equivocal	344	Cow's milk	[Significant]			<117	117-358	>358
Equivocal	167	Casein	[Significant]			<105	105-324	>324
Equivocal	211	Lactalbumin	[Significant]			<140	140-438	>438
Negative	0	Goat's milk	[Insignificant]			<125	125-391	>391
Negative	177	American Cheese	[Significant]			<186	186-580	>581
Negative	161	Cheddar cheese	[Significant]			<162	162-502	>502
Equivocal	183	Cottage cheese	[Significant]			<133	133-408	>409
Negative	128	Mozzarella cheese	[Significant]			<138	138-430	>430
Negative	107	Swiss cheese	[Significant]			<115	115-358	>358
<b>Grains</b>								
Negative	0	Barley	[Insignificant]			<117	117-351	>351
Negative	0	Buckwheat	[Insignificant]			<122	122-374	>374
Negative	0	Corn	[Insignificant]			<113	113-337	>337
Significant	975	Gliadin	[Significant]			<92	192-594	>594
Significant	956	Gluten	[Significant]			<115	115-363	>363
Negative	0	Malt	[Insignificant]			<101	101-500	>500
Negative	0	Oat	[Insignificant]			<143	143-447	>447
Negative	0	Rice	[Insignificant]			<67	67-201	>201
Significant	546	Rye	[Significant]			<136	136-421	>421
Significant	689	Wheat	[Significant]			<171	171-528	>528

Gluten

Cow's Milk  
Wheat

Gliadin

Rye



## Subjective Findings

1. History of digestive disturbances (ie, cramping, bloating, and diarrhea)
2. History of vague and diffuse myalgia and arthralgia
3. Behavioral and mood disturbances
4. Inability to concentrate and other cognitive problems
5. General malaise
6. Pubertal delay

## Objective Findings

1. Failure to grow and thrive (children)
2. Enlarged abdomen and vomiting (children)
3. Short stature in physically mature adults
4. Weight loss, anorexia, and lack of sufficient body fat
5. Muscle atrophy and wasting

## Clinical Findings

1. Anemia and abnormal blood tests
2. Rickets (from vitamin D deficiency) and other vitamin deficiencies
3. Dermatitis herpetiformis
4. Extreme sensitivity to allergen exposure testing and ELISA\* testing
5. Chronic history of miscarriages (females)
6. Higher mortality rates

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\*ELISA indicates enzyme-linked immunosorbent assay.



# Case Study #2

## Celiac Disease in an Elite Female Collegiate Volleyball Athlete: A Case Report

- **Background:** Athlete lost 8.1 kg during the first 20 days of training, & we initially suspected an eating disorder.
  - found she did not have psychological sx's indicative of an eating disorder.
  - Results of routine blood tests revealed critically high platelet counts; in conjunction w/ physical findings, the athlete was referred to a gastroenterologist.
  
- **Treatment:** Tx w/ a GFD, which excludes wheat, barley, and rye.
  
- **Uniqueness:** The presence of active CD may not be uncommon. However, elite athletes who face CD present a new challenge for the athletic trainer. The athletic trainer can help guide the athlete in coping w/ lifestyle changes associated w/ a GFD.

# Athlete's Blood Panel

Diagnostic Test	Normal Range	9 Months Before Diagnosis	Flag	At Time of Diagnosis	Flag
Hemoglobin, g/dL	11.5–16.0	10.3	Low	11.3	Low*
Hematocrit, %	37.0–47.0	33.4	Low	36.5	Low*
Mean corpuscular volume, fL	80.0–100.0	76.3	Low	72.5	Low*
Mean corpuscular hemoglobin, pg	27.0–34.0	23.6	Low	22.5	Low*
Red blood cell distribution width, %	11.6–16.5	14.5	WNL†	17.8	High‡
Platelet count, × 10 <sup>3</sup> /μl	150–450	444	WNL	542	Critically high§

\*Low values suggest anemia, but no differences identified.

†WNL indicates within normal limits.

‡High red blood cell distribution width outside the normal range.

§Critically high platelet count well outside the normal range.

# Discussion of Case Studies

- One presents w/ clinically significant sx's
- Other presents w/ underlying sx's (anorexia n.)
- BOTH are likely CD, but high functioning
- Different ways in which they were managed
  - Many doctor's have not experienced or heard of CD, particularly in athletes

# Personal Communications

- “I have been searching & searching for any research on CD & athletes, & I came across your article in the JAT. I am the captain of the men’s soccer team at X University & I was just dx w/ CD. I have had 2 injury filled & frustrating yrs as I pushed myself through my muscle fatigue, weight loss, & weakness. I have high hopes to return to my former health. I am wondering how hard to train & whether there are supplements that celiac athletes should take? I am desperate for some kind of help. Any information would be appreciated!”

- “I found your web abstract on CD. I have a 20 yr old daughter who is a basketball player at the national level. She had a 3 week episode of serious leg cramps & is now hospitalized for vertigo & cramps that go on for 2 hrs at a time. She has had so many tests, but nothing has been found. She has lost weight, but denies an ED. Please help!”

- Communication from Finland



# Summary for the Clinical Management of CD:

- The ATC's role:
  - Know what it is! (first things first!)
  - Challenge your clinical thinking/paradigm
  - Educate your colleagues; including physicians!
  - Be aware of physical signs:
    - Mouth sores
    - Unexplained weight loss
    - Skin reactions
    - Abnormal blood panels





# Psychological Management...

- DOES MATTER!
  - Helping athlete to cope
  - Support systems
  - Sense of *loss*



# Take-Home Points:

- People w/ CD can't eat foods or use items w/ gluten
- CD harms the small intestine.
- People w/ untreated CD can't get needed nutrients.
- Without tx, people w/ CD can develop other health problems.
- CD is dx by blood tests & biopsy of the small intestine.
- A GFD must be followed for life.
- A dietitian can help people choose the right foods.

## Celiac Disease Radio Segment with Dr. Green:

<http://www.peoplespharmacy.com/2009/06/15/extended-interv-31/>

*Discusses overview of CD*

## Four Presentations from Experts from the Celiac Center

<http://www.youtube.com/CeliacDiseaseCenter>

### Includes following panel:

Peter Green, MD

*Introduction to the Center and recent new information on celiac disease*

Suzanne Lewis, MD

*Evaluation of poorly responsive patients*

Suzanne Simpson, RD

*Why see an expert nutritionist for evaluation of celiac disease*

Christina Tennyson, MD

*Nutrient and vitamin replacement*



# Resources

- **Celiac Disease Awareness Campaign**  
National Digestive Diseases Information  
Clearinghouse  
2 Information Way  
Bethesda, MD 20892–3570  
Phone: 1–800–891–5389  
Fax: 703–738–4929  
Email: [celiac@info.niddk.nih.gov](mailto:celiac@info.niddk.nih.gov)  
Internet: [www.celiac.nih.gov](http://www.celiac.nih.gov)





- **American Celiac Society**

P.O. Box 23455

New Orleans, LA 70183–0455

Phone: 504–737–3293

Email: [info@americancelesociety.org](mailto:info@americancelesociety.org)

Internet: [www.americancelesociety.org](http://www.americancelesociety.org)





## ■ American Dietetic Association

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Chicago, IL 60606–6995

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Internet: [www.eatright.org](http://www.eatright.org)





## ■ Celiac Disease Foundation

13251 Ventura Boulevard, #1

Studio City, CA 91604

Phone: 818–990–2354

Fax: 818–990–2379

Email: [cdf@celiac.org](mailto:cdf@celiac.org)

Internet: [www.celiac.org](http://www.celiac.org)





- **Celiac Sprue Association/USA Inc.**

P.O. Box 31700

Omaha, NE 68131-0700

Phone: 1-877-CSA-4CSA (272-4272)

Fax: 402-558-1347

Email: [celiacs@csaceliacs.org](mailto:celiacs@csaceliacs.org)

Internet: [www.csaceliacs.org](http://www.csaceliacs.org)







## ■ **Gluten Intolerance Group of North America**

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Internet: [www.gluten.net](http://www.gluten.net)





- **National Foundation for Celiac Awareness**

P.O. Box 544

Ambler, PA 19002

Phone: 215–325–1306

Email: [info@celiaccentral.org](mailto:info@celiaccentral.org)

Internet: [www.celiaccentral.org](http://www.celiaccentral.org)



# Select References

1. Ciacci et al. *Scand J Gastroenterol*.1995;30(11):1077-81)
2. Maaki M et al. *Gut*. 2001;49(4): 502–505.
3. [http://www.medicinenet.com/celiac\\_disease/article.htm](http://www.medicinenet.com/celiac_disease/article.htm)
4. *NCAA CHOICES* Program: 2008
5. National Federation of State High School Associations (NFHS). 2005--2006 High School Athletics Participation Survey. Indianapolis, IN: NHFS; 2006.
6. Thompson T. *Celiac Disease Nutrition Guide*, 2nd ed. Chicago: American Dietetic Association; 2006. © American Dietetic Association.
7. Leone et al. *J Athl Train*. 2005;40(4):365-369.
8. Eberman & Cleary. *J Athl Train*. 2005;40(4):360-364.
9. Leone JE. *Training & Conditioning*. 2009;19(2):21-26.



# THANKS FOR ATTENDING!

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