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The Guts and Bolts of the Diet and a Look into the Microbiome

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THE INFLAMMATORY BOWEL DISEASE ANTI-INFLAMMATORY DIET: THE IBD-AID

The Guts and Bolts of the diet and a look into the Microbiome



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The Current Guidelines for IBD:

- “There is no need to avoid foods unless they worsen your symptoms. It is best to restrict as few foods as possible to increase the chances that you are getting a balanced, nutritious diet. This is important for maintaining the function of your digestive tract and your overall health.”
- If you do have a flare, follow a low-residue diet. Enteral nutrition may be helpful.

Crohn’s and Colitis Foundation of America (CCFA)

A Brief History of IBD and Treatments

United States

- First line treatment in Adults is medication:
 - Steroids
 - 5-ASA
 - Immune-modulating drugs
- Low-residue diet (concern that fiber will irritate bowel) ¹¹



(f)

Asian countries

- First line treatment in Adults is Enteral/Parenteral Nutrition ⁸
 - Followed by Elimination diet
 - Gradually re-introduce foods one at a time.
 - If symptoms displayed, eliminate that food from diet.
 - Low fat



(g)



RESEARCH

Open Access

An anti-inflammatory diet as treatment for inflammatory bowel disease: a case series report

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Abstract

Background: The Anti-Inflammatory Diet (IBD-AID) is a nutritional regimen for inflammatory bowel disease (IBD) that restricts the intake of certain carbohydrates, includes the ingestion of pre- and probiotic foods, and modifies dietary fatty acids to demonstrate the potential of an adjunct dietary therapy for the treatment of IBD.

Methods: Forty patients with IBD were consecutively offered the IBD-AID to help treat their disease, and were retrospectively reviewed. Medical records of 11 of those patients underwent further review to determine changes in the Harvey Bradshaw Index (HBI) or Modified Truelove and Witts Severity Index (MTLWSI), before and after the diet.

Results: Of the 40 patients with IBD, 13 patients chose not to attempt the diet (33%). Twenty-four patients had either a good or very good response after reaching compliance (60%), and 3 patients' results were mixed (7%). Of those 11 adult patients who underwent further medical record review, 8 with CD, and 3 with UC, the age range was 19–70 years, and they followed the diet for 4 or more weeks. After following the IBD-AID, all (100%) patients were able to discontinue at least one of their prior IBD medications, and all patients had symptom reduction including bowel frequency. The mean baseline HBI was 11 (range 1–20), and the mean follow-up score was 1.5 (range 0–3). The mean baseline MTLWSI was 7 (range 6–8), and the mean follow-up score was 0. The average decrease in the HBI was 9.5 and the average decrease in the MTLWSI was 7.

Conclusion: This case series indicates potential for the IBD-AID as an adjunct dietary therapy for the treatment of IBD. A randomized clinical trial is warranted.

Keywords: Diet, Inflammatory bowel disease, Nutrition

IBD-AID Pilot Study

- 40 pts from UMMHC gastroenterology clinics.
- 13 choose not to follow the prescription.
- 24 pts had a good or very good (remission) response to diet
- 3 pts did not respond well (who complied), 2 were dx with *C. diff*, 1 unknown reasons
- Subjects received nutrition instruction and counseling on the diet, with cooking classes available
- Symptoms at baseline and at follow-up assessed.
 - Harvey Bradshaw Index for CD patients
 - Modified Truelove and Witts Severity Index for UC patients.
- Regular medical management by GI physicians continued.

Targets of dietary components and IBD-AID

	Fatty Acids	Pre-Pro	Nutrient Balance
Beneficial bacteria growth		x	x
Short chain Fatty Acids production		x	x
Mucin repletion		x	
Junction protein restoration		x	
Suppression of inflammatory eicosanoids	x		
Blockade of inflammation	x		x
Suppression of immune response	x	x	x
Reduction in oxidative stress			x

Adapted from Sung and Park, *W J Gastro*, Feb 2013.

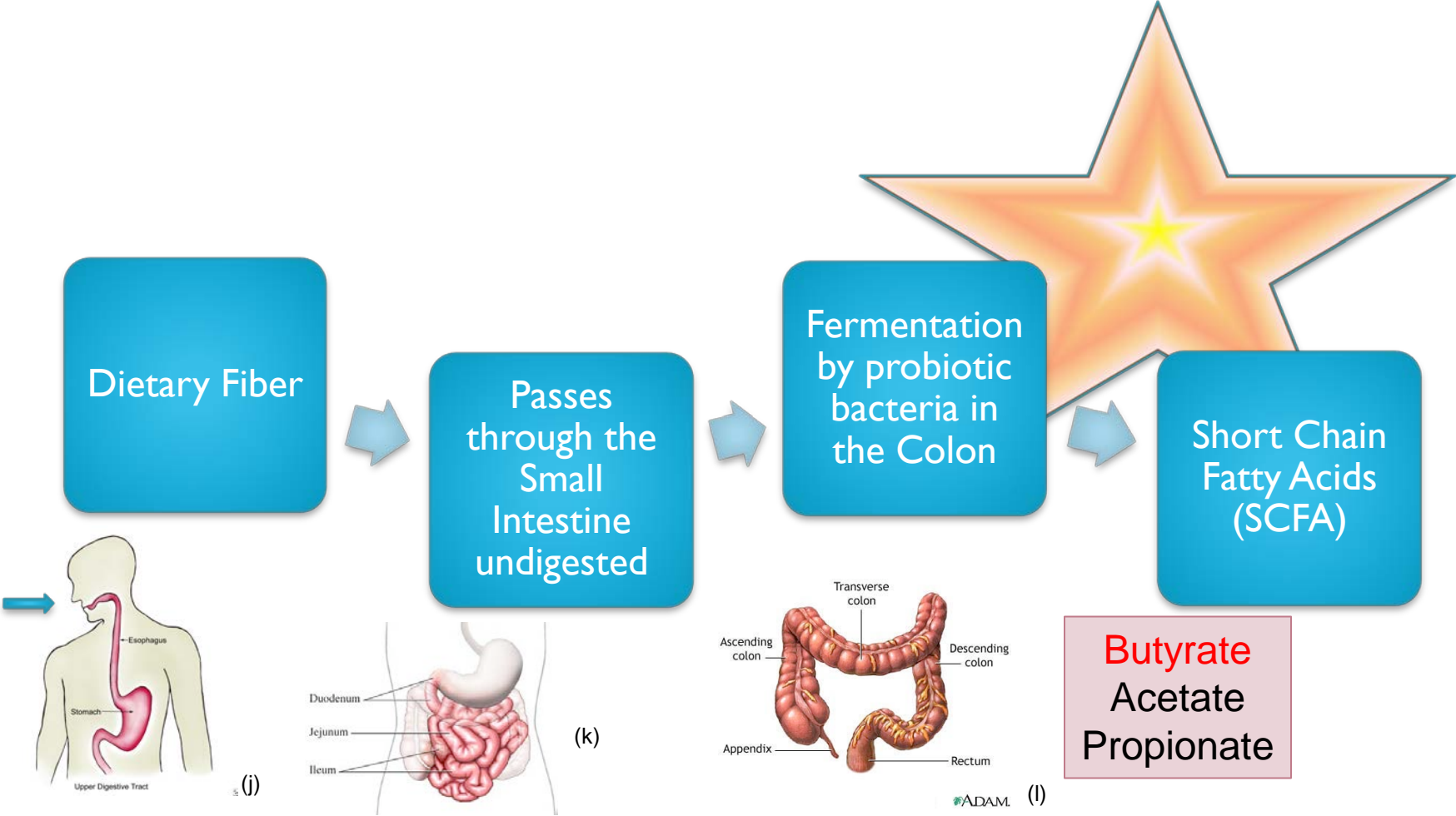
Summary of Components for IBD-AID

- 1) Prebiotics
- 2) Probiotics
- 3) Beneficial nutrients, delivered in a way accepted by pt's current digestive abilities
- 4) Avoidance of adverse foods (**why?**)
 - 1) Starve out the bad guys
 - 2) Simplify
 - 3) ↓ GMOs that may affect the balance of the microbiome

How IBD-AID fits in

- Bacteria (restoring the balance)
 - Probiotics
 - Prebiotics
 - Take away the food source of pathogenic bacteria (no grains except for oats, no refined sugars)
- Barrier (repair intestinal epithelial structure)
 - Dietary fiber (prebiotics) + probiotics → SCFA cause epithelial cell proliferation.
 - Some good bacteria induce expression of tight-junction proteins.
- Target the Immune system and Inflammatory signals.
 - Phytochemicals and antioxidants (variety of veggies + fruits)
 - Prebiotics + probiotics → SCFA (inhibits NF- κ B)
 - Anti-inflammatory PUFAs

The Good Guys: Anti-IBD Factors



Dietary Fiber helps restore Good Bacteria

- Prebiotics = type of fiber that specifically encourages beneficial bacterial growth. ¹
 - Examples: inulin and oligofructose, steel cut oats
 - Good sources of **inulin** include: artichokes, leeks, bananas, chicory root

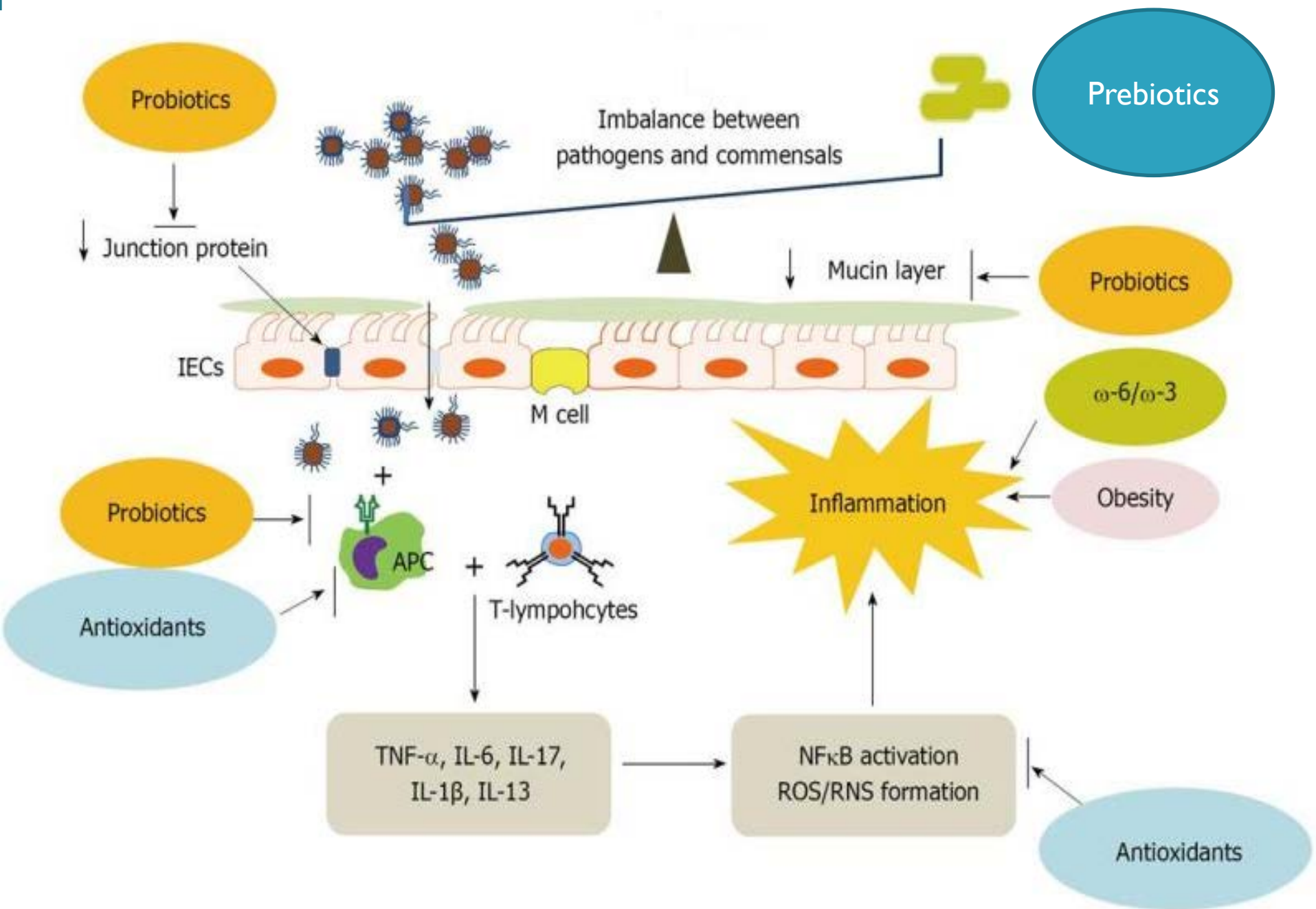


(p)



(q)

- Stimulate growth of the “good guys” (*Lactobacilli* and *Bifidobacteria*)¹
- Decrease colonic pH inhibiting growth of some pathogenic bacteria.¹



The Nefarious, Ne'er-do-well **NF-κB**

NF-κB



This Story's **BAD GUY**

How can we stop NF- κ B activation?

Dietary Inhibitors: focus on SCFA

- Soluble fiber \rightarrow fermentation by bacteria \rightarrow SCFA (ex. Butyrate)
- Berries and oats are a great examples of fibrous foods that can be turned into butyrate.
- Butyrate inhibits the enzyme's (IKK) phosphorylation of I κ B^{12,18,19}
 - Result: NF- κ B stays bound and inactive in the cytoplasm.
 - Stops the inflammatory cascade
 - Note: Exact mechanism of inhibition still to be determined.
 - It doesn't work to just take butyrate supplements, the microorganisms are needed
- Low levels of luminal butyrate linked to chronic bowel inflammation.²²

SCFAs help Repair Colonic Epithelium

- Butyrate has been shown to ↑ epithelial cell proliferation at the base of the colonic crypts.¹⁸
- Better cellular electrolyte absorption ¹⁸
- Decreases TNF α , thereby preventing cellular apoptosis
 - TNF α normally works to: ¹²
 - disrupt the epithelial barrier
 - induce apoptosis in epithelial cells
 - induce chemokine secretion in intestinal epithelial cells

E-nose Technology: IBD-AID

- Prospective study of dietary change with Enose measurements
 - Fermentome = the complex interplay between diet, symbiotic bacteria and volatile gases.
- Application of this technology:
 - The VOC chemical fingerprint and changes to it can help scientists investigate GI disorders.
- Prior research shows that the E-nose is able to distinguish between patients and controls as well as among patients with different diseases (Crohn's, Ulcerative Colitis, Diabetes)
 - 97% separation rate.

E-nose Technology

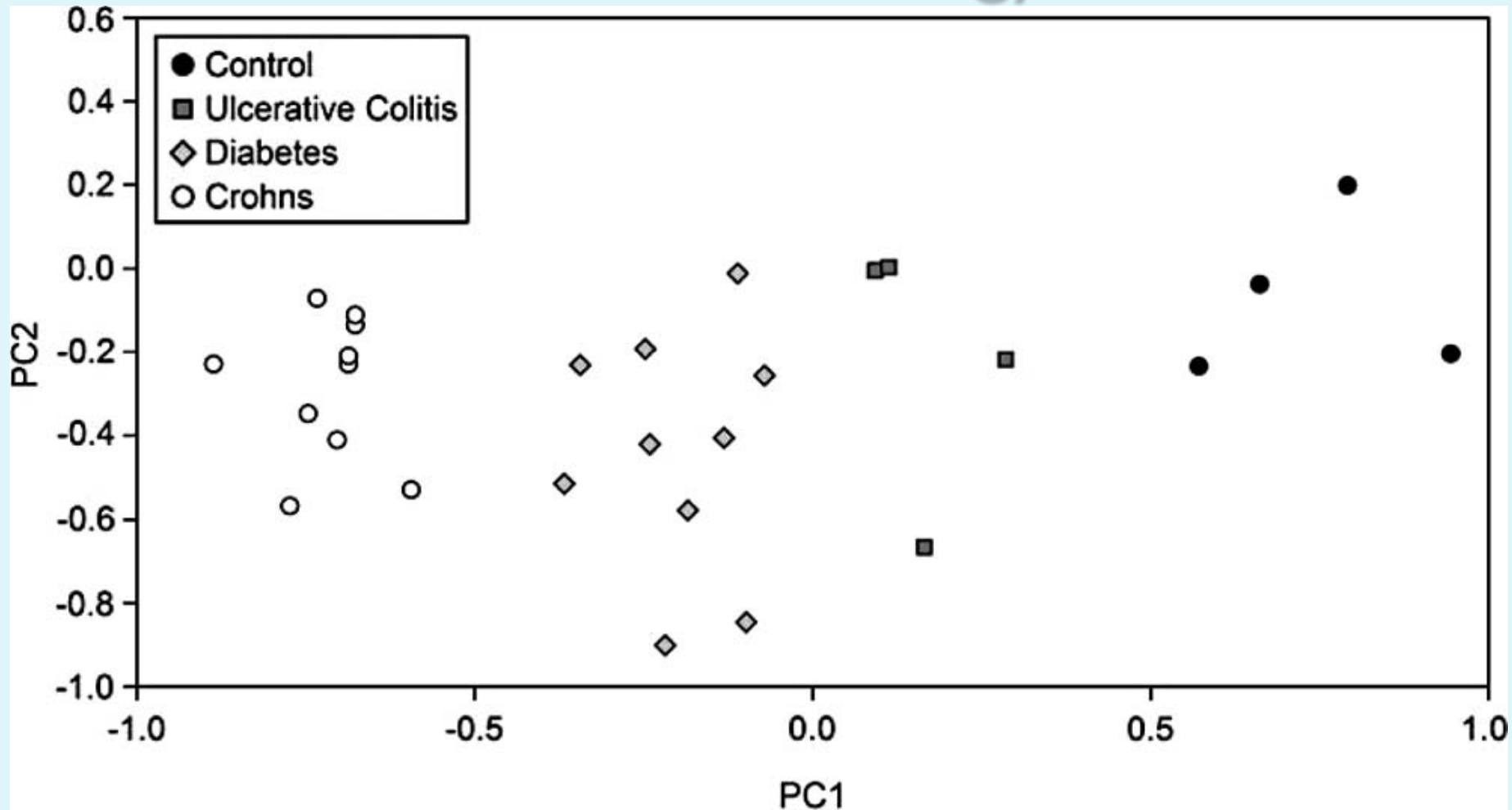


Figure 3. Principal component analysis plot showing the distinct spatial characteristics between healthy volunteers and disease groups for the Cyrano A320 e-nose.

Case Study: UC

- June '12. 50yo, 5"8", 168 lb. Has been following the SCD for 1 year. Currently bleeding, frequent stools. Introduced type of soluble fiber (ground flax), modified fatty acids.
- June '13. 175 lb. Still not well (energy, bleeding). Ready to transition to complete IBD-AID. Added oats, miso, other foods.
- March '14. 180 lb. Minimal bleeding, well-being significantly increased, exercising hard, looks great!

	SCD	SCD-IBD-AID	IBD-AID	
	6/18/12	6/20/13	12/12/13	Nominals
Pancreatic Elastase 1	110	198	269	>=201 mcg/g
Putrefactive SCFAs	1.3	0.8	0.7	1.3-8.6 micromol/g
Eosinophil Protein X	3.1	0.3	3.3	<=7.0 mcg/g
Calprotectin	65	37	49	<=50 mcg/g
Beneficial SCFAs	7.2	37.7	71.7	>=13.6 micromol/g
n-Butyrate	0	4	12.8	>=2.5 micromol/g

Beneficial Bacteria

Lactobacillus	0	3	3	4
E coli	4	2	4	4
Bifido	3	1	3	4

Additional Bacteria

alpha haemolytic Streptococcus	4	4	4	4
gamma haemolytic Streptococcus	4	3	4	4
Streptococcus agalactiae gp B	4			
Citrobacter freundii	4			
Klebsiella oxytoca	4			
Bacillus species		1		
Pseudomonas aeruginosa		1		
Klebsiella pneumoniae		1		
Proteus mirabilis			4	2

Highlighted represents potentially pathogenic bacteria

Date	7/30/13	7/27/13	9/12/13	12/20/13	Nominal Values
Lab	Umass	Bordiuk	Quest	Umass	
Iron(mcg/dl)	94		86	116	45-182
Ferritin(ng/ml)	35		34	46	23-336
RBC(mil/mm3)		4.76	4.63	4.92	4.4-6
HGB(g/dl)	14	14.4	14.2	15.1	14-18
HCT(%)	42	43.6	42.8	44	42-52
D		52			30-100
ESR	7			10	0 - 20
Testosterone		320			175-781
CRP	0.3			1.1	<10
WBC	7.6	6.2		6	4.3 - 10.3

Notes: 7/13: just after transfusion.

Food, Pt

Oats, steel cut

Nut Butter Bread

Yogurt(SCDoph)/Banana

Nut Butter Bread

Chicken Soup/Carrots/Broccoli

Apple Sauce

Yogurt(GIPro)

Sauerkraut/Navy Beans

Fish/Squash/Asparagus/Wakame/Flax

Yogurt(GIPro)/Banana

Nut Butters

Phase 4 Suggestions

Kale & Fruit Smoothie

Frittata with Squash and Celeriac

Home Fries

Gluten-Free Granola and Yogurt

Red Pepper and Tomato Soup

Mediterranean Chickpeas and Vegetables

Coconut Curry Red Lentil Soup

Cannellini Beans with Kale and Walnuts

Chickpeas With Sole And Spinach

Tofu Stir Fry with Miso Sauce

Cinnamon Apple Muffins

Guacamole and Cheddar Cheese

Crackers

Crunchy Chickpeas



www.umassmed.edu/nutrition

References

1. Viladomiu M, Hontecillas R, Yuan L, Lu P, Bassaganya-Riera J. Nutritional protective mechanisms against gut inflammation. *J Nutr Biochem*. 2013 Jun;24(6):929-39.
2. Hooper LV, Wong MH, Thelin A, Hansson L, Falk PG, Gordon JI. Molecular analysis of commensal host-microbial relationships in the intestine. *Science*. 2001 Feb 2;291(5505):881-4.
3. National Institutes of Health. *The Human Microbiome Project*.
<http://commonfund.nih.gov/hmp/>
4. McGee, Harold. On Food and Cooking: The Science and Lore of the Kitchen. New York: Simon & Schuster. 2004. pgs. 1-884.
5. Baron JH. Inflammatory bowel disease up to 1932. *Mt Sinai J Med*. 2000 May;67(3):174-89.
6. Sung MK, Park MY. Nutritional modulators of ulcerative colitis: clinical efficacies and mechanistic view. *World J Gastroenterol*. 2013 Feb 21;19(7):994-1004.

References

7. Hou JK, Abraham B, El-Serag H. Dietary intake and risk of developing inflammatory bowel disease: a systematic review of the literature. *Am J Gastroenterol*. 2011 Apr;106(4):563-73.
8. Brown AC, Roy M. Does evidence exist to include dietary therapy in the treatment of Crohn's disease? *Expert Rev Gastroenterol Hepatol*. 2010 Apr;4(2):191-215.
9. Mullin, Gerard E. "What is the Right Diet for IBD?". Hopkins Medicine: IBD Symposium. 2011.
http://www.hopkinsmedicine.org/IBDsymposium/Presentations_2011/What%20is%20the%20Right%20Diet%20for%20IBD_Mullin.pdf
10. Shah, Shinil. Dietary Factors in the Modulation of Inflammatory Bowel Disease Activity. *MedGenMed*. 2007; 9(1): 60.
11. Chiba M, Abe T, Tsuda H, Sugawara T, Tsuda S, Tozawa H, Fujiwara K, Imai H. Lifestyle-related disease in Crohn's disease: relapse prevention by a semi-vegetarian diet. *World J Gastroenterol*. 2010 May 28;16(20):2484-95.

Picture References

- a) <http://www.precisionnutrition.com/all-about-nutrition-gut-health>
- b) <http://yubanet.com/life/Intestinal-Bacteria-Drive-Obesity-and-Metabolic-Disease-in-Immune-Altered-Mice.php#.UeFqUoWAE7A>
- c) <http://www.economist.com/node/21560523>
- d) http://mi9.com/wheat-field-landscape-picture_79595.html
- e) http://commons.wikimedia.org/wiki/File:Cow_female_black_white.jpg
- f) <http://hua.umf.maine.edu/Chinese/maps/usmap.html>
- g) http://www.gojapango.com/travel/map_of_japan.html
- h) <http://www.bellaverde.net/2012/10/the-chicken-and-the-egg/>
- i) <http://www.turbosquid.com/FullPreview/Index.cfm/ID/522964>
- j) http://www.emedicinehealth.com/cancer_of_the_esophagus/page8_em.htm
- k) <http://drugline.org/medic/term/small-intestine/>
- l) <http://digestivedisease.uthscsa.edu/colectomy.asp>