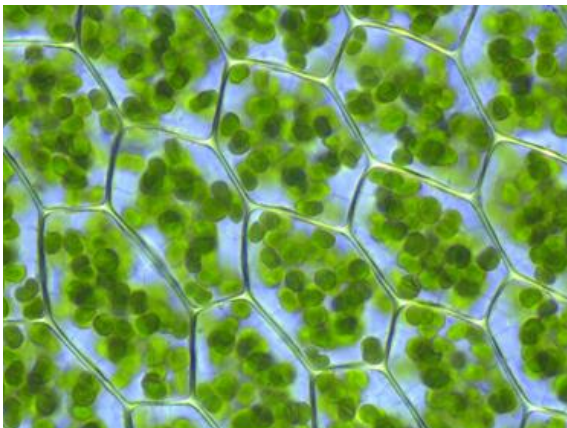


**The Microbiome: Healing the Gut Brain Axis**  
**MAND 2016**

Liz Lipski, PhD, CNS, CCN, CHN, CFM, LDN  
Maryland University of Integrative Health

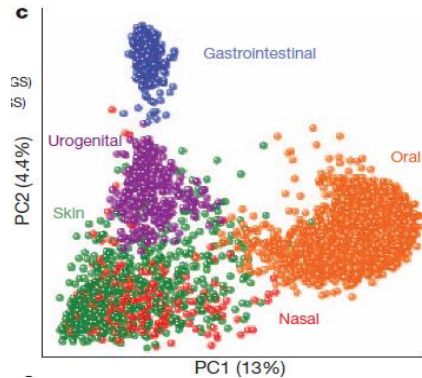
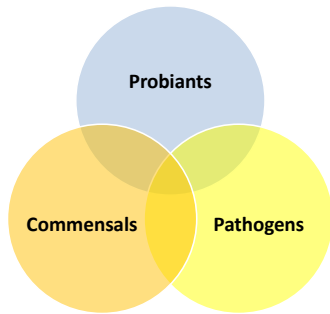


# Microbiome

- 2-6 pounds of microbes live on our epithelial surfaces
- Microbes outnumber human cells 10/1
- Microbial DNA: Human DNA = 150/1
- 10,000 known species of commensals
- Each of us have between 200-1000 sp.
- Most cannot be cultured



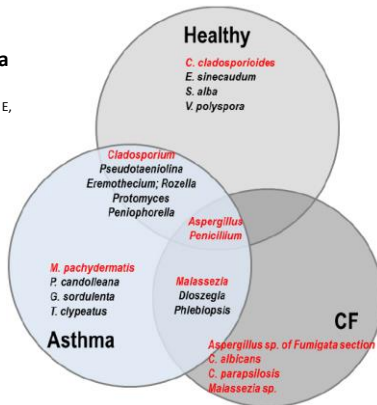
## Microbiota = Bacteria Viruses Fungi



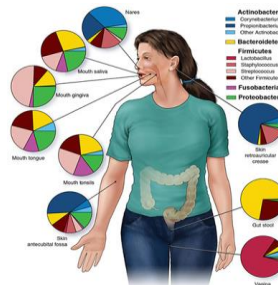
C Huttenhower et al. Nature 486, 207-214 (2012)

## Lung Microbiota

Nguyen LDN, Viscogliosi E, & Delhaes L. Front. Microbiol. 13 Feb 2015.



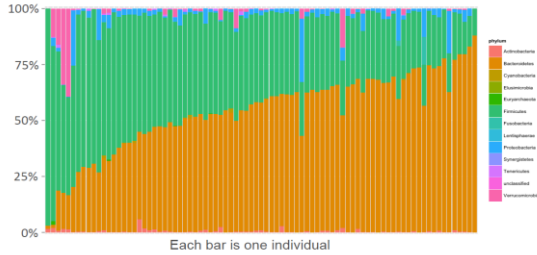
## Human Microbiome: Microbial GENES



<http://unlockinglifecode.org/explore/genomic-medicine/microbiome>

### Microbiome is highly diverse across individuals

Ratio of **bacteroidetes** to **firmicutes** phyla spans a wide range in only 100 individuals. Some individuals have excess growth of **proteobacteria** and **verrucomicrobia**, which may be linked to excess inflammation or a result of recent antibiotic treatment.



Price, N. Institute for Systems Biology, 2015 Personalized Lifestyle Medicine Conference, Chicago.



Phylum	Selected Species
Actinobacteria	Bifidobacterium spp.
Firmicutes	Lactobacilli spp. Bacillus spp. Lactococcus spp. Lachnospiraceae Candidatus savegella
Bacteroidetes	Bacteroides spp. Prevotella spp.
Proteobacteria	Helicobacter spp. Bilophila wadsworthia Vibrio cholerae

Buffie CG & Palmer EG (2013) Nature Rev Immunol 13, 790-801

### Microbiome & Health

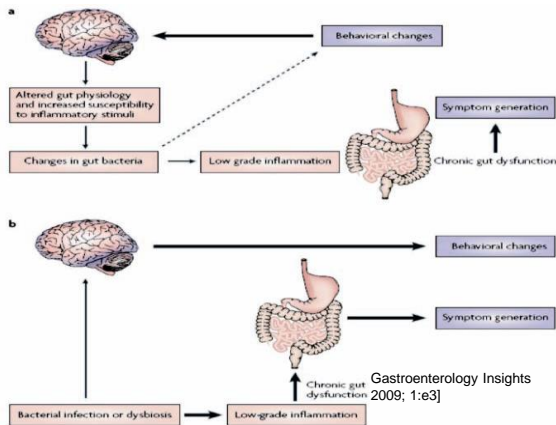
- Cardiovascular
- Autoimmune Disease
- Nerve Health
- Skin
- Weight Management
- Pain
- Glucose Metabolism
- Digestive Health
- Mental Health
- Child Behavior
- Stress
- Atopy





“Many human genes are homologs of bacterial genes.... The word commensal is derived from the Latin term “cum mensa”, which means “eating together” ....We are fundamentally dependent on a myriad of essential neurochemicals produced by microbes.”

Timothy Dinan, Roman Shilling, Catherine Stanton, Jon Cryan  
*J Psych Res 63 (2015) 1-9*



### Microbiome & the Gut-Brain Axis

- Germ Free Mice: Gut Microbiota affects
  - Anxiety
  - Learning & Memory
  - Mental Health & Mood
  - Appetite and Satiety
  - Autistic behavior
  - Neurological disorders such as MS, Parkinson’s

Mazmanian, Hsiao, et al.

### Anxiety and Depression people with GI Diseases

- 1641 patients from GI practices
- 84.1% state anxiety
- 67% trait anxiety
- 27% depression

Addolorato G, et al. 2008. *Int J Clin Pract.* Jul;62(7):1063-9

### Psychiatric Comorbidity with IBS

- IBS in 10-20% of US adult population
- 70-90% of patients with IBS who seek treatment have psychiatric comorbidity: mainly mood and anxiety disorders.
- 19% IBS in schizophrenia
- 29% IBS in major depression
- 46% IBS in panic disorder

*Am J Ther.* 2003 Jan-Feb;10(1):61-7.

### Mental Disorders and Celiac in Adolescents

- 29 teens with celiac/29 teen controls
- 31% vs 7% major depressive disorder
- 28% vs 3% disruptive behavior disorders
- Typically these Diagnoses preceded the diagnosis of celiac disease.

Psychosomatics. 2004 Jul-Aug;45(4):325-35.

### Schizophrenia and The Gut

- 5.5% high levels of anti-gliadin antibodies
- 2.6-4.2% meet criteria for celiac disease
- 10% improve on GF diet
- Dohan: 62% of men on GF/CF diet improved in an inpatient setting
- Casein: > bioactive brain peptides yet < severity of episodes when H. pylori is present
- > IgG to Anti-Saccharomyces cerevisiae antibodies, casein, gluten, and 6 infections in people with schizophrenia
- > IgA to gliadin, beta-lactoglobulin and casein

Catassi. (2013) *Nutrients* 5, 3839-3853; Lipski E (2011) *Digestive Wellness*, p. 400-2.; Nemani (2014) *Prog Neuropsychopharmacol Biol Psychiatry*, 2015 Jan 2;56:155-60; Arroll et al. *Nutrition Journal* 2014, 13:91; Schizoph Res, 2012 Jun;138(1):48-53. *Biol Psychiatry* 1995 Mar 15;37(6):410-3.

Liz Lipski 2015

### Neurological Issues in Celiac

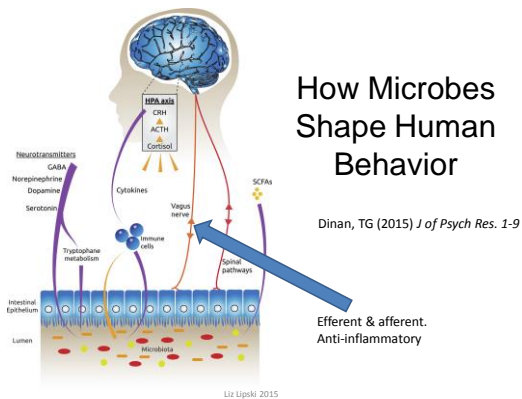
- 72 people with celiac disease
- Migraine (28%)
- Carpal tunnel syndrome (20%)
- 35% reported hx of psychiatric disease: depression, personality changes, or even psychosis
- 35% deep sensory loss

Neurological symptoms in patients with biopsy proven celiac disease. *Mov Disord.* 2009 Dec 15;24(16):2358-62.

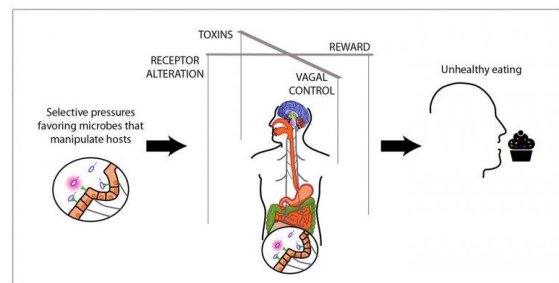
### Gluten Sensitivity and the Brain

- 57% positive anti gliadin antibodies in people with neurological issues (12% in controls)
- Ataxia, neuropathy, epilepsy, myopathy, myelopathy

Hadjivassiliou M. *Dig. Dis.* 2015;33(2):264-8; Catassi (2013) *Nutrients* 5, 3839-3853



### Does your microbiome tell you what to eat?



Aktipis, A. *USCF news.edu/2014/08/116526/do-gut-bacteria-rule-our-minds*

## Psychobiotic

“We define a psychobiotic as a live organism that, when ingested in adequate amounts, produces health benefits in patients suffering from a psychiatric illness. As a class of probiotic, these bacteria are capable of producing and delivering neuroactive substances such as gamma-aminobutyric acid and serotonin, which act on the brain-gut axis.”

Dinan, T.G., C. Stanton, and J.F. Cryan, 2013. 74(10): p. 720-6.

Microbe	Neurotransmitter	Depression/ Anxiety	Cortisol/ Stress
L. rhamnosis	GABA	X	
B. infantis		X	
L. helveticus & B. longum			X
Bacillus infantis	Norphinephrine Dopamine		
L. casei		X	
Lactobacilli	GABA acetylcholine		
Bifidobacteria	GABA		
Escherichia,	Norphinephrine, Serotonin		
Saccharomyces	Norphinephrine		
Spore forming microbes	Serotonin		
Enterococcus	Serotonin		
B. breve	Alters brain fatty acids and lipids		

Smythies, L.E. and J.R. Smythies, *Front Hum Neurosci*, 2014. 8: p. 720; Dinan, T.G., C. Stanton, & J.F. Cryan, 2013. 74(10): p. 720-6. 1.Dinan, T.G. & J.F. Cryan, *Neurogastroenterol Motil*. 2013. 25(9): p. 713-9; Zhou, L. *Neuropsychiatr Dis Treat*, 2015. 11: p. 715-23; Gnanavel S. *Indian J Psychol Med* 2015;37:110. 1; Wall, R. *Adv Exp Med Biol*, 2014. 817: p. 221-39.

## Probiotics and Mental Health

- Women: fermented milk: b. animalis (Lactis), S. thermophiles, L. bulgaricus, Lactococcus lactis 4 wks: Global enhancement on brain function. (no change in placebo group)
- Lactobacilli and Bifidobacterium < Post MI depression
- Mechanism: < inflammatory cytokines, regulation of tryptophan metabolism, and neurotransmitters, healthier gut barrier

*Brain Behav Immun*. 2014 May; 38: 1–12.

## Probiotics Improved HPA Axis and Mental Health

- 70 petrochemical workers
- Randomized for 6 weeks
  - Placebo + probiotic yogurt,
  - Probiotic capsule + 100 gms commercial yogurt
  - Placebo + 100 gms commercial yogurt
- Improved: in Probiotic yogurt and probiotic groups: general health questionnaires, mental health and stress

Mohammadi AA. *Nutr Neurosci*. 2015 Apr 16.

## Leaky Gut = Leaky Brain

- Mental Disorder
- Mood swings
- Nervousness
- Aggressive Behavior
- Fatigue/Malaise
- Poor memory/concentration
- Confusion
- Food & Environmental Sensitivities
- Addictive Behavior



- Sex
- Age
- Diet
- Stress
- Geography
- Ethnicity
- Family
- Probiotics
- Prebiotics
- Method of birth
- Breast fed or bottle fed
- Medications/Antibiotics
- Lifestyle

What Affects  
your  
Microbiota

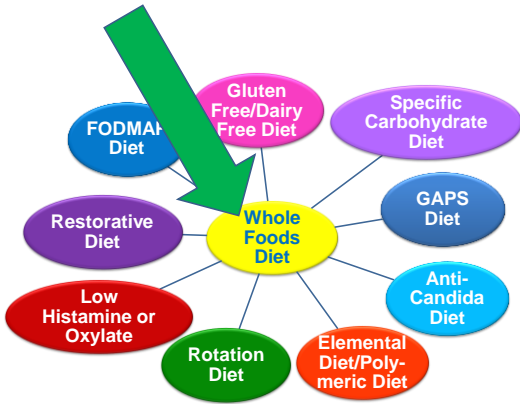


### Diet and Microbiome

“Diet has the most powerful influence on gut microbial communities in healthy human subjects.”

About 75% of the food in the Western diet is of limited or no benefit to the microbiota in the lower gut. Most of it, comprised specifically of refined carbohydrates, is already absorbed in the upper part of the GI tract, and what eventually reaches the large intestine is of limited value, as it contains only small amounts of the minerals, vitamins and other nutrients necessary for maintenance of the microbiota.

Benchmark S. “Nutrition of the Critically Ill: a 21st-Cent perspective” *Nutrients* 2013, 5, 162-207



JECM Online First, published on March 31, 2014 as 10.1136/jech-2013-203500



#### Fruit and vegetable consumption and all-cause, cancer and CVD mortality: analysis of Health Survey for England data

Ojinoia Oyebode, Vanessa Gordon-Dasagu, Alice Walker, Jennifer S Mendel

**ABSTRACT** Background: Consumption of fruit and vegetables is associated with lower mortality. We examined the association between fruit and vegetable consumption and mortality with trends over time in the general population.

two portions of fruit (150 g per portion) and five portions of vegetables (75 g per portion). Daily consumption of fruit and vegetables was associated with a 42% lower risk of death from all causes and from cancer and heart disease/stroke of 25% and 31%, respectively, after excluding deaths within the first year of the monitoring period.

Eating at least seven daily portions was linked to a 42% lower risk of death from all causes and from cancer and heart disease/stroke of 25% and 31%, respectively, after excluding deaths within the first year of the monitoring period.

Oyebode, O. (2014). Fruit and vegetable consumption and all-cause, cancer and CVD mortality: analysis of Health Survey for England data. *J Epidemiol Community Health*, 68(9), 856-62. doi:10.1136/jech-2013-203500

#### Polyphenols in food promote growth of Probiotic microbes

- Green tea
  - Red wine
  - Apples
  - Onions
  - Chocolate
  - Panax ginseng
- > Lactobacilli
  - > Bifidobacteria
  - < pathogens



&  
Spices:  
Dried:  
1-3 tsp daily  
or  
Fresh:  
1-3 TBSP daily

### Probiotic Rich Foods

- Yogurt/Kefir
- Miso
- Natto
- Tempeh
- Sauerkraut
- Kim chee
- Raw pickles
- Fermented anything
- Root and ginger beers
- Olives

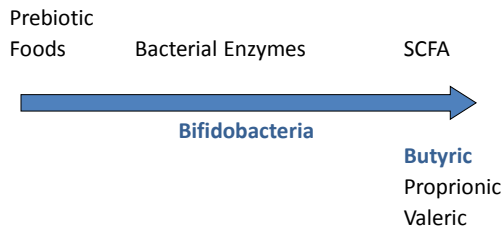
- Honey
- Pulke
- Kombucha
- Fermented vegetables
- Buttermilk
- Raw whey
- Raw vinegars
- Fermented sausages
- Sourdough
- Essene bread
- Beer
- Wine



### Prebiotics



### SCFA Production in Colon



### Prebiotic Rich Foods

- Jerusalem artichokes
- Onions
- Chicory
- Garlic
- Leeks
- Bananas
- Fruit
- Soybeans
- Burdock root
- Asparagus
- Maple syrup/sugar
- Chinese chives
- Peas
- Legumes
- Eggplant
- Honey
- Green Tea
- Yogurt, cottage cheese, kefir



### Rebalance Health with FOOD

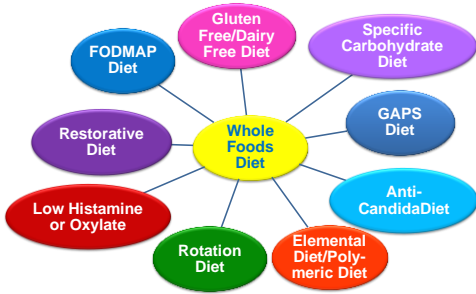


### GI Healing Diets

- Enhance digestion and absorption
- Reduce inflammation
- Hypo allergenic (restricts proteins)
- Balance microbiota
- Heals a Leaky Gut
- Often limited to specific types of carbohydrates
- Reduces toxic burden



### GI Healing Diets



Lipski 2016

### Resources:

- Robynne Chutkan MD, *Microbiome Solution*
- Raphael Kellman MD, *The Microbiome Diet*
- Gerard E. Mullin, MD, *Gut Balance Revolution*
- Kathie Swift, MS, RD, *The Swift Diet*
- Tom Malterre, MS, CNS/A. Segersten, *The Elimination Diet, Whole Life Nutrition Cookbook*
- Sue Sheppard/Peter Gibson, [www.FODMAP.com](http://www.FODMAP.com)  
*The Complete Low FODMAP DIET*
- Donna Gates, *Body Ecology Diet*
- Natasha Campbell McBride, MD: *Gut & Psychology Syndrome*
- Elaine Gotschall PhD, *Breaking the Vicious Cycle*  
[www.breakingtheviciouscycle.info](http://www.breakingtheviciouscycle.info). *Breaking the Vicious Cycle, Grain-Free Gourmet*



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